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Imaging modalities for characterising focal pancreatic lesions (Review)

Best LMJ, Rawji V, Pereira SP, Davidson BR, Gurusamy KS

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[Diagnostic Test Accuracy Review]

Imaging modalities for characterising focal pancreatic lesions

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ABSTRACT

Background

Increasing numbers of incidental pancreatic lesions are being detected each year. Accurate characterisation of pancreatic lesions into benign, precancerous, and cancer masses is crucial in deciding whether to use treatment or surveillance. Distinguishing benign lesions from precancerous and cancerous lesions can prevent patients from undergoing unnecessary major surgery. Despite the importance of accurately classifying pancreatic lesions, there is no clear algorithm for management of focal pancreatic lesions.

Objectives

To determine and compare the diagnostic accuracy of various imaging modalities in detecting cancerous and precancerous lesions in people with focal pancreatic lesions.

Search methods

We searched the CENTRAL, MEDLINE, Embase, and Science Citation Index until 19 July 2016. We searched the references of included studies to identify further studies. We did not restrict studies based on language or publication status, or whether data were collected prospectively or retrospectively.

Selection criteria

We planned to include studies reporting cross-sectional information on the index test (CT (computed tomography), MRI (magnetic resonance imaging), PET (positron emission tomography), EUS (endoscopic ultrasound), EUS elastography, and EUS-guided biopsy or FNA (fine-needle aspiration)) and reference standard (confirmation of the nature of the lesion was obtained by histopathological examination of the entire lesion by surgical excision, or histopathological examination for confirmation of precancer or cancer by biopsy and clinical follow-up of at least six months in people with negative index tests) in people with pancreatic lesions irrespective of language or publication status or whether the data were collected prospectively or retrospectively.

Data collection and analysis

Two review authors independently searched the references to identify relevant studies and extracted the data. We planned to use the bivariate analysis to calculate the summary sensitivity and specificity with their 95% confidence intervals and the hierarchical summary receiver operating characteristic (HSROC) to compare the tests and assess heterogeneity, but used simpler models (such as univariate random-effects model and univariate fixed-effect model) for combining studies when appropriate because of the sparse data. We were unable to compare the diagnostic performance of the tests using formal statistical methods because of sparse data.

Imaging modalities for characterising focal pancreatic lesions (Review)

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Main results

We included 54 studies involving a total of 3,196 participants evaluating the diagnostic accuracy of various index tests. In these 54 studies, eight different target conditions were identified with different final diagnoses constituting benign, precancerous, and cancerous lesions. None of the studies was of high methodological quality. None of the comparisons in which single studies were included was of sufficiently high methodological quality to warrant highlighting of the results. For differentiation of cancerous lesions from benign or precancerous lesions, we identified only one study per index test. The second analysis, of studies differentiating cancerous versus benign lesions, provided three tests in which meta-analysis could be performed. The sensitivities and specificities for diagnosing cancer were: EUS-FNA: sensitivity 0.79 (95% confidence interval (CI) 0.07 to 1.00), specificity 1.00 (95% CI 0.91 to 1.00); EUS: sensitivity 0.95 (95% CI 0.84 to 0.99), specificity 0.53 (95% CI 0.31 to 0.74); PET: sensitivity 0.92 (95% CI 0.80 to 0.97), specificity 0.65 (95% CI 0.39 to 0.84). The third analysis, of studies differentiating precancerous or cancerous lesions from benign lesions, only provided one test (EUS-FNA) in which meta-analysis was performed. EUS-FNA had moderate sensitivity for diagnosing precancerous or cancerous lesions (sensitivity 0.73 (95% CI 0.01 to 1.00) and high specificity 0.94 (95% CI 0.15 to 1.00), the extremely wide confidence intervals reflecting the heterogeneity between the studies). The fourth analysis, of studies differentiating cancerous (invasive carcinoma) from precancerous (dysplasia) provided three tests in which meta-analysis was performed. The sensitivities and specificities for diagnosing invasive carcinoma were: CT: sensitivity 0.72 (95% CI 0.50 to 0.87), specificity 0.92 (95% CI 0.81 to 0.97); EUS: sensitivity 0.78 (95% CI 0.44 to 0.94), specificity 0.91 (95% CI 0.61 to 0.98); EUS-FNA: sensitivity 0.66 (95% CI 0.03 to 0.99), specificity 0.92 (95% CI 0.73 to 0.98). The fifth analysis, of studies differentiating cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) provided six tests in which meta-analysis was performed. The sensitivities and specificities for diagnosing cancer (high-grade dysplasia or invasive carcinoma) were: CT: sensitivity 0.87 (95% CI 0.00 to 1.00), specificity 0.96 (95% CI 0.00 to 1.00); EUS: sensitivity 0.86 (95% CI 0.74 to 0.92), specificity 0.91 (95% CI 0.83 to 0.96); EUS-FNA: sensitivity 0.47 (95% CI 0.24 to 0.70), specificity 0.91 (95% CI 0.32 to 1.00); EUS-FNA carcinoembryonic antigen 200 ng/mL: sensitivity 0.58 (95% CI 0.28 to 0.83), specificity 0.51 (95% CI 0.19 to 0.81); MRI: sensitivity 0.69 (95% CI 0.44 to 0.86), specificity 0.93 (95% CI 0.43 to 1.00); PET: sensitivity 0.90 (95% CI 0.79 to 0.96), specificity 0.94 (95% CI 0.81 to 0.99). The sixth analysis, of studies differentiating cancerous (invasive carcinoma) from precancerous (low-grade dysplasia) provided no tests in which meta-analysis was performed. The seventh analysis, of studies differentiating precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) from precancerous (low-grade dysplasia) provided two tests in which meta-analysis was performed. The sensitivity and specificity for diagnosing cancer were: CT: sensitivity 0.83 (95% CI 0.68 to 0.92), specificity 0.83 (95% CI 0.64 to 0.93) and MRI: sensitivity 0.80 (95% CI 0.58 to 0.92), specificity 0.81 (95% CI 0.53 to 0.95), respectively. The eighth analysis, of studies differentiating precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) from precancerous (low-grade dysplasia) or benign lesions provided no test in which meta-analysis was performed.

There were no major alterations in the subgroup analysis of cystic pancreatic focal lesions (42 studies; 2086 participants). None of the included studies evaluated EUS elastography or sequential testing.

Authors' conclusions

We were unable to arrive at any firm conclusions because of the differences in the way that study authors classified focal pancreatic lesions into cancerous, precancerous, and benign lesions; the inclusion of few studies with wide confidence intervals for each comparison; poor methodological quality in the studies; and heterogeneity in the estimates within comparisons.

PLAIN LANGUAGE SUMMARY

Accuracy of different imaging techniques for determining whether a pancreatic tumour is cancerous

Background

The pancreas is an organ in the abdomen that secretes pancreatic juice, which aids digestion and contains cells that produce important hormones such as insulin. Increasingly, abnormalities in the pancreas are noted in people undergoing routine scans, such as ultrasound or computed tomography (CT) scans, in the form of what are known as 'shadows', which may be described as focal pancreatic lesion, pancreatic mass, pancreatic tumour, pancreatic cyst, or pancreatic nodule. A significant proportion of focal pancreatic lesions are benign (non-cancerous) lesions requiring no treatment. Surgical removal of the tumour is the main method of treatment for precancerous (i.e. focal pancreatic lesions that are not full-blown cancer and do not have the ability to spread like cancer, but can turn into cancer) and cancerous focal pancreatic lesions. New methods are being developed for treating precancerous lesions, such as using heat to destroy the tumour. Surgical removal remains the only potentially curative treatment for people with limited pancreatic cancer. It is thus important

to characterise whether a focal pancreatic lesion is non-cancerous, precancerous, or cancerous. A number of scans are available for characterising the nature of the focal pancreatic lesion, which include the following.

- Computed tomography (CT) scan: a series of X-rays taken from different angles, which are then reconstructed using a computer.
- Magnetic resonance imaging (MRI): the use of a powerful magnet to produce images of different tissues of the body.
- Positron emission tomography (PET): the use of a small amount of radioactive glucose (sugar) to differentiate between different tissues. It takes advantage of the tendency of cancer cells to use more glucose than normal cells.
- Endoscopic ultrasound (also known as endosonography or EUS): the use of an endoscope, a camera introduced into a body cavity to view the inside of the body. An ultrasound (high-energy sound waves) probe at the end of the endoscope is used to differentiate tissues.
- EUS elastography: this measures the stiffness of the lesion, which is used to identify whether the lesion is cancerous.
- EUS-guided biopsy: the removal of cells or tissues for examination under a microscope or to perform other tests on the cells or tissue.

At present it is unclear how effective different scans are in characterising focal pancreatic lesions.

Study characteristics

We performed a thorough literature search for studies reporting the accuracy of different scans until 19 July 2016. We identified 54 studies reporting information on 3196 people with focal pancreatic lesions. These studies evaluated one or more of the above tests and compared these test results with the eventual diagnosis provided by surgical removal of the lesion and examination under microscope. There were no diagnostic test accuracy studies of EUS elastography or studies that looked at multiple scans rather than single scans.

Key results

Variations in how studies defined precancerous and cancerous lesions meant that we were not able to combine the data to provide the overall results for many tests. We were unable to arrive at any firm conclusions for the following reasons.

- The way that study authors classified focal pancreatic lesions into cancerous, precancerous, and benign lesions was not consistent in different studies.
- The studies included few participants, leading to significant uncertainty in the results.
- The studies were of poor methodological quality, which introduced additional uncertainty in the results.
- Even among the studies that classified focal pancreatic lesions into cancerous, precancerous, and benign lesions in a similar manner, the results were not consistent.

Quality of evidence

All of the studies were of low methodological quality, which may result in arriving at false conclusions.

BACKGROUND

(Please see the glossary in [Appendix 1](#) for terms that have not been described in the main text.)

A 'shadow' identified in the pancreas on imaging may be variously described as a focal pancreatic lesion, pancreatic mass, pancreatic tumour, pancreatic cyst, or pancreatic nodule. This phrasing refers to focal lesions, as opposed to diffuse changes of the pancreas, and includes solid and cystic lesions of the pancreas. In the Western

world, the prevalence of focal pancreatic lesions is approximately 1.2% and is increasing steadily (by approximately 8%) each year, with smaller and asymptomatic lesions being identified more frequently ([Gaujoux 2011](#); [Spinelli 2004](#)). An incidental pancreatic lesion is one that is detected in the pancreas of a patient who undergoes radiological investigations for an unrelated medical condition ([Sachs 2009](#)). Such asymptomatic incidental lesions represent 55% to 60% of pancreatic tumours ([Gaujoux 2011](#); [Spinelli 2004](#)). Some focal pancreatic lesions may be associated with symp-

toms, depending upon their size and nature. The symptoms of pancreatic cancer, which generally refers to pancreatic adenocarcinoma, can include obstructive jaundice (yellowish discolouration of the skin and the whites of the eyes with dark urine and pale stool due to blockage of bile duct (National Cancer Institute 2011a), a tube that transports the bile from the liver), loss of appetite, and abdominal pain (Holly 2004). The symptoms of pancreatic neuroendocrine tumours (tumours arising from cells that secrete hormones), some of which may be cancer, are related to the excessive secretion of hormones (by the tumour) such as insulin, glucagon, gastrin, somatostatin, and vasoactive peptide resulting in hypoglycaemia (decreased blood sugar), hyperglycaemia (increased blood sugar, a rare cause of diabetes), and gastrointestinal disturbances such as peptic ulcer and diarrhoea (Batcher 2011). The symptoms of chronic pancreatitis (chronic inflammation of the pancreas that can result in alteration in the structure and function of the pancreas) are abdominal and back pain and those symptoms related to pancreatic insufficiency, which include steatorrhoea, malabsorption, vitamin deficiency, diabetes, or weight loss (Braganza 2011; Nair 2007). About 40% of people with focal pancreatic lesions have chronic pancreatitis (Spinelli 2004). In the remaining 60% of people with focal pancreatic lesions, the remaining pancreas is normal.

Focal pancreatic lesions can be benign (serous pancreatic cystadenoma, acinar cell cystadenoma, papillary cysts, lymphoepithelial cysts, simple cysts), precancerous (intraductal papillary mucinous neoplasm (IPMN) with dysplasia but without invasive cancer, mucinous cystic neoplasm (MCN), benign neuroendocrine tumours), or cancer (ductal adenocarcinoma, acinar cell carcinoma, IPMN with invasive carcinoma, cystadenocarcinoma, pancreatoblastoma, solid pseudo-papillary neoplasm, cancer neuroendocrine tumours) (Luttges 2011; Sachs 2009; Spinelli 2004; WHO 2016). Dysplasia can be low grade, intermediate grade, or high grade (WHO 2016). About 80% of benign lesions, 50% of precancerous lesions, and 20% of cancerous lesions are asymptomatic (Spinelli 2004). Focal pancreatic lesions can be solid or cystic or mixed solid and cystic tumours (Cho 2011).

Surgical resection is generally considered to be the only curative treatment for pancreatic cancer. Worldwide, only 15% to 20% of people with pancreatic cancer undergo potentially curative resection (Conlon 1996; Engelken 2003; Katz 2009; Michelassi 1989; Shahrudin 1997; Smith 2008). In the remaining patients, the cancers are not resected because of infiltration of local structures or disseminated disease. Early diagnosis of pancreatic cancer might enable resection of the pancreatic cancer before it is too late to resect. Pancreatic resection is a major surgery, with an approximately 1% to 25% risk of perioperative death reported worldwide (Conlon 1996; Katz 2009; Michelassi 1989; Shahrudin 1997; van Oost 2006). High-volume centres show a lower perioperative mortality of less than 5% compared to low-volume centres, which are associated with a perioperative mortality of up to 25% (Gurusamy

2013; van Oost 2006). Pancreatic resection is also associated with an about 40% morbidity rate (Gurusamy 2013; van der Gaag 2010). Only 5% to 25% of patients survive for five years (Conlon 1996; Katz 2009; Michelassi 1989; Shahrudin 1997). Surgery is generally offered if there are features suggestive of precancerous or cancerous lesions (Lee 2005c), although some clinicians prefer sequential follow-up (by imaging) of precancerous lesions to surgical resection (Irie 2004). Surgery is offered when there is an increase in the size or morphology (the way the lesion appears) of the lesion in sequential imaging (Gaujoux 2011). Surgery is also offered when there is considerable uncertainty as to the nature of the lesion. In some ways, surgery can be considered as a diagnostic test for characterisation of the lesion and as a treatment for people with cancerous and precancerous lesions. Histological confirmation of the lesion by percutaneous biopsy is generally not performed because of difficulty in accessing the lesion percutaneously and because of dissemination of cancer cells.

Target condition being diagnosed

1. Cancerous versus benign or precancerous lesions.
2. Precancerous or cancerous (including the type of cancerous lesion) versus benign lesions.

Index test(s)

Computed tomography (CT) scan

This involves a series of X-rays taken from different angles, which are then reconstructed using a computer (National Cancer Institute 2011a). Morphological features of the lesion, such as density, regularity of margins, vascularity, and the diameter of the pancreatic duct, are taken into account to characterise the lesion. The main side effect of CT scan is the ionising radiation (radioactivity) associated with it. Everyone is exposed to very small amounts of radiation (background radiation). One CT scan of the abdomen is equivalent to approximately three years of background radiation (Fred 2004). In addition, the contrast material (dye used to view the structures better) can cause allergic reactions, such as difficulty breathing, or kidney damage, particularly in people with pre-existing kidney disease (Namasivayam 2006).

Magnetic resonance imaging (MRI)

This involves the use of a powerful magnet to produce images of different tissues of the body. Magnetic resonance imaging is also known as nuclear magnetic resonance imaging (NMRI) (National Cancer Institute 2011b). Similar features as those employed in CT scan are used to characterise the lesion. While MRI does not use radiation, it is contraindicated in people with metallic implants

such as artificial joints, those with cardiac pacemakers (devices used to control heart rhythm), and those with claustrophobia (fear of closed spaces) (Dill 2008). Some of the contrasts used can also cause kidney damage (Dill 2008).

Positron emission tomography (PET)

This involves the use of a small amount of radioactive glucose (sugar) to differentiate between different tissues. It takes advantage of the tendency of cancer cells to use more glucose than normal cells. Positron emission tomography is also known as PET scan (National Cancer Institute 2011c). Cancerous lesions appear as areas of increased uptake. Positron emission tomography also uses ionising radiation (Leide-Svegborn 2010). The radiation exposure to one PET scan is similar to that in one CT scan of abdomen (Fred 2004; Leide-Svegborn 2010).

Endoscopic ultrasound (EUS)

This involves the use of an endoscope, a camera introduced into a body cavity to view the inside of the body. An ultrasound (high-energy sound waves) probe at the end of the endoscope is used to differentiate tissues. Endoscopic ultrasound is also known as endosonography (National Cancer Institute 2011d). Features such as echogenicity and regularity of margins are taken into account and used to characterise the lesion. Complications following EUS are rare and include perforation (Benson 2010; Niv 2011).

EUS elastography

This measures the stiffness of the lesion, which can be used to identify whether the lesion is benign or cancerous (Iglesias-Garcia 2010). The complications associated with EUS elastography are the same as with EUS.

EUS-guided biopsy

This is the removal of cells or tissues for examination by a pathologist. The pathologist may study the tissue under a microscope or perform other tests on the cells or tissue. There are many different types of biopsy procedures. The most common types include:

1. incisional biopsy, in which only a sample of tissue is removed;
2. excisional biopsy, in which an entire lump or suspicious area is removed; and
3. needle biopsy, in which a sample of tissue or fluid is removed with a needle. When a wide needle is used the procedure is called a core biopsy. When a thin needle is used the procedure is called a fine-needle aspiration biopsy (FNAB) (National Cancer Institute 2011e).

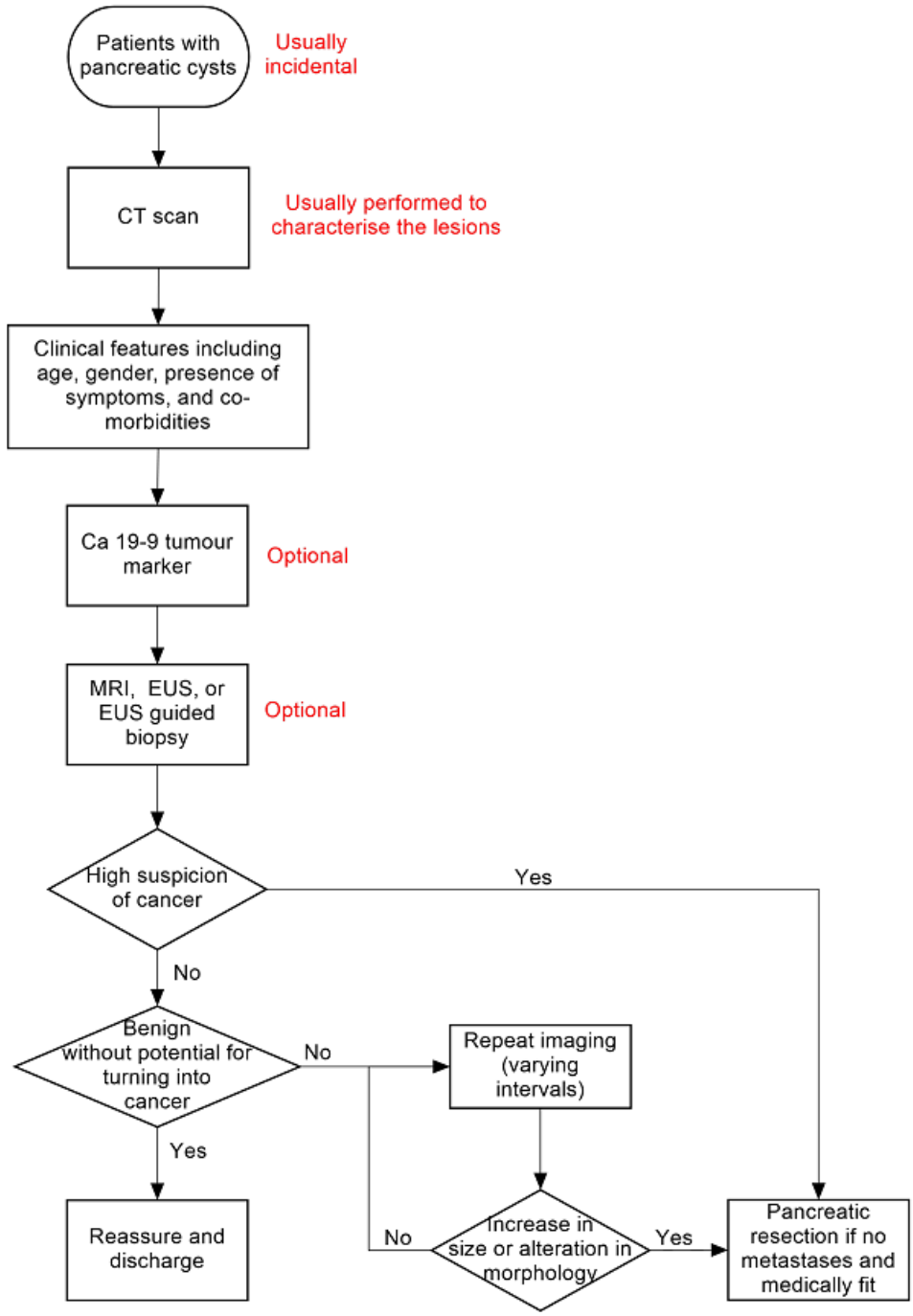
Because of the risk of dissemination from cancer, EUS-guided biopsy is preferable to percutaneous (image-guided) biopsy (Micames 2003). The examinations under the microscope used may include the routine haematoxylin and eosin stain for core biopsy and special staining for FNAB (Mehta 2010). Immunocytochemistry and proteomic profiling to identify the presence of biomarkers in the tissue may also be used in the diagnosis (Cui 2009; Mehta 2010). A positive core biopsy can confirm cancer, but a negative core biopsy cannot rule out cancer. Cytology results are not quite as reliable as core biopsy as false-positive cytology has been reported (Hancke 1984).

Complications associated with EUS-guided biopsy include those associated with EUS as well as bleeding (Benson 2010; Niv 2011). Of these index tests, the commonly available tests are CT scan and MRI. The remaining tests (PET, EUS, EUS elastography, and EUS-guided biopsy) are available in major tertiary centres only.

Clinical pathway

There is no standard algorithm in the diagnosis or management of focal pancreatic lesions. The algorithm may vary from one centre to another and even within the same centre (Gaujoux 2011; Goh 2006b). One possible diagnostic clinical pathway is shown in Figure 1. As noted in Figure 1, an increase in the size of or change of morphological features is one of the reasons that surgeons recommend surgical excision, as this may indicate that the lesion was malignant in the first instance (without features suggestive of malignancy in the original scan) or has transformed into a malignant lesion. The interval for sequential scans is variable. Our local protocol advises sequential scanning in one year in the absence of malignant features. It is important to distinguish whether the focal pancreatic lesion is benign with no cancer potential so that unnecessary surgery and anxiety can be avoided. It is also important to know whether the lesion is precancerous or cancerous so that an informed decision about surgery can be made after weighing the potential benefits and harms. In addition, new alternative treatments such as radiofrequency ablation (destruction of tissue using radiofrequency waves) are being evaluated for precancerous lesions (Pereira 2015). It is also necessary to differentiate the different types of cancer, since different malignancies carry different prognoses (Klempnauer 1995). Some surgeons follow the single-test strategy, that is making decisions based on the features of the lesion in a single test, while others follow repeated testing (repeating the imaging modality or using a different imaging modality), particularly if the nature of the lesion is indeterminate. The optimal interval between the tests in the repeated-testing strategy is unknown.

Figure 1. Clinical pathway. Abbreviations: Ca 19-9: carbohydrate antigen 19-9; CT: computed tomography; EUS: endoscopic ultrasound; MRI: magnetic resonance imaging; PET: positron emission tomography



Prior test(s)

The tests that occur prior to pancreatic imaging depend on how the patient presents. The investigation may be targeted if the patient presents with abdominal symptoms, however it is equally possible that the pancreatic lesion is an incidental finding on an abdominal scan for an alternative reason. As pancreatic cancer is relatively late presenting (Porta 2005), the number of incidental lesions found will be high comparative to other cancers where symptoms will primarily drive discovery. Whilst CT, MRI, and PET may identify incidental lesions, EUS and EUS-guided fine-needle aspiration (EUS-FNA) are the likely second test for known lesions of symptomatic individuals.

Role of index test(s)

All of the index tests described are used primarily to characterise pancreatic lesions as either benign or cancerous, or more importantly as needing significant or more conservative treatment. The location of the pancreas makes percutaneous biopsy dangerous because of the risk of cancer spread, therefore determination of cancer stage and consequently required treatment must be made non-invasively by the imaging techniques and by EUS-FNA.

Alternative test(s)

Computed tomography is usually part of a standard algorithm for assessing focal pancreatic lesions (Gaujoux 2011). If the incidental lesion is detected on CT scan, then CT scan can be the only investigation, since the added value of the other tests is not known. One or more of the above tests may be used in addition to, or instead of, CT scan. Diagnostic laparoscopy and laparoscopic ultrasound are other tests that may be used in the differential diagnosis of focal pancreatic lesions; however, these tests are not used routinely. Serum carbohydrate antigen 19-9 (CA 19-9) is a substance released into the bloodstream by both cancer cells and normal cells and is used as a type of tumour marker (National Cancer Institute 2011f). Excessive CA 19-9 in the blood can be a sign of pancreatic cancer or other types of cancer or conditions. The amount of CA 19-9 in the blood can be used to measure how effective cancer treatments are or if cancer has returned. It can be used in conjunction with other imaging modalities in the assessment of the focal pancreatic lesion.

Rationale

The various imaging modalities use different methods to differentiate normal and diseased tissues. Endoscopic ultrasound is closer to the tissues and therefore high-frequency ultrasound waves can be used, which have better resolution but poorer penetration than an external ultrasound. Image-guided biopsy can be performed

and the tissue can be examined under the microscope to differentiate between types of focal pancreatic lesion.

Accurate characterisation of lesions will help in patient management. Patients with cancerous lesions will be offered surgery if there is no distant spread of cancer and assuming they are fit for major surgery. Patients with cancerous lesions who are not eligible for surgery because of distant spread of cancer or lack of fitness for major surgery will be offered other treatments such as chemotherapy. Patients with precancerous lesions may also undergo surgery or ablation depending upon the clinician and patient preferences. Unnecessary major surgery can be avoided in patients with benign lesions.

There is currently no Cochrane review of studies assessing the diagnostic accuracy of different imaging modalities in the assessment of focal pancreatic lesions.

OBJECTIVES

To determine and compare the diagnostic accuracy of various imaging modalities in detecting cancerous and precancerous lesions in people with focal pancreatic lesions.

Secondary objectives

We planned to explore the following sources of heterogeneity.

1. Studies at low risk of bias versus those at unclear or high risk of bias (as assessed by the revised Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool as recommended by the [Cochrane Screening and Diagnostic Tests Methods Group](#)) (Whiting 2006). In particular, we considered the studies classified as 'yes' for the items differential verification, uninterpretable results, and withdrawals as the most important sources of heterogeneity.
2. Full-text publications versus abstracts (this might be indicative of publication bias, since there may be an association between the results of the study and the study reaching full publication) (Eloubeidi 2001).
3. Prospective studies versus retrospective studies.
4. Different types of reference standard.
5. Symptomatic versus asymptomatic lesions (the presence of symptoms may increase the pre-test probability).
6. Solid versus cystic lesions (as the diagnostic accuracy of the imaging modalities may vary depending upon whether the lesion is solid or cystic).
7. Participants with chronic pancreatitis versus those without chronic pancreatitis.
8. Different criteria used by the authors to classify the lesions.

9. Single imaging versus sequential imaging (repeated imaging).
10. Different intervals of sequential imaging (e.g. imaging every six months versus annual review).

METHODS

Criteria for considering studies for this review

Types of studies

We included studies reporting on cross-sectional information of the index test and reference test in the appropriate patient population (see below), irrespective of language or publication status or whether the data were collected prospectively or retrospectively. However, we excluded case series in which only true-positive results or true-negative results were reported without any information on the other participants who underwent the test.

Participants

Adults with focal pancreatic lesions.

Index tests

CT scan, MRI scan, PET scan, EUS, EUS elastography, and EUS-guided biopsy either alone or in combination as replacement for major surgery for diagnostic purposes.

We accepted the criteria stated by the authors to classify the lesion as benign, precancerous, and cancerous for different imaging modalities.

There is no standard algorithm in the diagnosis or management of focal pancreatic lesions. Other tests that may be used in the diagnosis of focal pancreatic lesions include diagnostic laparoscopy, laparoscopic ultrasound, serum levels of CA 19-9, and surgical resection (surgical resection may be considered diagnostic when the diagnosis is uncertain after all other diagnostic modalities have been attempted).

Target conditions

1. Benign versus precancerous and cancerous lesions (including the type of cancerous lesion).
2. Benign and precancerous versus cancerous lesions.

Reference standards

We accepted the following reference standards.

- Histopathological examination of the entire lesion by surgical resection (gold standard). This classified the lesion as benign, precancerous, or cancerous.
- Histopathological examination (irrespective of how the tissues were obtained for histopathological examination) in people with positive test (for cancerous or precancerous lesions) and clinical follow-up by a doctor (with or without sequential follow-up with imaging but using appropriate criteria such as metastases or confirmation of cancer by biopsy or death of participants due to cancer) of all participants with negative test for a period of at least six months and for a maximum period of 24 months. Until a definitive diagnosis is available, percutaneous biopsy is generally avoided because of the fear of seeding of cancer cells in potentially resectable cancers. As anticipated, the tissues obtained for histopathological examination were obtained from surgical resection. It is unlikely that patients with a low likelihood for cancer based on clinical symptoms and signs and test results (may include the results of index test) are subject to surgery or biopsy. Even if a biopsy is performed in such patients, a cancerous or precancerous lesion cannot be ruled out because of sampling error. Consequently, such patients are usually followed up clinically with sequential imaging. Pancreatic adenocarcinoma will cause clinical deterioration or increase in tumour size during a period of six months, and so we accepted clinical follow-up or sequential follow-up imaging (irrespective of the modality of the imaging) of all participants with a negative biopsy or no biopsy for at least six months as one of the reference standards. However, we accepted clinical follow-up as a reference standard only when the criteria used for diagnosis were appropriate (e.g. identification of metastases, later biopsy of the lesion confirming the nature of the lesion, and death of participants due to cancer). The choice of a maximum period of 24 months was an arbitrary choice based on the low probability of precancerous lesions becoming cancerous during 24 months. Clinical follow-up of patients is unlikely to classify precancerous lesions correctly since patients are unlikely to develop metastases or die within this interval.

Search methods for identification of studies

Electronic searches

We searched the following databases.

1. Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library (Issue 7, 2016) ([Appendix 2](#)).
2. MEDLINE via PubMed (January 1946 to 19 July 2016) ([Appendix 3](#)).

3. Embase via OvidSP (January 1947 to 19 July 2016) ([Appendix 4](#)).
4. Science Citation Index Expanded via ISI Web of Knowledge (January 1980 to 19 July 2016) ([Appendix 5](#)).

Searching other resources

We searched the references of included studies to identify further studies ([Horsley 2011](#)). We also searched for additional articles related to the included studies by performing the 'related search' function in MEDLINE (PubMed) and Embase (OvidSP) and 'citing reference' search (search the articles that cited the included articles) in Science Citation Index Expanded and Embase (OvidSP) ([Sampson 2008](#)).

Data collection and analysis

Selection of studies

Two review authors independently searched the references to identify relevant studies. We obtained the full text of references that at least one of the review authors consider relevant and used these full texts to further exclude irrelevant references. We selected references to studies that met the inclusion criteria for data extraction. Any differences in study selection were arbitrated by review author BR Davidson.

Data extraction and management

Two review authors independently extracted the following data from each included study.

- First author of report.
- Year of publication of report.
- Study design (prospective or retrospective; cross-sectional studies or randomised clinical trials).
 - Inclusion and exclusion criteria for individual studies.
 - Total number of participants.
 - Number of females.
 - Mean age of the participants.
 - Criteria used for classification of lesions.
 - Preoperative tests carried out prior to index test.
 - Index test.
 - Reference standard.
 - True positive (TP), false positive (FP), true negative (TN), and false negative (FN) data.

Main analysis

The unit of analysis was the participant. We extracted the TP, FP, TN, and FN information for each index test for the following situations (when data were available).

1. Precancerous or cancerous lesions (positive test) versus benign lesions with no cancer potential (negative test) (this helps determine whether the patient needs further follow-up).

2. Cancerous lesions (positive test) versus non-cancerous lesions (negative test) (this helps determine whether the patient needs immediate surgery).

3. In the group of participants with precancerous or cancerous lesions (i.e. those with positive test in the analysis of benign lesions with no cancer potential (negative test) versus precancerous or cancerous lesions (positive test)), we extracted the TP, FP, TN, and FN information for cancerous lesions (positive test) versus precancerous lesions (negative test) (this helps in assessing whether or not surgery is appropriate; surgery is the only curative option for cancerous lesions, while follow-up may be an option for precancerous lesions).

We extracted the information on indeterminate results separately from the TP, FP, TN, and FN data. There is no standard algorithm of management of patients with indeterminate results in the first scan. Some surgeons may recommend surgical resection for indeterminate lesions, while others may advise additional scans or sequential follow-up imaging. We therefore planned to perform a sensitivity analysis as described in [Sensitivity analyses](#).

For tests performed for sequential follow-up imaging (repeated-testing strategy), we planned to extract the TP, FP, TN, and FN data for the strategy as a whole. We considered increase in size or change in the lesion on sequential follow-up imaging (performed within 12 months) a positive index test. If the lesion remained static (or decreased in size) without any change in the characteristics of the lesion, we considered this a negative index test. The majority of surgeons will recommend further follow-up imaging or no follow-up if the sequential follow-up image shows no change in the lesion, and there is no clinical deterioration for the comparison between precancerous and cancerous lesions. We therefore considered indeterminate results on sequential follow-up imaging as negative results for this comparison.

We sought further information from study authors where necessary. Any differences between the review authors were resolved by discussion.

Assessment of methodological quality

Two review authors independently assessed the quality of the studies using the QUADAS-2 assessment tool ([Whiting 2006](#); [Whiting 2011](#)). We resolved any differences in assessment using the QUADAS-2 assessment algorithm published in the protocol. We sought further information from the authors of the studies in order to accurately assess the methodological quality of the studies. We assessed the quality items derived from the QUADAS-2 tool using the methodology stated in [Table 1](#).

Statistical analysis and data synthesis

We have plotted study estimates of sensitivity and specificity on forest plots and in receiver operating characteristic (ROC) space to explore between-study variation in the performance of each test. To estimate the summary sensitivity and specificity of each test, we planned to perform the meta-analysis by fitting the bivariate model (Chu 2006; Reitsma 2005), which accounts for between-study variability in estimates of sensitivity and specificity through the inclusion of random effects for the logit sensitivity and logit specificity parameters of the bivariate model. As there was lack of convergence due to sparse data, we tried other alternate models suggested by Takwoingi 2015 and colleagues. These included the random-effects model, ignoring the inverse correlation between sensitivities and specificities in the different studies due to intrinsic threshold effect, and the fixed-effect model for either sensitivity or specificity or both after visualising the forest plots and summary receiver operating characteristics (SROC) plots (Takwoingi 2015). We based our choice between the different models on the distribution of sensitivities and specificities as noted in the forest plots or ROC space. We also used the model fit as indicated by the -2 log likelihood and considered the model with the lower -2 log likelihood to be the better model.

We planned to compare the diagnostic accuracy of the tests by including covariate terms for test type (CT scan, MRI, PET, EUS, EUS-FNA, EUS elastography) in the bivariate model to estimate differences in the sensitivity and specificity of the tests. We planned to allow both the sensitivity and specificity to vary by covariate. In addition, we planned to permit the variances of the random effects and their covariance to also depend on test type, thus allowing the variances to differ between tests. We planned to use likelihood ratio tests to compare the model with and without covariate (test type). We planned to use a P value of less than 0.05 for the likelihood ratio test to indicate differences in the diagnostic accuracy between the tests. If studies that reported different tests in the same study population were available from at least four studies, we planned to perform a direct head-to-head comparison by limiting the test comparison to such studies. We planned to calculate the relative sensitivities and specificities for each pair-wise comparison of tests. We performed the meta-analysis using the NLMIXED command in SAS version 9.4 (SAS Institute Inc, Cary, North Carolina, USA) (Takwoingi 2012). The post-test probabilities were calculated using these pre-test probabilities and the summary positive and negative likelihood ratios. We calculated the summary likelihood ratios and their confidence intervals from the functions of the parameter estimates from the model that we fitted to estimate the summary sensitivities and specificities. Post-test probability associated with a positive test is the probability of having the target condition (e.g. precancer or cancer) on the basis of a positive test result (e.g. positive CT) and is the same as the term 'positive predictive value' used in a single diagnostic accuracy study. Post-test probability associated with a negative test is the probability of having the target condition (e.g. precancer or cancer) on the basis of a negative test result (e.g. negative CT) and is $1 - \text{'negative predictive value'}$.

'Negative predictive value' is the term used in a single diagnostic accuracy study to indicate the chance that the participant has no target condition when the test is negative. We have reported the summary sensitivity, specificity, and post-test probabilities for the median pre-test probabilities whenever possible.

Investigations of heterogeneity

We visually inspected forest plots of sensitivity and specificity and the ROC curve to identify heterogeneity. We planned to explore heterogeneity by using the different sources of heterogeneity as covariates in the METADAS macro (Takwoingi 2012), but due to the sparseness of the data we were unable to do this. We planned to assess whether there was a statistically significant difference in the likelihood ratios in order to identify heterogeneity. Although we did not formally compare the diagnostic test accuracy of different index tests between solid and cystic lesions, we have presented a subgroup analysis of solid and cystic lesions, since some clinicians consider the diagnostic test accuracies to differ between the two.

Sensitivity analyses

In the presence of indeterminate results (for any reason) for the initial test, we planned to consider two scenarios: the participants with indeterminate results as positive for the test, as some surgeons will recommend surgical resection for indeterminate lesions; and the indeterminate results as negative for the test, as some surgeons will recommend sequential follow-up imaging. We planned to assess the diagnostic accuracy in both of these scenarios. However, due to sparse data and few studies reporting indeterminate results we did not perform the above.

We also planned to assess the comparative performance of tests by direct comparison (i.e. the tests performed in the same participant) versus indirect comparison (the tests performed in different participants across studies).

RESULTS

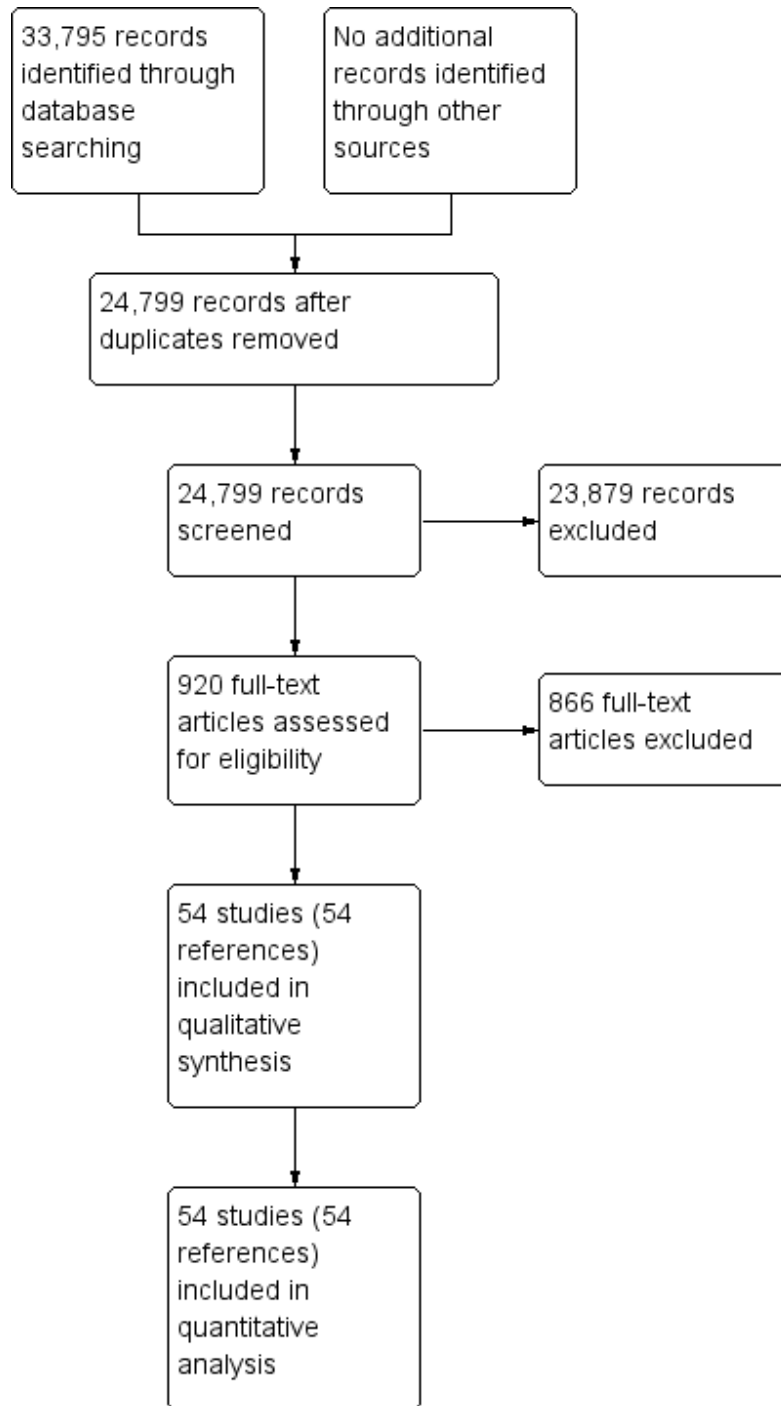
Results of the search

We identified 33,795 references through electronic searches of the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, Embase, and Science Citation Index. We were left with 24,799 references after removing duplicate references. We excluded 23,879 clearly irrelevant references through reading the abstracts. We sought the full text for 920 references for further assessment. We did not identify any additional references to studies through other searches. We excluded 866 references for the reasons described in the [Characteristics of excluded studies](#) tables. Fifty-two studies (54 references) met the inclusion criteria. Two studies

reported the diagnostic test data on solid and cystic lesions separately (Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Fischer 2009 - Cystic; Fischer 2009 - Solid) therefore, we considered them as separate studies. We thus included a total of 54 studies in the review (Brand 2000; Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cellier 1998; Choi 2003; Correa-Gallego 2009; de Jong 2012; Doi 2002; Erkan 2012; Fischer 2009 - Cystic; Fischer 2009 - Solid; Fisher 2008; Grieser 2010; Harrison 1999; Higashi 1997; Hong 2010; Hu 2013; Jafarimehr 2010; Jang 2014a; Jang 2014b;

Jin 2013a; Jin 2015; Kalha 2003; Kamata 2016a; Kato 1995; Kim 2015; Klau 2011; Kobayashi 2012; Kubo 2001; Kucera 2012; Le Baleur 2011a; Lee 2014; Maire 2008; McHenry 2002; Nakagawa 2009; Nara 2009; Ogawa 2008; Ogawa 2014; Otomi 2014; Pais 2007; Sahani 2006; Saito 2013; Salla 2007; Sedlack 2002; Smith 2016; Takanami 2011; Takeshita 2008; Tan 2009; Taouli 2000; Tomimaru 2010; Yamao 2001; Zhan 2011; Zhan 2013). The reference flow diagram is shown in Figure 2.

Figure 2. Study flow diagram.



Characteristics of included studies

For a summary of the characteristics of included studies see the [Characteristics of included studies](#) table.

We included a total of 54 studies involving 31,196 participants in this systematic review. The studies reported investigation of eight different target conditions:

- cancerous versus benign or precancerous lesions;
- cancerous versus benign lesions;
- precancerous or cancerous lesions versus benign lesions;
- cancerous (invasive carcinoma) versus precancerous (dysplasia) lesions;
 - cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) lesions;
 - cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) lesions;
 - precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) lesions; and
 - precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) or benign lesions.

The variation in target condition was due to different definitions of what constitutes a benign, precancerous, and cancerous lesion. For example, the World Health Organization pancreatic tumour classification system classifies intraductal papillary mucinous neoplasms' (IPMNs) as precancerous tumours regardless of dysplasia (Luttges 2011). However, many of the included studies considered IPMNs to be benign lesions or even classified them as benign or cancerous based on the grade of dysplasia. This meant that the index tests were actually used for differentiating between very different populations of cancerous and benign tumours, and therefore the combination of all studies as simply cancer versus benign would have been inappropriate. In addition, different surgeons will have different thresholds for recommending surgery. Consequently, we have presented the results for all of the various definitions used by authors to classify a lesion as benign, precancerous, or cancerous.

Three studies reported data on tests differentiating cancerous from benign or precancerous lesions. Of these three studies, one reported the performance of EUS-FNA using cytology (McHenry 2002); another reported the performance of EUS-FNA using a carcinoembryonic antigen (CEA) threshold of 500 ng/mL (Kalha 2003); and the third reported the performance of PET to differentiate between benign or precancerous and cancerous lesions (Jafarimehr 2010). The median pre-test probability of a cancerous lesion in these studies was 0.625 or 62.5% (minimum 0.533, maximum 0.711).

Twelve studies reported data on tests differentiating cancerous

from benign lesions. Of these 12 studies, two reported the performance of EUS (Brand 2000; Harrison 1999); three reported the performance of EUS-FNA (Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cherian 2010); three reported the performance of PET (Erkan 2012; Higashi 1997; Kato 1995); one reported the performance of PET with a standard uptake value (SUV) maximum of greater than 3.5 as its threshold for positivity (Hu 2013); two reported the performance of CT (Grieser 2010; Harrison 1999); and one reported the performance of MRI to differentiate between cancerous and benign lesions (Klau 2011). The median pre-test probability of a cancerous lesion in these studies was 0.697 or 69.7% (minimum 0.231, maximum 0.889).

Six studies reported data on tests differentiating precancerous or cancerous from benign lesions, with one study providing data for multiple imaging modalities (Sedlack 2002). One study reported the performance of EUS (Sedlack 2002); three studies reported the performance of EUS-FNA (Fischer 2009 - Cystic; Fischer 2009 - Solid; Sedlack 2002); one study reported the performance of EUS-FNA using a CEA threshold of 50 ng/mL (Sedlack 2002); one study reported the performance of PET with an SUV maximum threshold of greater than 2.4 as its threshold for positivity (Otomi 2014); one study reported the performance of CT (Fisher 2008); and one study reported the performance of MRI (Jang 2014a). The median pre-test probability of a precancerous or cancerous lesion in these studies was 0.706 or 70.6% (minimum 0.519, maximum 0.75).

Twelve studies reported data on tests differentiating cancerous invasive carcinomas from precancerous dysplastic lesions, with some studies reporting the diagnostic test accuracy or more than one index test. Five studies reported the performance of EUS (Cellier 1998; de Jong 2012; Nakagawa 2009; Yamao 2001; Zhan 2011); three studies reported the performance of EUS-FNA (Jin 2015; Pais 2007; Salla 2007); and one study reported the performance of EUS-FNA using a CEA threshold of 200 ng/mL (Maire 2008). Six studies reported the performance of CT (Cellier 1998; Nakagawa 2009; Nara 2009; Ogawa 2008; Taouli 2000; Yamao 2001), and one study reported the performance of MRI (de Jong 2012). The median pre-test probability of a cancerous invasive carcinoma was 0.270 or 27% (minimum 0.122, maximum 0.618).

Eighteen studies reported data on tests differentiating cancerous lesions defined by high-grade dysplasia or invasive carcinoma from precancerous lesions with a low or intermediate grade of dysplasia, with some studies reporting the diagnostic test accuracy or more than one index test. Four studies reported the performance of EUS (Doi 2002; Kobayashi 2012; Lee 2014; Yamao 2001). Three studies reported the performance of EUS-FNA (Jin 2013a; Smith 2016; Zhan 2013). Three studies reported the performance of EUS-FNA using a CEA threshold of 200 ng/mL (Correa-Gallego 2009; Kucera 2012; Maire 2008). One study reported the perfor-

mance of EUS-FNA using a carbohydrate antigen 19-9 threshold of greater than 1000 U/mL (Maire 2008). One study reported the performance of EUS-FNA using a CEA threshold of 692.8 ng/mL (Zhan 2013). Four studies reported the performance of PET with an SUV_{max} value between 2 and 2.5 as their threshold for positivity (Hong 2010; Saito 2013; Takanami 2011; Tomimaru 2010). Three studies reported the performance of CT (Hong 2010; Le Baleur 2011a; Yamao 2001). Three studies reported the performance of MRI (Jang 2014b; Kim 2015; Ogawa 2014). The median pre-test probability of a cancerous lesion defined by high-grade dysplasia or invasive carcinoma in these studies was 0.449 or 44.9% (minimum 0.167, maximum 0.875).

Two studies reported data on tests differentiating cancerous invasive carcinomas from precancerous lesions with a low grade of dysplasia. One study reported the performance of EUS (Kubo 2001), and one study reported the performance of CT (Takeshita 2008). The median pre-test probability of cancerous invasive carcinoma in these studies was 0.214 or 21.4% (minimum 0.174, maximum 0.255).

Five studies reported data on tests differentiating precancerous or cancerous lesions that may be moderately or highly dysplastic or invasive carcinomas from precancerous lesions with a low grade of dysplasia. Three studies reported the performance of CT (Ogawa 2008; Sahani 2006; Tan 2009), and two studies reported the performance of MRI (Choi 2003; Sahani 2006). None of the studies reported the diagnostic accuracy of EUS elastography or sequential testing. The median pre-test probability of a cancerous lesion that may be moderately or highly dysplastic or an invasive carcinoma in these studies was 0.593 or 59.3% (minimum 0.574, maximum 0.68).

One study reported data on tests differentiating precancerous or cancerous lesions that may be moderately or highly dysplastic or invasive carcinomas from benign or precancerous lesions with a low grade of dysplasia. This study reported the performance of EUS. The median pre-test probability of a cancerous lesion that may be moderately or highly dysplastic or an invasive carcinoma in this study was 0.429 or 42.9%.

Forty-six studies were full-text publications (Brand 2000; Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cellier 1998; Cherian 2010; Choi 2003; Correa-Gallego 2009; de Jong 2012; Doi 2002; Fisher 2008; Grieser 2010; Harrison 1999; Higashi 1997; Hong 2010; Hu 2013; Jang 2014a; Jang 2014b; Jin 2015; Kamata 2016a; Kato 1995; Kim 2015; Klau 2011; Kobayashi 2012; Kubo 2001; Kucera 2012; Le Baleur 2011a; Lee 2014; Maire 2008; Nakagawa 2009; Nara 2009; Ogawa 2008; Ogawa 2014; Otomi 2014; Pais 2007; Sahani 2006; Saito 2013; Salla 2007; Sedlack 2002; Smith 2016; Takanami 2011; Takeshita 2008; Tan 2009; Taouli 2000; Tomimaru 2010; Yamao 2001; Zhan 2013). The remaining studies were abstracts (Erkan 2012; Fischer 2009 - Cystic; Fischer 2009 - Solid; Jafarimehr 2010; Jin 2013a; Kalha 2003; McHenry 2002; Zhan 2011). Three studies were prospective (Brand 2000; de Jong 2012; Erkan 2012); 39 were retro-

spective (Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cellier 1998; Cherian 2010; Correa-Gallego 2009; Doi 2002; Fisher 2008; Grieser 2010; Harrison 1999; Hong 2010; Hu 2013; Jafarimehr 2010; Jang 2014a; Jang 2014b; Jin 2013a; Jin 2015; Kalha 2003; Kamata 2016a; Kim 2015; Klau 2011; Kobayashi 2012; Kubo 2001; Kucera 2012; Lee 2014; Maire 2008; McHenry 2002; Nakagawa 2009; Ogawa 2008; Otomi 2014; Pais 2007; Sahani 2006; Saito 2013; Salla 2007; Sedlack 2002; Smith 2016; Takanami 2011; Taouli 2000; Zhan 2011; Zhan 2013); and 12 did not state whether they were prospective or retrospective (Choi 2003; Fischer 2009 - Cystic; Fischer 2009 - Solid; Higashi 1997; Kato 1995; Le Baleur 2011a; Nara 2009; Ogawa 2014; Takeshita 2008; Tan 2009; Tomimaru 2010; Yamao 2001).

None of the studies reported data on symptomatic and asymptomatic participants separately. Forty-two studies (2086 participants) reported on cystic pancreatic lesions (Brandwein 2001 - Cystic; Cellier 1998; Choi 2003; Correa-Gallego 2009; de Jong 2012; Doi 2002; Fischer 2009 - Cystic; Fisher 2008; Hong 2010; Hu 2013; Jang 2014a; Jang 2014b; Jin 2013a; Jin 2015; Kalha 2003; Kamata 2016a; Kim 2015; Kobayashi 2012; Kubo 2001; Kucera 2012; Le Baleur 2011a; Lee 2014; Maire 2008; McHenry 2002; Nakagawa 2009; Nara 2009; Ogawa 2008; Ogawa 2014; Pais 2007; Sahani 2006; Saito 2013; Salla 2007; Sedlack 2002; Smith 2016; Takanami 2011; Takeshita 2008; Tan 2009; Taouli 2000; Tomimaru 2010; Yamao 2001; Zhan 2011; Zhan 2013).

Four studies reported on solid pancreatic lesions (Brandwein 2001 - Solid; Cherian 2010; Fischer 2009 - Solid; Klau 2011). The remaining eight studies either did not mention whether the lesions were cystic or solid, or did not report this information separately (Brand 2000; Erkan 2012; Grieser 2010; Harrison 1999; Higashi 1997; Jafarimehr 2010; Kato 1995; Otomi 2014). None of the studies reported data on people with chronic pancreatitis separately.

Overall, 12 studies reported data on EUS results (Brand 2000; Cellier 1998; de Jong 2012; Doi 2002; Harrison 1999; Kamata 2016a; Kobayashi 2012; Kubo 2001; Lee 2014; Nakagawa 2009; Sedlack 2002; Yamao 2001); 19 studies reported data on EUS-FNA (Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cherian 2010; Correa-Gallego 2009; Fischer 2009 - Cystic; Fischer 2009 - Solid; Fisher 2008; Jin 2013a; Jin 2015; Kalha 2003; Kucera 2012; Maire 2008; McHenry 2002; Pais 2007; Salla 2007; Sedlack 2002; Smith 2016; Zhan 2011; Zhan 2013); 10 studies reported data on PET (Erkan 2012; Higashi 1997; Hong 2010; Hu 2013; Jafarimehr 2010; Kato 1995; Otomi 2014; Saito 2013; Takanami 2011; Tomimaru 2010); 13 studies reported data on CT (Cellier 1998; Grieser 2010; Harrison 1999; Hong 2010; Le Baleur 2011a; Nakagawa 2009; Nara 2009; Ogawa 2008; Sahani 2006; Takeshita 2008; Tan 2009; Taouli 2000; Yamao 2001); and eight studies reported data on MRI (Choi 2003; de Jong 2012; Jang 2014a; Jang 2014b; Kim 2015; Klau 2011; Ogawa 2014; Sahani 2006). The criteria for a positive test result varied widely by study and are described in detail in Characteristics of included studies. The

reference standards in all of the included studies was surgical excision.

Methodological quality of included studies

The methodological quality of the included studies is summarised in [Figure 3](#) and [Figure 4](#). None of the included studies was of high methodological quality.

Figure 3. Risk of bias and applicability concerns graph: review authors' judgements about each domain presented as percentages across included studies.

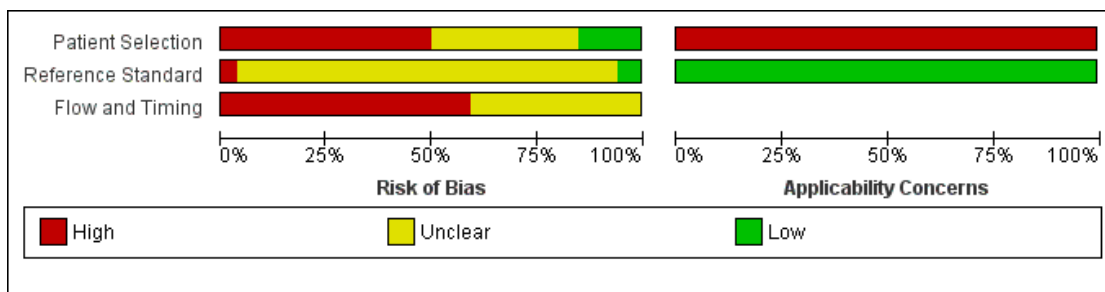


Figure 4. Risk of bias and applicability concerns summary: review authors' judgements about each domain for each included study.



Participant selection domain

In the participant selection domain, nine studies had a low risk of bias (Cherian 2010; Correa-Gallego 2009; Fisher 2008; Kamata 2016a; Klau 2011; Nara 2009; Otomi 2014; Saito 2013; Salla 2007). All of the studies had high applicability concerns because of concerns that the participants did not match the review question. The review question was to find out the diagnostic accuracy of these index tests in people with focal lesions. However, all of the studies meeting the inclusion criteria for this review except Cherian 2010 used surgical excision as the reference standard, suggesting that the surgeons considered these patients to be at high risk of malignancy based on the results of the index tests or the tests that patients had prior to or subsequent to the index test. Cherian 2010 was also at high risk of applicability concern because it excluded participants with resectable lesions on CT scan and included only those equivocal lesions on CT scan.

Index test domain

In the index test domain, nine studies were at low risk of bias (Correa-Gallego 2009; Hong 2010; Jang 2014b; Kim 2015; Kubo 2001; Nara 2009; Ogawa 2014; Tan 2009; Taouli 2000). Of the remaining studies, 31 were at unclear risk of bias because it was unclear whether the index test results were interpreted without knowledge of the results of the reference standard (Brand 2000; Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cellier 1998; Choi 2003; Cherian 2010; de Jong 2012; Doi 2002; Erkan 2012; Fischer 2009 - Cystic; Fischer 2009 - Solid; Fisher 2008; Harrison 1999; Jafarimehr 2010; Jin 2013a; Jin 2015; Kalha 2003; Kamata 2016a; Kato 1995; Kobayashi 2012; Kucera 2012; Le Baleur 2011a; McHenry 2002; Ogawa 2008; Pais 2007; Salla 2007; Sedlack 2002; Smith 2016; Yamao 2001; Zhan 2011; Zhan 2013). Fifteen studies were at high risk of bias because the threshold for the index test was not prespecified (Grieser 2010; Higashi 1997; Hu 2013; Jang 2014a; Klau 2011; Lee 2014; Maire 2008; Nakagawa 2009; Otomi 2014; Sahani 2006; Saito 2013; Takanami 2011; Takeshita 2008; Tomimaru 2010; Zhan 2013). Twenty-eight studies had low applicability concerns (Brand 2000; Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cellier 1998; Choi 2003; Cherian 2010; Correa-Gallego 2009; de Jong 2012; Doi 2002; Hong 2010; Hu 2013; Jang 2014b; Jin 2013a; Jin 2015; Kalha 2003; Kamata 2016a; Kim 2015; Kubo 2001; Le Baleur 2011a; Nara 2009; Ogawa 2008; Ogawa 2014; Pais 2007; Sahani 2006; Sedlack 2002; Smith 2016; Yamao 2001; Zhan 2013), and the remaining 27 studies had high applicability concerns because of concerns that the index test, its conduct, or interpretation differed from the review question (Erkan 2012; Fischer 2009 - Cystic; Fischer 2009 - Solid; Fisher 2008; Grieser 2010; Harrison 1999; Higashi 1997; Jafarimehr 2010; Jang 2014a; Kato 1995; Klau 2011; Kobayashi

2012; Kucera 2012; Lee 2014; Maire 2008; McHenry 2002; Nakagawa 2009; Otomi 2014; Saito 2013; Salla 2007; Sedlack 2002; Takanami 2011; Takeshita 2008; Tan 2009; Taouli 2000; Tomimaru 2010; Zhan 2011).

Reference standard domain

In the reference standard domain, three studies were at low risk of bias (Correa-Gallego 2009; Grieser 2010; Hu 2013). Two studies were at high risk of bias because the reference standard results were not interpreted without knowledge of the index test results (Pais 2007), or because radiological and clinical follow-up was used in some of the participants as the reference standard. The remaining 49 studies were at unclear risk of bias as it was unclear if the reference standard was interpreted without knowledge of the results of index tests (Brand 2000; Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cellier 1998; Choi 2003; de Jong 2012; Doi 2002; Erkan 2012; Fischer 2009 - Cystic; Fischer 2009 - Solid; Fisher 2008; Harrison 1999; Higashi 1997; Hong 2010; Jafarimehr 2010; Jang 2014a; Jang 2014b; Jin 2013a; Jin 2015; Kalha 2003; Kamata 2016a; Kato 1995; Kim 2015; Klau 2011; Kobayashi 2012; Kubo 2001; Kucera 2012; Le Baleur 2011a; Lee 2014; Maire 2008; McHenry 2002; Nakagawa 2009; Nara 2009; Ogawa 2008; Ogawa 2014; Otomi 2014; Sahani 2006; Saito 2013; Salla 2007; Sedlack 2002; Smith 2016; Takanami 2011; Takeshita 2008; Tan 2009; Taouli 2000; Tomimaru 2010; Yamao 2001; Zhan 2011; Zhan 2013). All studies were at low concern for applicability, as we considered the definition of the target condition by the reference standard to match the review question.

Flow and timing domain

None of the studies were at low risk of bias in the flow and timing domain. Thirty studies were at high risk of bias because not all of the participants were included in the analysis, or there was an inappropriate interval between the index test and reference standard (Brand 2000; Brandwein 2001 - Cystic; Cellier 1998; Choi 2003; Correa-Gallego 2009; de Jong 2012; Doi 2002; Erkan 2012; Hong 2010; Jang 2014a; Jang 2014b; Jin 2015; Kalha 2003; Kamata 2016a; Kato 1995; Kim 2015; Kobayashi 2012; Kucera 2012; Lee 2014; Nakagawa 2009; Ogawa 2008; Ogawa 2014; Pais 2007; Sedlack 2002; Smith 2016; Takanami 2011; Tan 2009; Taouli 2000; Tomimaru 2010; Yamao 2001). One study was at high risk of bias because the reference standards that participants received were dependent on the index test results. The remaining 23 studies were at unclear risk of bias because it was either unclear if there was an appropriate interval between the index test and reference standard or if all participants were included in the analysis, or both (Brandwein 2001 - Solid; Fischer 2009 - Cystic; Fischer 2009 -

Solid; Fisher 2008; Grieser 2010; Harrison 1999; Higashi 1997; Hu 2013; Jafarimehr 2010; Jin 2013a; Klau 2011; Kubo 2001; Le Baleur 2011a; Maire 2008; McHenry 2002; Nara 2009; Otomi 2014; Sahani 2006; Saito 2013; Salla 2007; Takeshita 2008; Zhan 2011; Zhan 2013).

Findings

The results are summarised in the [Summary of findings](#). The overall sensitivities and specificities for different tests for different target conditions are tabulated in [Table 2](#). A detailed description is given below.

Cancerous versus benign or precancerous

EUS-FNA cytology: We included one study reporting data on 45 participants for this test (McHenry 2002). The sensitivity and

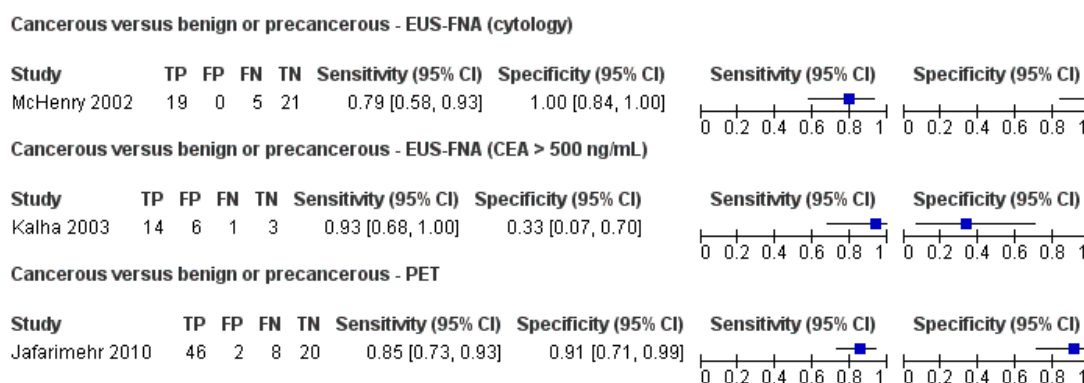
specificity for diagnosing cancer were 0.79 (95% confidence interval (CI) 0.60 to 0.91) and 1.00 (95% CI 0.85 to 1.00), respectively.

EUS-FNA (CEA > 500 ng/mL): We included one study reporting data on 24 participants for this test (Kalha 2003). The sensitivity and specificity for diagnosing cancer were 0.93 (95% CI 0.70 to 0.99) and 0.33 (95% CI 0.12 to 0.65), respectively.

PET (criteria: not specified): We included one study reporting data on 76 participants for this test (Jafarimehr 2010). The sensitivity and specificity for diagnosing cancer were 0.85 (95% CI 0.73 to 0.92) and 0.91 (95% CI 0.72 to 0.97), respectively.

The results including sensitivities and specificities and post-test probabilities at median pre-test probabilities are summarised in [Summary of findings](#). A forest plot summarising all of the sensitivity and specificity data for the 'cancerous versus benign or precancerous' studies is shown in [Figure 5](#).

Figure 5. Forest plot - Cancerous versus benign or precancerous.



Cancerous versus benign

EUS: Two studies reporting data on 133 participants were included for this test, allowing meta-analysis to be performed (Brand 2000; Harrison 1999). The summary sensitivity and summary specificity for diagnosing cancer were 0.95 (95% CI 0.84 to 0.99) and 0.53 (95% CI 0.31 to 0.74), respectively.

EUS-FNA cytology: Three studies reporting data on 147 participants were included for this test (Brandwein 2001 - Cystic; Brandwein 2001 - Solid; Cherian 2010). The sensitivity and specificity for diagnosing cancer were 0.79 (95% CI 0.07 to 1.00) and 1.00 (95% CI 0.91 to 1.00), respectively.

PET (criteria: not specified): Three studies reporting data on 99 participants were included for this test, allowing meta-analysis to be performed (Erkan 2012; Higashi 1997; Kato 1995). The summary sensitivity and summary specificity for diagnosing cancer were 0.92 (95% CI 0.80 to 0.97) and 0.65 (95% CI 0.39 to 0.85), respectively.

PET (SUVmax > 3.5): We included one study reporting data on 80 participants for this test (Hu 2013). The sensitivity and specificity for diagnosing cancer were 0.96 (95% CI 0.87 to 0.99) and 0.62 (95% CI 0.43 to 0.78), respectively.

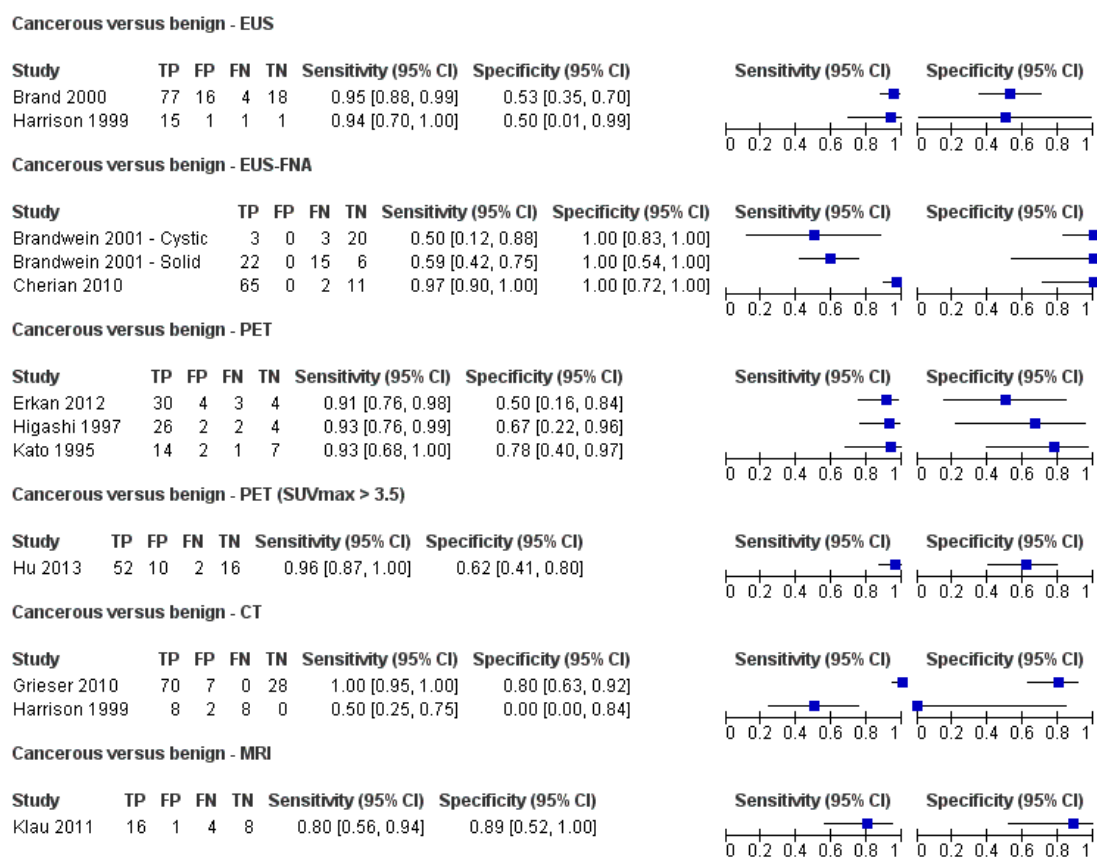
CT: Two studies reporting data on 123 participants were included for this test, allowing meta-analysis to be performed (Grieser 2010;

Harrison 1999). The summary sensitivity and summary specificity for diagnosing cancer were 0.98 (95% CI 0.00 to 1.00) and 0.76 (95% CI 0.02 to 1.00), respectively.

MRI: We included one study reporting data on 29 participants for this test (Klau 2011). The sensitivity and specificity for diagnosing cancer were 0.80 (95% CI 0.58 to 0.92) and 0.89 (95% CI 0.57 to 0.98), respectively.

The results including sensitivities and specificities and post-test probabilities at median pre-test probabilities are summarised in [Summary of findings](#). A forest plot summarising all of the sensitivity and specificity data for the 'cancerous versus benign' studies is shown in [Figure 6](#).

Figure 6. Forest plot - Cancerous versus benign.



Precancerous or cancerous versus benign

EUS: We included one study reporting data on 34 participants for this test (Sedlack 2002). The sensitivity and specificity for

diagnosing cancer or precancer were 0.92 (95% CI 0.74 to 0.98) and 0.60 (95% CI 0.31 to 0.83), respectively.

EUS-FNA cytology: We included three studies, reporting data on 52 participants for this test (Fischer 2009 - Cystic; Fischer 2009 - Solid; Sedlack 2002). The summary sensitivity and summary specificity for diagnosing cancer or precancer were 0.73 (95% CI 0.01 to 1.00) and 0.94 (95% CI 0.15 to 1.00), respectively.

EUS-FNA (CEA > 50 ng/mL): We included one study reporting data on 11 participants for this test (Sedlack 2002). The sensitivity and specificity for diagnosing cancer or precancer were 0.29 (95% CI 0.08 to 0.64) and 0.25 (95% CI 0.05 to 0.70), respectively.

PET (SUVmax > 2.4): We included one study reporting data on 32 participants for this test (Otomi 2014). The sensitivity and specificity for diagnosing cancer or precancer were 0.94 (95% CI

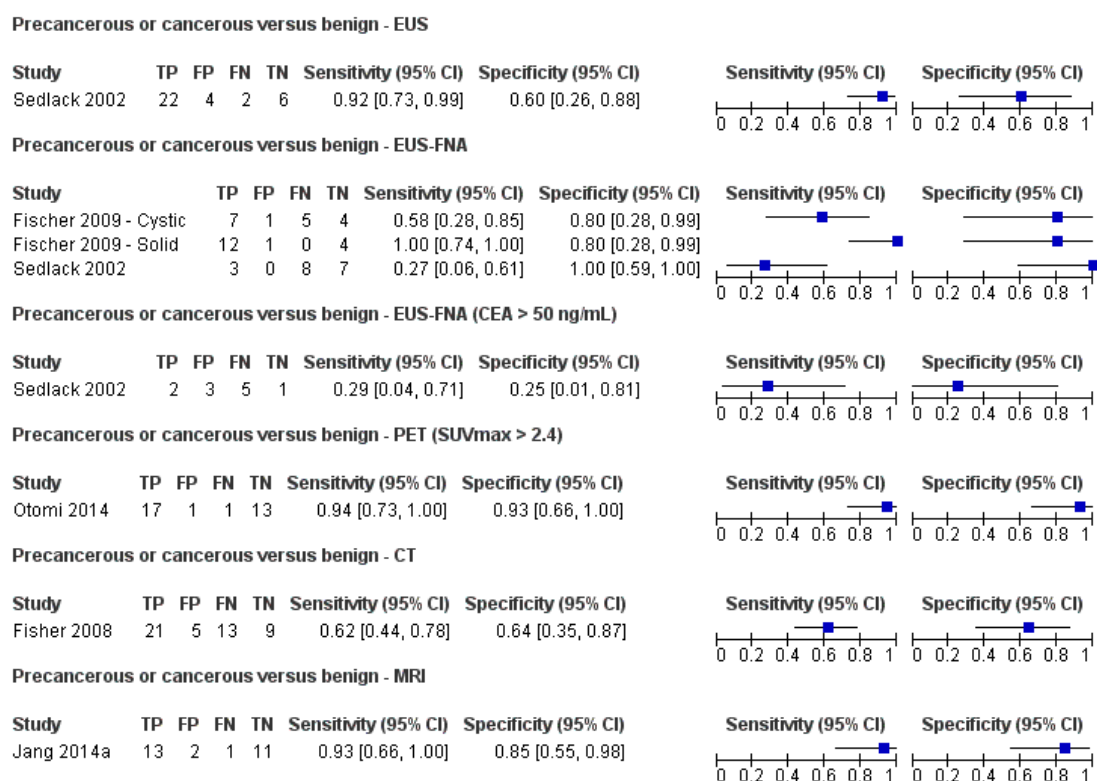
0.74 to 0.99) and 0.93 (95% CI 0.69 to 0.99), respectively.

CT: We included one study reporting data on 48 participants for this test (Fisher 2008). The sensitivity and specificity for diagnosing cancer or precancer were 0.62 (95% CI 0.45 to 0.76) and 0.64 (95% CI 0.39 to 0.84), respectively.

MRI: We included one study reporting data on 27 participants for this test (Jang 2014a). The sensitivity and specificity for diagnosing cancer or precancer were 0.93 (95% CI 0.69 to 0.99) and 0.85 (95% CI 0.58 to 0.96), respectively.

The results including sensitivities and specificities and post-test probabilities at median pre-test probabilities are summarised in [Summary of findings](#). A forest plot summarising all of the sensitivity and specificity data for the 'precancerous or cancerous versus benign' studies is shown in [Figure 7](#).

Figure 7. Forest plot - Precancerous or cancerous versus benign.



Cancerous (invasive carcinoma) versus precancerous

(dysplasia)

EUS: Five studies reporting data on 156 participants were included

for this test, allowing meta-analysis to be performed (Cellier 1998; de Jong 2012; Nakagawa 2009; Yamao 2001; Zhan 2011). The summary sensitivity and summary specificity for diagnosing invasive cancer were 0.78 (95% CI 0.45 to 0.94) and 0.91 (95% CI 0.61 to 0.98), respectively.

EUS-FNA cytology: Three studies reporting data on 158 participants were included for this test, allowing meta-analysis to be performed (Jin 2013a; Pais 2007; Salla 2007). The summary sensitivity and summary specificity for diagnosing invasive cancer were 0.66 (95% CI 0.03 to 0.99) and 0.92 (95% CI 0.73 to 0.98), respectively.

EUS-FNA (CEA > 200 ng/mL): We included one study reporting data on 41 participants for this test (Maire 2008). The sensitivity and specificity for diagnosing invasive cancer were 1.00 (95% CI 0.57 to 1.00) and 0.64 (95% CI 0.48 to 0.78), respectively.

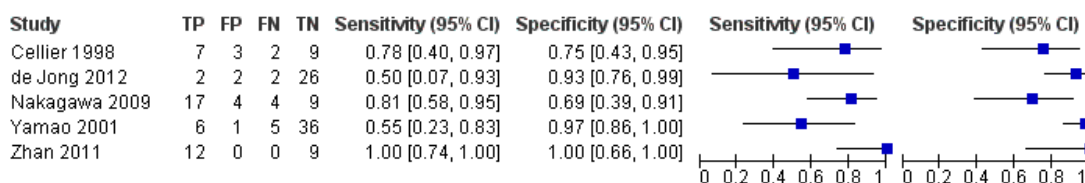
CT: Six studies reporting data on 326 participants were included for this test, allowing meta-analysis to be performed (Cellier 1998; Nakagawa 2009; Nara 2009; Ogawa 2008; Taouli 2000; Yamao 2001). The summary sensitivity and summary specificity for diagnosing invasive cancer were 0.72 (95% CI 0.50 to 0.87) and 0.92 (95% CI 0.81 to 0.97), respectively.

MRI: We included one study reporting data on 32 participants for this test (de Jong 2012). The sensitivity and specificity for diagnosing invasive cancer were 0.75 (95% CI 0.30 to 0.95) and 0.93 (95% CI 0.77 to 0.98), respectively.

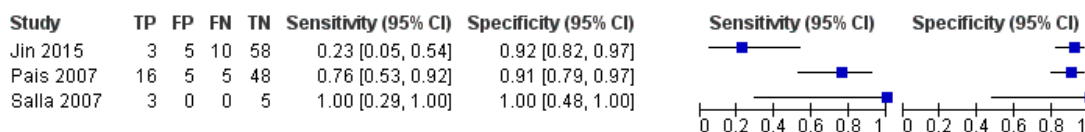
The results including sensitivities and specificities and post-test probabilities at median pre-test probabilities are summarised in [Summary of findings](#). A forest plot summarising all of the sensitivity and specificity data for the 'cancer (invasive carcinoma) versus precancerous (dysplasia)' studies is shown in [Figure 8](#).

Figure 8. Forest plot - Cancerous (invasive carcinoma) versus precancerous (dysplasia).

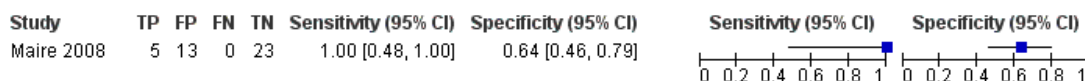
Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS



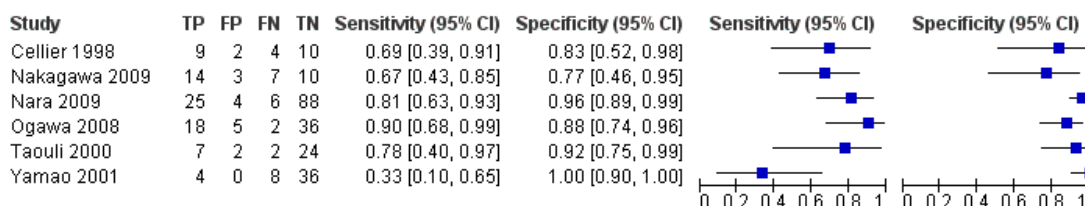
Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS-FNA



Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS-FNA (CEA > 200 ng/mL)



Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT



Cancerous (invasive carcinoma) versus precancerous (dysplasia) - MRI



Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)

EUS: Four studies reporting data on 196 participants were included for this test, allowing meta-analysis to be performed (Doi 2002; Kobayashi 2012; Lee 2014; Yamao 2001). The summary sensitivity and summary specificity for diagnosing high-grade dysplasia or invasive cancer were 0.86 (95% CI 0.74 to 0.92) and 0.91 (95% CI 0.83 to 0.96), respectively.

EUS-FNA cytology: Three studies reporting data on 310 participants were included for this test, allowing meta-analysis to be performed (Jin 2013a; Smith 2016; Zhan 2013). The summary sensitivity and summary specificity for diagnosing high-grade dysplasia or invasive cancer were 0.47 (95% CI 0.24 to 0.70) and 0.91 (95% CI 0.32 to 1.00), respectively.

EUS-FNA (CEA > 200 ng/mL): Three studies reporting data on 160 participants were included for this test, allowing meta-analysis to be performed (Correa-Gallego 2009; Kucera 2012; Maire 2008). The summary sensitivity and summary specificity for diagnosing high-grade dysplasia or invasive cancer were 0.58 (95% CI 0.28 to 0.83) and 0.51 (95% CI 0.19 to 0.81), respectively.

EUS-FNA (carbohydrate antigen 19-9 > 1000 U/mL): We included one study reporting data on 41 participants for this test (Maire 2008). The sensitivity and specificity for diagnosing high-grade dysplasia or invasive cancer were 0.90 (95% CI 0.60 to 0.98) and 0.42 (95% CI 0.26 to 0.59), respectively.

EUS-FNA (CEA > 692.8 ng/mL): We included one study re-

porting data on 20 participants for this test (Zhan 2013). The sensitivity and specificity for diagnosing high-grade dysplasia or invasive cancer were 0.80 (95% CI 0.49 to 0.94) and 0.90 (95% CI 0.60 to 0.98), respectively.

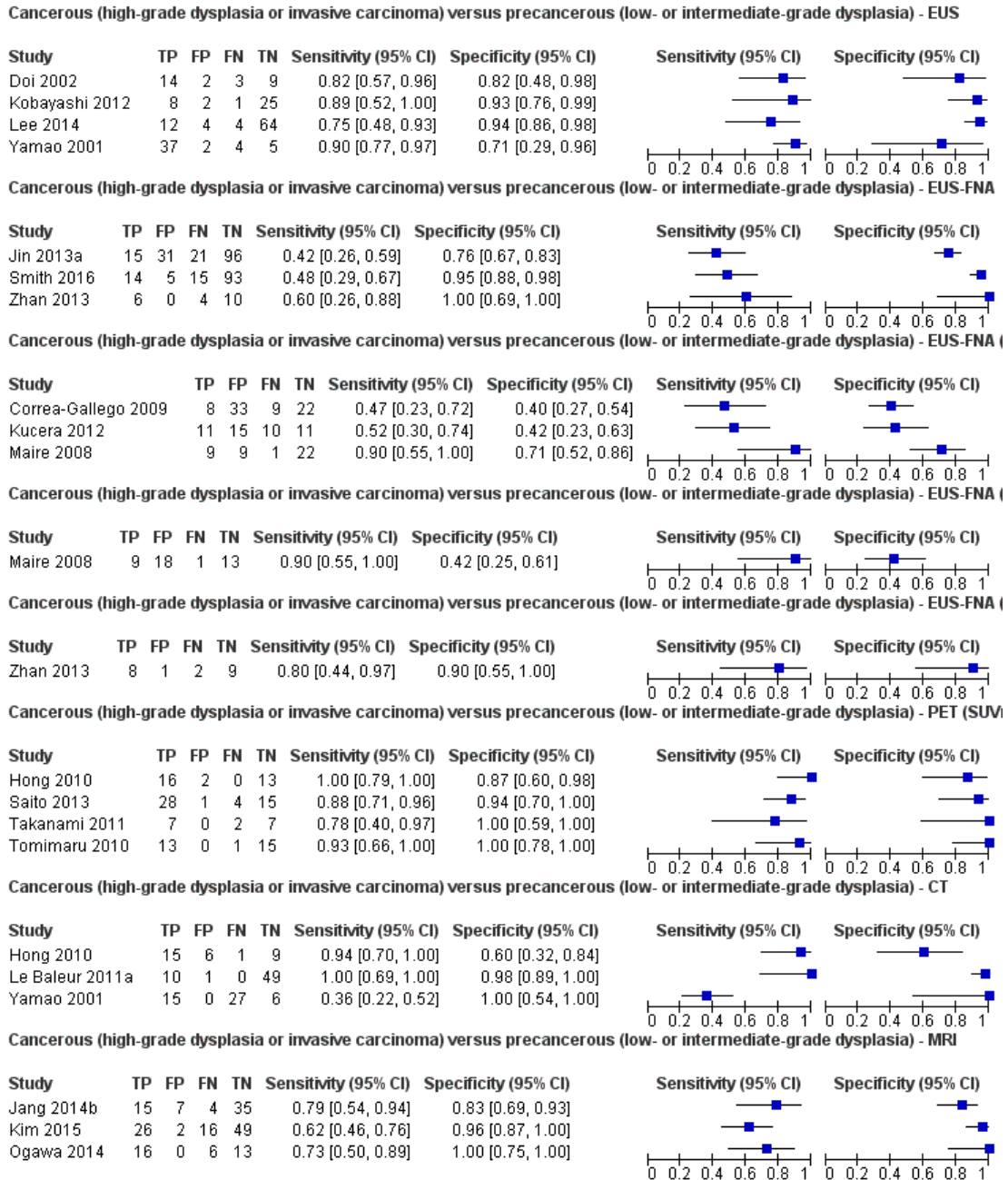
PET (SUV_{max} 2 to 2.5): Four studies reporting data on 124 participants were included for this test, allowing meta-analysis to be performed (Hong 2010; Saito 2013; Takanami 2011; Tomimaru 2010). The summary sensitivity and summary specificity for diagnosing high-grade dysplasia or invasive cancer were 0.90 (95% CI 0.79 to 0.96) and 0.94 (95% CI 0.81 to 0.99), respectively.

CT: Three studies reporting data on 139 participants were included for this test, allowing meta-analysis to be performed (Hong 2010; Le Baleur 2011a; Yamao 2001). The summary sensitivity and summary specificity for diagnosing high-grade dysplasia or invasive cancer were 0.87 (95% CI 0.00 to 1.00) and 0.96 (95% CI 0.00 to 1.00), respectively.

MRI: Three studies reporting data on 189 participants were included for this test, allowing meta-analysis to be performed (Jang 2014b; Kim 2015; Ogawa 2014). The summary sensitivity and summary specificity for diagnosing high-grade dysplasia or invasive cancer were 0.69 (95% CI 0.44 to 0.86) and 0.93 (95% CI 0.43 to 1.00), respectively.

The results including sensitivities and specificities and post-test probabilities at median pre-test probabilities are summarised in [Summary of findings](#). A forest plot summarising all of the sensitivity and specificity data for the 'cancer (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)' studies is shown in [Figure 9](#).

Figure 9. Forest plot - Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia).



Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia)

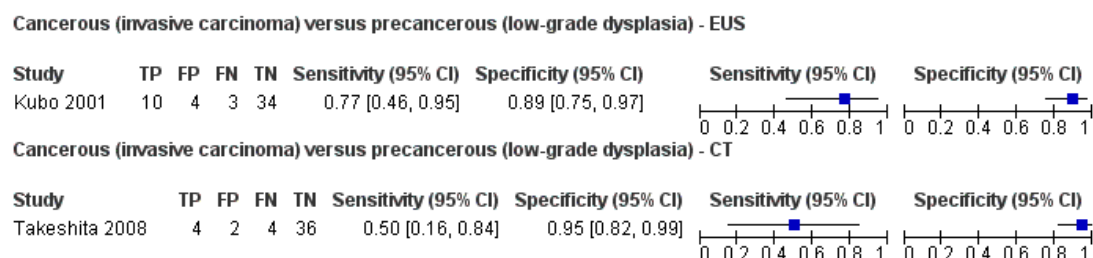
EUS: We included one study reporting data on 51 participants for this test (Kubo 2001). The sensitivity and specificity for diagnosing invasive cancer were 0.77 (95% CI 0.50 to 0.92) and 0.89 (95% CI 0.76 to 0.96), respectively.

CT: We included one study reporting data on 46 participants

for this test (Takeshita 2008). The sensitivity and specificity for diagnosing invasive cancer were 0.50 (95% CI 0.22 to 0.78) and 0.95 (95% CI 0.83 to 0.99), respectively.

The results including sensitivities and specificities and post-test probabilities at median pre-test probabilities are summarised in [Summary of findings](#). A forest plot summarising all of the sensitivity and specificity data for the 'cancer (invasive carcinoma) versus precancerous (low-grade dysplasia)' studies is shown in [Figure 10](#).

Figure 10. Forest plot - Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia).



Precancerous or cancer (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia)

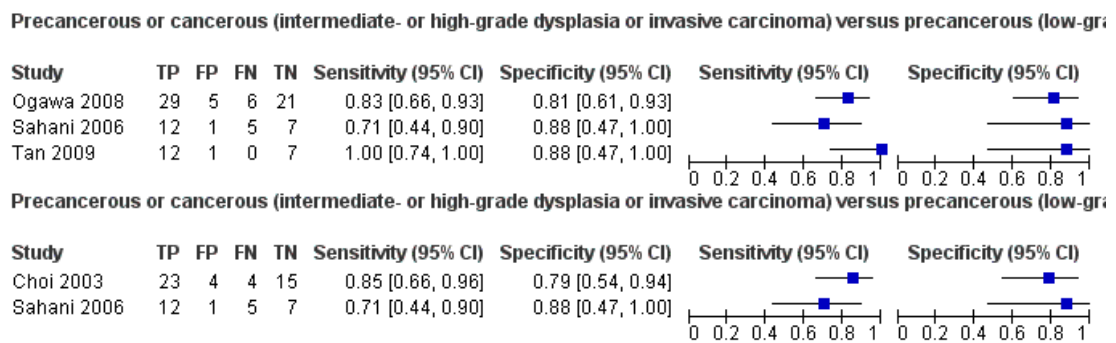
CT: Three studies reporting data on 106 participants were included for this test, allowing meta-analysis to be performed (Ogawa 2008; Sahani 2006; Tan 2009). The summary sensitivity and summary specificity for diagnosing intermediate- or high-grade dysplasia or invasive cancer were 0.83 (95% CI 0.68 to 0.92) and 0.83 (95% CI 0.64 to 0.93), respectively.

MRI: Two studies reporting data on 71 participants were included

for this test, allowing meta-analysis to be performed (Choi 2003; Takeshita 2008). The summary sensitivity and specificity for diagnosing intermediate- or high-grade dysplasia or invasive cancer were 0.80 (95% CI 0.58 to 0.92) and 0.81 (95% CI 0.53 to 0.95), respectively.

The results including sensitivities and specificities and post-test probabilities at median pre-test probabilities are summarised in [Summary of findings](#). A forest plot summarising all of the sensitivity and specificity data for the 'precancerous or cancer (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia)' studies is shown in [Figure 11](#).

Figure 11. Forest plot - Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia).

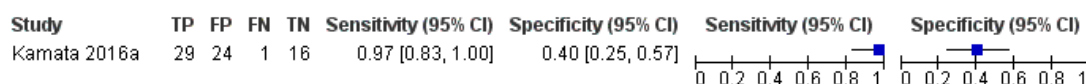


Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) or benign

EUS: We included one study reporting data on 70 participants for this test (Kamata 2016a). The sensitivity and specificity for diagnosing intermediate- or high-grade dysplasia or invasive carcinoma were 0.97 (95% CI 0.83 to 0.99) and 0.40 (95% CI 0.26 to 0.55), respectively.

The results including sensitivity and specificity and post-test probability at median pre-test probability are summarised in [Summary of findings](#). A forest plot summarising the sensitivity and specificity data for the 'precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) or benign' study is shown in [Figure 12](#).

Figure 12. Forest plot of 33 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) or benign - EUS.



Subgroup analyses

We assessed the performance of the tests excluding any studies investigating participants with solid lesions and those in which information for solid and cystic lesions was not reported separately. All of the studies assessing the ability of different imaging modalities

to differentiate precancerous versus cancerous lesions regardless of the definitions used by authors for precancer and cancer (Analysis 4 to Analysis 8) included participants with cystic focal pancreatic lesions only, therefore all the results reported are for cystic focal pancreatic lesions only.

In the analysis assessing the ability of different imaging modalities to differentiate benign or precancerous versus cancerous lesions, we excluded one study because it did not specify the type (solid or cystic) of lesions for which included participants were investigated (Jafarimehr 2010). However, as this study did not contribute to a meta-analysis, there were no changes to the analysis.

Cancerous versus benign

In the analysis assessing the ability of different imaging modalities to differentiate benign versus cancerous lesions, we excluded eight studies because they did not explicitly include participants with cystic lesions (Brand 2000; Erkan 2012; Grieser 2010; Harrison 1999; Higashi 1997; Hu 2013; Kato 1995; Klau 2011), and one study that only had one component included (Brandwein 2001 - Cystic; Brandwein 2001 - Solid). This left two remaining studies,

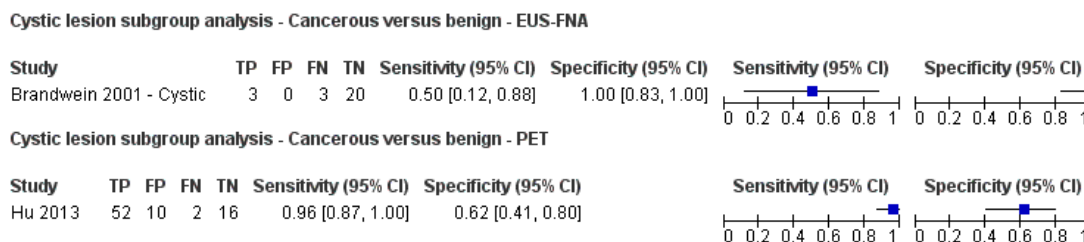
which did not contribute to a meta-analysis due to the exclusion of the other studies (Brandwein 2001 - Cystic; Hu 2013). We therefore performed no meta-analyses for this group. The new findings for benign versus cancerous lesions are described below.

EUS-FNA: We included one study reporting data on 26 participants for this test (Brandwein 2001 - Cystic). The sensitivity and specificity for diagnosing cancer were 0.50 (95% CI 0.19 to 0.81) and 1.00 (95% CI 0.84 to 1.00), respectively.

PET: We included one study reporting data on 80 participants for this test (Hu 2013). The sensitivity and specificity for diagnosing cancer were 0.96 (95% CI 0.87 to 0.99) and 0.62 (95% CI 0.43 to 0.78), respectively.

A forest plot summarising all the sensitivity and specificity data for the cystic subgroup analysis of 'cancerous versus benign lesion' studies is shown in Figure 13.

Figure 13. Forest plot - Cystic lesion subgroup analysis: Cancerous versus benign.



Precancerous or cancerous versus benign

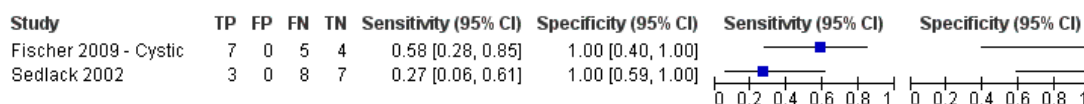
In the analysis assessing the ability of different imaging modalities to differentiate precancerous or cancerous versus benign lesions, we excluded a component of one study because the participants had solid pancreatic lesions (Fischer 2009 - Solid). We therefore re-performed the meta-analysis for precancerous or cancerous versus benign lesions - EUS-FNA without these data. The remaining tests for this target condition did not have any studies excluded and were therefore not redone. The new findings are described

below.

EUS-FNA: Two studies reporting data on 34 participants were included for this test, allowing meta-analysis to be performed (Fischer 2009 - Cystic; Sedlack 2002). The summary sensitivity and summary specificity for diagnosing precancer or cancer were 0.43 (95% CI 0.19 to 0.71) and 1.00 (95% CI 0.74 to 1.00), respectively.

A forest plot summarising the sensitivity and specificity data for the cystic subgroup analysis of 'precancerous or cancerous versus benign lesion' study is shown in Figure 14.

Figure 14. Forest plot - Cystic lesion subgroup analysis: Precancerous or cancerous versus benign - EUS-FNA.



Summary of findings

Name of test	Number of studies (number of participants)	Sensitivity (95% CI)	Specificity (95% CI)	Post-test probability of positive test* (95% CI)	Post-test probability of negative test* (95% CI)	Number of false positives per 100 positive index test results (95% CI)	Number of false negatives per 100 negative index test results (95% CI)	Risk of bias	Applicability concerns	Uncertainty (due to inconsistency or inability to assess inconsistency, and random errors because of overall small sample size)
Cancerous versus benign or precancerous (median pre-test probability: 63%)										
EUS-FNA (cytology)	1 (45)	0.79 (0.60 to 0.91)	1.00 (0.85 to 1.00)	98% (79% to 100%)	26% (14% to 43%)	2 (0 to 21)	26 (14 to 43)	Unclear	High	High
EUS-FNA (CEA > 500 ng/mL)	1 (24)	0.93 (0.70 to 0.99)	0.33 (0.12 to 0.65)	70% (59% to 79%)	25% (4% to 73%)	30 (21 to 41)	25 (4 to 73)	High	High	High
PET (criteria unspecified)	1 (76)	0.85 (0.73 to 0.92)	0.91 (0.72 to 0.97)	94% (81% to 98%)	21% (12% to 34%)	6 (2 to 19)	21 (12 to 34)	Unclear	High	High
Cancerous versus benign (median pre-test probability: 70%)										
EUS	2 (133)	0.95 (0.84 to 0.99)	0.53 (0.31 to 0.74)	82% (74% to 88%)	18% (6% to 45%)	18 (12 to 26)	18 (6 to 45)	Unclear or high	High	High
EUS-FNA (cytology)	3 (147)	0.79 (0.07 to 1.00)	1.00 (0.91 to 1.00)	99% (90% to 100%)	32% (2% to 92%)	0 (0 to 9)	32 (2 to 92)	High	High	High
PET (criteria unspecified)	3 (99)	0.92 (0.80 to 0.97)	0.65 (0.39 to 0.85)	86% (75% to 92%)	22% (9% to 44%)	14 (8 to 25)	22 (9 to 44)	High	High	High

PET (SUVmax > 3.5)	1 (80)	0.96 (0.87 to 0.99)	0.62 (0.43 to 0.78)	85% (78% to 90%)	12% (3% to 36%)	15 (10 to 22)	12 (3 to 36)	High	High	High
CT	2 (123)	0.98 (0.00 to 1.00)	0.76 (0.02 to 1.00)	90% (17% to 100%)	6% (0% to 100%)	10 (0 to 83)	6 (0 to 100)	Unclear high	or High	High
MRI	1 (29)	0.80 (0.58 to 0.92)	0.89 (0.57 to 0.98)	94% (72% to 99%)	34% (17% to 56%)	6 (1 to 28)	34 (17 to 56)	High	High	High
Precancerous or cancerous versus benign (median pre-test probability: 71%)										
EUS	1 (34)	0.92 (0.74 to 0.98)	0.60 (0.31 to 0.83)	85% (72% to 92%)	25% (7% to 58%)	15 (8 to 28)	25 (7 to 58)	High	High	High
EUS-FNA (cytology)	2 (52)	0.73 (0.01 to 1.00)	0.94 (0.15 to 1.00)	97% (25% to 100%)	41% (1% to 98%)	3 (0 to 75)	41 (1 to 98)	Unclear high	or High	High
EUS-FNA (CEA > 50 ng/mL)	1 (11)	0.29 (0.08 to 0.64)	0.25 (0.05 to 0.70)	48% (20% to 77%)	87% (54% to 98%)	52 (23 to 80)	87 (54 to 98)	High	High	High
PET (SUVmax 2.4)	1 (32)	0.94 (0.74 to 0.99)	0.93 (0.69 to 0.99)	97% (83% to 100%)	13% (2% to 49%)	3 (0 to 17)	13 (2 to 49)	High	High	High
CT	1 (48)	0.62 (0.45 to 0.76)	0.64 (0.39 to 0.84)	81% (66% to 90%)	59% (44% to 72%)	19 (10 to 34)	59 (44 to 72)	Unclear	High	High
MRI	1 (27)	0.93 (0.69 to 0.99)	0.85 (0.58 to 0.96)	94% (80% to 98%)	17% (3% to 58%)	6 (2 to 20)	17 (3 to 58)	High	High	High
Cancerous (invasive carcinoma) versus precancerous (dysplasia) (median pre-test probability: 27%)										
EUS	5 (156)	0.78 (0.45 to 0.94)	0.91 (0.61 to 0.98)	75% (37% to 94%)	8% (3% to 22%)	25 (6 to 63)	8 (3 to 22)	Unclear high	or High	High

EUS-FNA (cytology)	3 (158)	0.66 (0.03 to 0.99)	0.92 (0.73 to 0.98)	75% (29% to 95%)	12% (1% to 69%)	25 (5 to 71)	12 (1 to 69)	Unclear high	or High	High
EUS-FNA (CEA > 200 ng/mL)	1 (41)	1.00 (0.57 to 1.00)	0.64 (0.48 to 0.78)	51% (40% to 61%)	Not estimable	49 (39 to 60)	Not estimable	High	High	High
CT	6 (326)	0.72 (0.50 to 0.87)	0.92 (0.81 to 0.97)	78% (57% to 91%)	10% (5% to 18%)	22 (9 to 43)	10 (5 to 18)	Unclear high	or High	High
MRI	1 (32)	0.75 (0.30 to 0.95)	0.93 (0.77 to 0.98)	80% (48% to 94%)	9% (2% to 35%)	20 (6 to 52)	9 (2 to 35)	High	High	High
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) (median pre-test probability: 45%)										
EUS	4 (196)	0.86 (0.74 to 0.92)	0.91 (0.83 to 0.96)	89% (80% to 94%)	11% (7% to 19%)	11 (6 to 20)	11 (7 to 19)	High	High	High
EUS-FNA (cytology)	3 (310)	0.47 (0.24 to 0.70)	0.91 (0.32 to 1.00)	81% (19% to 99%)	32% (22% to 45%)	19 (1 to 81)	32 (22 to 45)	Unclear high	or High	High
EUS-FNA (CEA > 200 ng/mL)	3 (160)	0.58 (0.28 to 0.83)	0.51 (0.19 to 0.81)	49% (28% to 70%)	40% (19% to 65%)	51 (30 to 72)	40 (19 to 65)	High	High	High
EUS-FNA (CA 19-9 > 1000 U/mL)	1 (41)	0.90 (0.60 to 0.98)	0.42 (0.26 to 0.59)	56% (47% to 65%)	16% (3% to 57%)	44 (35 to 53)	16 (3 to 57)	High	High	High
EUS-FNA (CEA > 692.8 ng/mL)	1 (20)	0.80 (0.49 to 0.94)	0.90 (0.60 to 0.98)	87% (50% to 98%)	15% (5% to 39%)	13 (2 to 50)	15 (5 to 39)	Unclear	High	High
PET (SUVmax > 2 to 2.5)	4 (124)	0.90 (0.79 to 0.96)	0.94 (0.81 to 0.99)	93% (78% to 98%)	8% (4% to 16%)	7 (2 to 22)	8 (4 to 16)	High	High	High

CT	3 (139)	0.87 (0.00 to 1.00)	0.96 (0.00 to 1.00)	95% (0% to 100%)	10% (0% to 100%)	5 (0 to 100)	10 (0 to 100)	Unclear high	or High	High
MRI	3 (189)	0.69 (0.44 to 0.86)	0.93 (0.43 to 1.00)	89% (35% to 99%)	21% (12% to 36%)	11 (1 to 65)	21 (12 to 36)	High	High	High
Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) (median pre-test probability: 21%)										
EUS	1 (51)	0.77 (0.50 to 0.92)	0.89 (0.76 to 0.96)	67% (43% to 84%)	7% (3% to 16%)	33 (16 to 57)	7 (3 to 16)	Unclear	High	High
CT	1 (46)	0.50 (0.22 to 0.78)	0.95 (0.83 to 0.99)	72% (36% to 92%)	13% (7% to 22%)	28 (8 to 64)	13 (7 to 22)	High	High	High
Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) (median pre-test probability: 59%)										
CT	3 (106)	0.83 (0.68 to 0.92)	0.83 (0.64 to 0.93)	89% (56% to 98%)	33% (18% to 52%)	11 (2 to 44)	33 (18 to 52)	High	High	High
MRI	2 (71)	0.80 (0.58 to 0.92)	0.81 (0.53 to 0.95)	86% (67% to 95%)	27% (13% to 47%)	14 (5 to 33)	27 (13 to 47)	High	High	High
Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) or benign (median pre-test probability: 43%)										
EUS	1 (70)	0.97 (0.83 to 0.99)	0.40 (0.26 to 0.55)	55% (48% to 61%)	6% (1% to 31%)	45 (39 to 52)	6 (1 to 31)	High	High	High

* Post-test probability was calculated at the median pre-test probability.

Abbreviations:

CA 19-9: carbohydrate antigen 19-9

CEA: carcinoembryonic antigen

CI: confidence interval

CT: computed tomography

EUS: endoscopic ultrasound

FNA: fine-needle aspiration

MRI: magnetic resonance imaging

PET: positron emission tomography
SUVmax: maximum standardised uptake values

DISCUSSION

Summary of main results

The results are summarised in [Summary of findings](#).

We included 54 studies involving a total of 3196 participants that evaluated the diagnostic accuracy of various imaging modalities (EUS, EUS-FNA, PET, CT, and MRI) for characterising focal pancreatic lesions. We identified eight different target conditions in these studies, with the studies using imaging modalities to differentiate: cancerous versus benign or precancerous lesions; cancerous versus benign lesions; precancerous or cancerous lesions versus benign lesions; cancerous (invasive carcinoma) versus precancerous (dysplasia) lesions; cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) lesions; cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) lesions; precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) lesions; and precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) or benign lesions. The wide variety of tumour types that constituted benign and cancerous lesions within the studies meant that only a few meaningful meta-analyses could be performed. None of the comparisons in which single studies were included were of sufficiently high methodological quality to warrant highlighting of the results. For differentiation of cancerous lesions from benign or precancerous lesions, only single studies were included and therefore meta-analysis was not performed. Overall, EUS-FNA (cytology) had a sensitivity of 0.79 (95% CI 0.60 to 0.91) and specificity of 1.00 (95% CI 0.85 to 1.00); EUS-FNA (CEA > 500 ng/mL) had a sensitivity of 0.93 (95% CI 0.70 to 0.99) and specificity of 0.33 (95% CI 0.12 to 0.65); and PET had a sensitivity of 0.85 (95% CI 0.73 to 0.92) and specificity of 0.91 (95% CI 0.72 to 0.97).

The second analysis, of studies differentiating cancerous versus benign lesions, provided three tests in which meta-analysis could be performed, however the data were sparse: one of these tests contained three studies, and the remaining two tests contained two studies, meaning the meta-analysis was of limited value. There was little difference in the diagnostic test accuracy between the imaging techniques. EUS-FNA achieved very high specificity (of 1.00, i.e. no false negatives) but modest sensitivity (0.79; 95% CI 0.07 to 1.00). A high specificity of EUS-FNA can be expected, since this involves physically sampling the lesion. However, the modest sensitivity may reflect that the sampling methods were inadequate. Additional guidance such as identifying the location most likely to yield the correct results or additional guidance using optical endoscopy techniques such as confocal laser microendoscopy may overcome this problem and improve the sensitivity of EUS ([Giovannini 2012](#)), but there are major challenges, such as knowing the area within the lesion that is being examined by

confocal laser microendoscopy, that must be addressed before such methods can be used routinely.

The third analysis, of studies differentiating precancerous or cancerous and benign lesions, only provided one test (EUS-FNA) for which meta-analysis was performed. The results were unreliable due to significant heterogeneity in the results between the studies. The fourth analysis, of studies differentiating cancerous (invasive carcinoma) versus precancerous (dysplasia) lesions, provided three tests in which meta-analysis was performed, with one test containing five studies (EUS), one test containing three studies (EUS-FNA), and the third test containing six studies (CT). All five of the tests included in the analysis had a similar level of accuracy according to their respective ROC curves. EUS and CT showed the highest (and similar) accuracy estimates (EUS = sensitivity 0.78 and specificity 0.91; CT = sensitivity 0.72 and specificity 0.92) and included the largest number of studies (five and six, respectively) among all comparisons.

The fifth analysis, of studies differentiating cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) lesions, provided six tests in which meta-analysis was performed, with two tests containing four studies (EUS and PET SUVmax 2 to 2.5), one test containing two studies (EUS-FNA), three tests containing three studies (EUS-FNA > 200, CT, and MRI), and the remaining two tests providing single studies. PET performed with the highest accuracy (sensitivity 0.90 (95% CI 0.79 to 0.96) and specificity 0.94 (95% CI 0.81 to 0.99)).

The sixth analysis, of studies differentiating cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) lesions, provided no tests in which meta-analysis was performed.

The seventh analysis, of studies differentiating precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) lesions, provided two tests in which meta-analysis was performed. The meta-analysis results for CT (sensitivity 0.83 (95% CI 0.68 to 0.92) and specificity 0.83 (95% CI 0.64 to 0.93)) were similar to those of MRI (sensitivity 0.80 (95% CI 0.58 to 0.92) and specificity 0.81 (95% CI 0.53 to 0.95)), however lack of significant data means little can be inferred from this.

The eighth analysis, of studies differentiating precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) or benign lesions, provided no tests in which meta-analysis was performed.

We performed a subgroup analysis to investigate the performance of imaging modalities for cystic pancreatic lesions. This only resulted in alterations to the 'cancerous versus benign or precancerous', 'cancerous versus benign', and 'precancerous or cancerous versus benign' groups, however when re-performed in these groups, the analysis did not result in any significant changes.

Overall, none of the tests assessed had sufficient overall diagnostic accuracy to be considered a definitive diagnostic modality. High sensitivity of the test is required so that precancer or cancer is not

missed. High specificity is required to avoid major surgery. Sensitivity and specificity in excess of 90% are required to recommend the particular modality over other modalities. Only PET in differentiating precancerous (low- or intermediate-grade dysplasia) versus cancer (high-grade dysplasia or invasive carcinoma) approaches this level of accuracy. Overall, modalities other than EUS-FNA had moderate to high sensitivity but moderate specificity, while EUS-FNA had high specificity with moderate sensitivity in distinguishing the nature of focal pancreatic lesions.

Strengths and weaknesses of the review

We conducted a thorough literature search and included full-text publications and abstracts without any language restrictions. Two review authors independently identified and extracted data from the studies, potentially reducing the chance of error that would be associated with one person performing the data extraction. We used strict reference standards that are likely to diagnose the target condition with a high degree of accuracy. These were the major strengths of the review.

We included EUS-FNA as part of the review. Strictly speaking, EUS-FNA cannot be considered an imaging modality since it uses cytology criteria or levels of tumour markers in the aspirate rather than imaging features to make the diagnosis. We had mentioned at the protocol stage that we would include EUS-FNA in this review, as the searches for EUS return EUS-FNA as well and because EUS-FNA along with the imaging modalities included in this review are the most widely used tests for characterising focal pancreatic lesions. Our review provides the most important information about the tests performed to characterise focal lesions in one location and hence is probably more useful for clinicians, who would otherwise have to search for another review for information on EUS-FNA.

The major limitation in the review process was the diverse nature of the collected data, with a wide variety of definitions of benign, precancerous, and cancerous lesions. This limited the possible analysis of the data and the conclusions that could be made from our analyses. While some authors defined precancerous lesions as lesions with low- and intermediate-grade dysplasia, others defined it as low-grade dysplasia only, while yet others considered any form of dysplasia as precancerous lesions. In the comparison 'cancer versus benign', it is unclear how the study authors dealt with precancerous lesions, that is whether they included precancerous lesions in the 'cancer' group or the 'benign' group, or whether they simply excluded them, consequently undermining any conclusions that could be made for this comparison.

We could not perform a bivariate random-effects model that takes correlation between sensitivity and specificity into account and were unable to compare the diagnostic test accuracy of index tests using formal statistical methods due to the sparseness of data for each comparison. As a result, we performed the analysis using simpler models suggested by [Takwoingi 2015](#) and colleagues. We

reported the model with the lowest -2 log likelihood and also visualised the forest plots and ROC plots in deciding the model to be reported. The confidence intervals were extremely wide for the following analyses: benign versus cancer: CT; benign versus cancer: EUS-FNA; benign versus precancer or cancer: EUS-FNA; and precancer (low- or intermediate-grade dysplasia) versus cancer (high-grade dysplasia or invasive carcinoma): CT. While fixed-effect model provided narrower confidence intervals for some of the above analyses, such models were inappropriate for these data because of the poor overlap of confidence intervals on the forest plot. This observation (i.e. that fixed-effect models were not appropriate) was supported by the -2 log likelihoods, which were higher for the univariate fixed-effect model than those of the models presented. The alternative was not to perform a meta-analysis at all, which is even more difficult to interpret. At least the current results allowed us to interpret that the sensitivity or specificity or both could not be estimated reliably. There was reasonable overlap of confidence intervals in the other meta-analyses performed. With regard to the tests for which meta-analysis could not be performed, the diagnostic test accuracy from single studies needs confirmation by other studies to assess whether the results are reproducible. Hence, we are unable to arrive at any major conclusions based on information by a single study.

A high proportion of studies were at high risk of bias and with high concern regarding applicability in all four domains of the QUADAS-2 tool. This makes the validity of the results questionable. Of particular concern was the type of people who underwent these tests. Because of the strict but appropriate reference standard, all of the participants in all of the studies included in this review except [Cherian 2010](#) underwent surgical resection. This suggested that the surgeons thought that these participants had high probability of having high-grade dysplasia or cancer, either because of the results of this test or other tests performed alongside the index tests. Since most of the studies were retrospective studies, if participants were operated on on the basis of the index test, and only participants who underwent surgery were included, participants with negative index tests but who had cancer would have been excluded inappropriately. This would have resulted in overestimation of sensitivity. The studies did not report the proportion of people in whom the different tests were feasible. This is particularly important for EUS and EUS-FNA, since the participants may have been selected to undergo EUS or EUS-FNA based on the proximity to the stomach or duodenum. This increases the concern regarding applicability. The studies did not report the complications associated with the index test. While this is unlikely to influence the diagnostic accuracy of the index test, it may have implications in determining the balance of benefits and harms in choosing a test.

Another limitation of this review was that we have included sensitivity-maximising diagnostic filters for searching MEDLINE and Embase databases ([Haynes 2004](#); [Wilczynski 2005](#)), and also used terms to limit the searches in Science Citation Index. We did this

because the original searches without the filters retrieved more than 60,000 references. We had to balance the possibility of missing some studies against the risk of not being able to complete the review. We decided that it is useful to have evidence from major studies rather than having no information at all. However, it must be noted that the diagnostic filters we used have a sensitivity of 98.6% for MEDLINE and 100% for Embase. Consequently, the chances that we missed some relevant diagnostic studies are extremely low. This was further reduced by performing a 'related search' and 'citing reference search', in which we found no studies that could be included in this review.

We identified six other systematic reviews on the topics included in this systematic review (Banafea 2016; Chen 2012; Fuccio 2013; Gillis 2015; Hewitt 2012; Mei 2013). These included the role of EUS-FNA (cytology), K-ras gene mutation analysis of FNA aspirate, and EUS elastography in focal pancreatic lesions. The diagnostic test accuracy in four of the studies showed that EUS cytology and K-ras gene mutation analysis of FNA aspirate had a reasonably high sensitivity (0.80 to 0.86) and very high specificity (96% to 98%) in solid pancreatic lesions (Banafea 2016; Chen 2012; Fuccio 2013; Hewitt 2012). These studies accepted cytology and clinical follow-up (without specifying the exact nature of acceptable clinical follow-up) in addition to histopathology as reference standards (Chen 2012; Fuccio 2013; Hewitt 2012). It is likely that this methodological difference was responsible for the major differences between our observations and these systematic reviews. In addition, these systematic reviews restricted participants to those with solid pancreatic lesions (Banafea 2016; Chen 2012; Fuccio 2013; Hewitt 2012), which could be another explanation for the differences between our observations and these systematic reviews. One systematic review evaluated EUS elastography in focal pancreatic lesions and reported a high sensitivity of 0.95 and a specificity of 0.67 (Mei 2013). We did not identify any study evaluating EUS elastography that met our inclusion criteria with respect to our reference standard, therefore we are unable to comment on the observation by Mei 2013. The last systematic review evaluated the role of EUS-FNA and EUS-FNA molecular analysis (i.e. check for abnormal genes) in people with cystic pancreatic lesions. The authors found poor sensitivity and high specificity of EUS-FNA, which is similar to our findings (Gillis 2015).

Applicability of findings to the review question

All studies had high applicability concerns, making the applicability of findings to the target patient population of all incidental lesions questionable. The findings are applicable only for people who are suspected to be at high risk of high-grade dysplasia or cancer. The review question was to find out the diagnostic accuracy of these index tests in people with focal pancreatic lesions,

usually detected incidentally. However, all of the studies that met the inclusion criteria for this review used surgical excision as the reference standard, suggesting that the surgeons considered these patients to have a high risk of malignancy based on the results of the index tests or any additional tests. In terms of current availability of these tests, CT scan and MRI are likely to be available in most secondary centres. EUS is likely to be available in limited secondary centres and most tertiary centres that treat pancreatic lesions. PET is likely to be available only in limited tertiary centres, although the tertiary centres are likely to have access to a PET scan. However, based on the observations in this review, there do not appear to be any major differences between the different imaging modalities. The improved sensitivity of EUS-FNA compared to other imaging modalities is compensated by a corresponding decrease in sensitivity, consequently there do not appear to be major advantages to using EUS for characterising focal pancreatic lesions compared to other non-invasive methodologies.

AUTHORS' CONCLUSIONS

Implications for practice

We were unable to arrive at any firm conclusions because of the differences in the way that study authors classified focal pancreatic lesions into cancerous, precancerous, and benign lesions; the inclusion of few studies with wide confidence intervals for each comparison; poor methodological quality in the studies; and heterogeneity in the estimates within comparisons.

Implications for research

Further studies of high methodological quality are necessary. Future research should be conducted in a prospective manner, however most importantly the definition of benign and cancerous lesions in the analysis of studies should be standardised according to World Health Organization (WHO) classification. The threshold for positivity of endoscopic ultrasound-guided fine-needle aspiration cancer markers should be prespecified. Future studies should avoid any inappropriate exclusions to ensure that true diagnostic accuracy can be determined. Long-term follow-up of participants with negative tests will help in understanding the implications of false-negative results and will aid clinical decision-making.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Brand 2000

Study characteristics		Study characteristics	
Patient sampling	Type of study: prospective study. Consecutive or random sample: neither.		
Patient characteristics and setting	Sample size: 179. Females: 47 (26.3%). Age: 61 years. Presentation: Patients with pancreatic lesions who had undergone EUS and surgical resection with histological confirmation. Setting: secondary care, Germany.		
Index tests	Index test: EUS. Further details: Technical specifications: Olympus GF-UM 3, GF-UM 20, and GF-UM 200. Performed by: gastroenterologist. Criteria for positive diagnosis: a mass lesion with irregular borders, non-homogeneous echotexture, and/or loss of vascular interface or obvious vascular involvement, without any signs of chronic pancreatitis in the lesion or the rest of the gland. However, in the presence of obvious chronic pancreatitis, an associated malignancy was suspected if the EUS morphology of the focal lesion suggested involvement of the adjacent structures		
Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 64 (35.8%)		
Comparative			
Notes	Possible overlap with Binmoeller 1998a and Binmoeller 1998b ; out of 179 patients, only 115 patients with histologically confirmed diagnosis were included		
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection		DOMAIN 1: Patient Selection	

Brand 2000 (Continued)

Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous versus benign - EUS		DOMAIN 2: In	
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FL	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		

Brand 2000 (Continued)

	High	
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Brandwein 2001 - Cystic

Study characteristics		Study characteristics	
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.		
Patient characteristics and setting	Sample size: 26. Females: not stated. Age: not stated. Presentation: Patients with cystic and solid pancreatic lesions who had undergone surgical resection; only patients with cystic lesions included in our analysis. Setting: secondary care, USA.		
Index tests	Index test: EUS-FNA. Further details: Technical specifications: Pentax echoendoscope (model not stated); 22-gauge needle. Performed by: endoscopist and cytologist. Criteria for positive diagnosis: a malignant mass was defined as a focal hypoechoic heterogeneous lesion within the pancreatic parenchyma and cytology reported stated malignancy		
Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection		DOMAIN 1: Patient Selection	
Was a consecutive or random sample of patients enrolled?	No		

Brandwein 2001 - Cystic (Continued)

Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cystic lesion subgroup analysis - Cancerous versus benign - EUS FNA			DOMAIN 2: In
If a threshold was used, was it pre-specified?	Unclear		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low
DOMAIN 2: Index Test Cancerous versus benign - EUS FNA			DOMAIN 2: In
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low
DOMAIN 3: Reference Standard			DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI

Brandwein 2001 - Cystic (Continued)

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Brandwein 2001 - Solid

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 43. Females: not stated. Age: not stated. Presentation: Patients with cystic and solid pancreatic lesions who had undergone surgical resection. Setting: secondary care, USA.
Index tests	Index test: EUS-FNA. Further details: Technical specifications: Pentax echoendoscope (model not stated); 22-gauge needle. Performed by: endoscopist and cytologist. Criteria for positive diagnosis: a malignant mass was defined as a focal hypoechoic heterogeneous lesion within the pancreatic parenchyma and cytology reported stated malignancy
Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Brandwein 2001 - Solid (Continued)

Methodological quality				Methodological
Item	Authors' judgement	Risk of bias	Applicability concerns	
DOMAIN 1: Patient Selection				DOMAIN 1: Pa
Was a consecutive or random sample of patients enrolled?	No			
Was a case-control design avoided?	Yes			
Did the study avoid inappropriate exclusions?	No			
		High	High	
DOMAIN 2: Index Test Cancerous versus benign - EUS FNA				DOMAIN 2: In
If a threshold was used, was it pre-specified?	Yes			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear			
		Unclear	Low	
DOMAIN 3: Reference Standard				DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes			
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear			
		Unclear	Low	
DOMAIN 4: Flow and Timing				DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear			

Brandwein 2001 - Solid (Continued)

Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Cellier 1998

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 46. Females: not stated. Age: not stated. Presentation: Patients with IPMN undergoing surgery. Setting: secondary care, France.
Index tests	Index test: EUS. Further details: Technical specifications: Olympus GFUM3 or GF UM20. Performed by: endoscopist. Criteria for positive diagnosis: <ul style="list-style-type: none"> ● Rupture of main pancreatic duct wall with tumoural intrapancreatic spread. ● Intrapancreatic mass. ● Tumour invasion of duodenum or common bile duct. ● Metastatic peripancreatic lymph nodes. ● Extrapancreatic spread. Index test: CT. Further details: Technical specifications: conventional CT (further details not available). Performed by: not stated. Criteria for positive diagnosis: <ul style="list-style-type: none"> ● Intraductal proliferation. ● Intrapancreatic tumoural mass. ● Extrapancreatic tumoural spread. ● Metastatic peripancreatic nodes.
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.

Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 22 (46.8%)		
Comparative			
Notes	A number of patients were excluded from the analysis. The reasons were not reported		
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Cherian 2010

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 78. Females: not stated. Age: not stated. Presentation: <ol style="list-style-type: none"> 1. Patients with solid pancreatic lesions and suspected pancreatic cancer who required definitive diagnosis. 2. Atypical histories and symptoms. 3. Equivocal CT findings. 4. Deemed unresectable or unfit for surgery. Setting: secondary care, UK.
Index tests	Index test: EUS-FNA. Further details: Technical specifications: Olympus GF-UCT240-AL5.

	Performed by: endoscopist and cytologist. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: benign versus malignant. Reference standard: surgical excision and histology in people who had undergone surgery and clinical follow-up, defined as serial imaging at 12 months that demonstrated progression of disease or patients had clinical deterioration or death. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	High

DOMAIN 2: Index Test Cancerous versus benign - EUS FNA **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 3: Reference Standard **DOMAIN 3: R**

Cherian 2010 (Continued)

Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		High	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	No		
Were all patients included in the analysis?	Yes		
		High	

Choi 2003

Study characteristics		Study character
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: neither.	
Patient characteristics and setting	Sample size: 64. Females: 14 (21.9%). Age: 61 years. Presentation: Patients with IPMN undergoing surgical resection. Setting: secondary care, Korea.	
Index tests	Index test: MRI. Further details: Technical specifications: 1.5-T MR system (Magnetom Vision; Siemens, Erlangen, Germany). Performed by: radiologist. Criteria for positive diagnosis: presence of mural nodules.	
Target condition and reference standard(s)	Target condition: precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia). Reference standard: surgical excision.	

Choi 2003 (Continued)

	Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: 0 (0%). Number of patients who were excluded from the analysis: 18 (28.1%)		
Comparative			
Notes			
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		High	High
DOMAIN 2: Index Test Precancerous or cancerous (intermediate or high grade dysplasia or invasive carcinoma) versus precancerous (low grade dysplasia) - MRI			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Unclear	Low
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		

Choi 2003 (Continued)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Correa-Gallego 2009

Study characteristics		Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.	
Patient characteristics and setting	Sample size: 72. Females: not stated. Age: not stated. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, USA.	
Index tests	Index test: EUS-FNA. Further details: Technical specifications: not stated. Performed by: not stated. Criteria for positive diagnosis: cyst CEA fluid \geq 200 ng/mL	
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.	

Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	High
DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA (CEA > 200 ng/ml)			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Low	Low
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
		Low	Low

DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	No		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		High	

de Jong 2012

Study characteristics	Study character
Patient sampling	Type of study: prospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 32. Females: 19 (59.4%). Age: 62 years. Presentation: Inclusion criteria <ul style="list-style-type: none"> • Patients above 18 years of age with a pancreatic cystic lesion of unknown aetiology detected on cross-sectional imaging (transabdominal ultrasound, CT, MRI). • Patients undergoing surgical resection. Exclusion criteria <ul style="list-style-type: none"> • Patients with a recent episode of acute pancreatitis or with known chronic pancreatitis. • Clotting disorders. • Acute pancreatitis or a synchronous malignancy elsewhere in the body. Setting: secondary care, Netherlands.
Index tests	Index test: EUS. Further details: Technical specifications: Olympus GF-UC(T)140(P). Performed by: endoscopists. Criteria for positive diagnosis: diffuse main duct dilatation (> 10 mm), and/or mural nodes were present, and/or a solid component was seen outside the cyst Index test: MRI. Further details: Technical specifications: Avanto 1.5 Tesla MR. Performed by: radiologist. Criteria for positive diagnosis: diffuse main duct dilatation (> 10 mm), and/or mural nodes were present, and/or a solid component was seen outside the cyst

de Jong 2012 (Continued)

Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Interval between index test and reference standard varied, with a median of 78 days

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - MRI **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
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de Jong 2012 (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	No		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Doi 2002

Study characteristics		Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.	
Patient characteristics and setting	Sample size: 38. Females: 12 (31.6%). Age: 60 years. Presentation: Patients with IPMN who had undergone a pancreatic resection. Setting: secondary care, Japan.	

Index tests	Index test: EUS. Further details: Technical specifications: not stated. Performed by: not stated. Criteria for positive diagnosis: presence of mural nodule or papillary projection
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Out of 38 participants included in the study, only 28 underwent EUS. We obtained diagnostic accuracy information from the discussion. The tables provide information on the number of participants who underwent EUS and the diagnostic accuracy of EUS in identifying the presence of the lesion

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS **DOMAIN 2: In**
cerous (low or i

If a threshold was used, was it pre-specified?	Yes		
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Doi 2002 (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Erkan 2012

Study characteristics	Study character
Patient sampling	Type of study: prospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 46. Females: not stated. Age: not stated. Presentation: Patients undergoing PET/CT scan for suspected pancreatic lesions and surgical resection. Setting: secondary care, Germany.

Index tests	Index test: PET. Further details: Technical specifications: model and manufacturer not stated. Performed by: radiologist. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 5 (10.9%)
Comparative	
Notes	FLT-PET was also available.

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection DOMAIN 1: Pa			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous versus benign - PET DOMAIN 2: In			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High

DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Fischer 2009 - Cystic

Study characteristics	Study character
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 33. Females: not stated. Age: not stated. Presentation: Patients with pancreatic lesions undergoing EUS-FNA. Setting: secondary care, country not stated.
Index tests	Index test: EUS-FNA. Further details: Technical specifications: not stated. Performed by: not stated. Criteria for positive diagnosis: not stated.

Fischer 2009 - Cystic (Continued)

Target condition and reference standard(s)	Target condition: precancerous or cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Precancerous or cancerous versus benign - EUS FNA **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cystic lesion subgroup analysis - Precancerous or cancerous versus benign - EUS FNA **DOMAIN 2: In
- EUS FNA**

If a threshold was used, was it pre-specified?	Yes		
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Fischer 2009 - Cystic (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Fischer 2009 - Solid

Study characteristics	Study character
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 33. Females: not stated. Age: not stated. Presentation: Patients with pancreatic lesions undergoing EUS-FNA. Setting: secondary care, country not stated.

Fischer 2009 - Solid (Continued)

Index tests	Index test: EUS-FNA. Further details: Technical specifications: not stated. Performed by: not stated. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: precancerous or cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection DOMAIN 1: Pa			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High
DOMAIN 2: Index Test Precancerous or cancerous versus benign - EUS FNA DOMAIN 2: In			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High

Fischer 2009 - Solid (Continued)

DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Fisher 2008

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 48. Females: 33 (68.8%). Age: 60 years. Presentation: Inclusion criteria <ul style="list-style-type: none"> • Patients with cystic pancreatic lesions who had undergone surgical resection. Exclusion criteria <ul style="list-style-type: none"> • Patients with a clear history of acute pancreatitis and subsequent development of a pseudocyst were excluded from the study. Setting: secondary care, USA.
Index tests	Index test: CT. Further details: Technical specifications: not stated.

Fisher 2008 (Continued)

	Performed by: radiologist. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: precancerous or cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	High

DOMAIN 2: Index Test Precancerous or cancerous versus benign - CT **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Unclear	High

DOMAIN 3: Reference Standard **DOMAIN 3: R**

Fisher 2008 (Continued)

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Unclear	

Grieser 2010

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 105. Females: 32 (30.5%). Age: 58 years. Presentation: Patients undergoing surgical exploration or resection for pancreatic mass and CT scan. Setting: secondary care, Germany.
Index tests	Index test: CT. Further details: Technical specifications: Siemens Somatom Plus 4; GE Healthcare LightSpeed Ultra, LightSpeed 16/Pro16, LightSpeed VCT. Performed by: radiologist. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision or biopsy during exploratory laparotomy for non-resectable

	cancers. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Another radiologist has a lower specificity.

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous versus benign - CT **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		High	High

DOMAIN 3: Reference Standard **DOMAIN 3: R**

Is the reference standards likely to correctly classify the target condition?	Yes		
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Grieser 2010 (Continued)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
		Low	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Harrison 1999

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 18. Females: 10 (55.6%). Age: 62 years. Presentation: Patients undergoing surgery for suspected pancreatic cancer. Setting: secondary care, USA.
Index tests	Index test: EUS. Further details: Technical specifications: Olympus UM20. Performed by: endoscopist. Criteria for positive diagnosis: not stated. Index test: CT. Further details: Technical specifications: not stated. Performed by: endoscopist. Criteria for positive diagnosis: not stated.

Harrison 1999 (Continued)

Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous versus benign - EUS **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous versus benign - CT **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
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Harrison 1999 (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Higashi 1997

Study characteristics		Study character
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: unclear.	
Patient characteristics and setting	Sample size: 34. Females: 16 (47.1%). Age: 61 years. Presentation: Patients with suspected pancreatic tumours undergoing PET and surgery. Setting: secondary care, Japan.	

Higashi 1997 (Continued)

Index tests	Index test: PET. Further details: Technical specifications: not stated. Performed by: not stated. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection DOMAIN 1: Pa			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High
DOMAIN 2: Index Test Cancerous versus benign - PET DOMAIN 2: In			
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High

Higashi 1997 (Continued)

DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Hong 2010

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 31. Females: 16 (51.6%). Age: 65 years. Presentation: Patients with IPMN who had undergone CT/PET. Setting: secondary care, Korea.
Index tests	Index test: PET. Further details: Technical specifications: DSTe (GE Healthcare). Performed by: radiologist. Criteria for positive diagnosis: SUVmax > 2.5. Index test: CT. Further details:

	<p>Technical specifications: LightSpeed Plus (GE Healthcare) or Somatom Sensation 64 (Siemens Healthcare).</p> <p>Performed by: radiologist.</p> <p>Criteria for positive diagnosis:</p> <ul style="list-style-type: none"> • Main duct-type. • Marked dilatation of the main pancreatic duct (> 10 mm). • Large mural nodule (> 1 cm). • Large cyst size (> 3 cm). • Irregular or septate cyst. • Calcification. • Patulous duodenal papilla.
Target condition and reference standard(s)	<p>Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia).</p> <p>Reference standard: surgical excision, open laparotomy biopsy or biopsy of metastases.</p> <p>Further details:</p> <p>Technical specifications: not applicable.</p> <p>Performed by: clinicians.</p> <p>Criteria for positive diagnosis: not stated.</p>
Flow and timing	<p>Number of indeterminates for whom the results of reference standard were available: not stated.</p> <p>Number of patients who were excluded from the analysis: not stated</p>
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - PET (SUV max 2-2.5) **DOMAIN 2: In**
cerous (low or i

If a threshold was used, was it pre-specified?	Yes		
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Hong 2010 (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Low	Low

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - CT

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Low	Low

DOMAIN 3: Reference Standard

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	No		
Were all patients included in the analysis?	Unclear		
		High	

Study characteristics		Study characteristics	
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.		
Patient characteristics and setting	Sample size: 80. Females: 36 (45.0%). Age: 57 years. Presentation: Inclusion criteria <ul style="list-style-type: none"> • Patients with solitary pancreatic lesions who had undergone PET scan and surgical resection. Exclusion criteria <ul style="list-style-type: none"> • Patients with suspected malignancies in other areas of the body. Setting: secondary care, China.		
Index tests	Index test: PET. Further details: Technical specifications: Biograph 16 HR PET/CT scanner (Siemens). Performed by: radiologist. Criteria for positive diagnosis: SUVmax > 3.5.		
Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		

		Unclear	High
DOMAIN 2: Index Test Cystic lesion subgroup analysis - Cancerous versus benign - PET			DOMAIN 2: In
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		High	Low
DOMAIN 2: Index Test Cancerous versus benign - PET (SUV max > 3.5)			DOMAIN 2: In
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		High	Low
DOMAIN 3: Reference Standard			DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
		Low	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		

Hu 2013 (Continued)

Were all patients included in the analysis?	Unclear		
		Unclear	

Jafarimehr 2010

Study characteristics		Study characteristics	
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.		
Patient characteristics and setting	Sample size: 76. Females: 40 (52.6%). Age: not stated. Presentation: Patients with pancreatic lesions with PET or PET/CT. Setting: secondary care, USA.		
Index tests	Index test: PET. Further details: Technical specifications: not stated. Performed by: not stated. Criteria for positive diagnosis: not stated.		
Target condition and reference standard(s)	Target condition: cancerous versus benign or precancerous. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection		DOMAIN 1: Patient Selection	
Was a consecutive or random sample of patients enrolled?	Unclear		

Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High
DOMAIN 2: Index Test Cancerous versus benign or precancerous - PET			DOMAIN 2: In
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High
DOMAIN 3: Reference Standard			DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: F
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Study characteristics		Study characteristics	
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.		
Patient characteristics and setting	Sample size: 34. Females: 21 (61.8%). Age: 52 years. Presentation: Patients with neuroendocrine pancreatic lesions who had undergone MRI and surgery. Setting: secondary care, Korea.		
Index tests	Index test: MRI. Further details: Technical specifications: Intera Achieva 3.0-T. Performed by: radiologist. Criteria for positive diagnosis: apparent diffusion coefficient: $1.09 \times 10^3 \text{ mm}^2/\text{s}$.		
Target condition and reference standard(s)	Target condition: precancerous or cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 7 (20.6%)		
Comparative			
Notes			
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

Jang 2014a (Continued)

DOMAIN 2: Index Test Precancerous or cancerous versus benign - MRI		DOMAIN 2: In	
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		High	High
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Jang 2014b

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.

Patient characteristics and setting	Sample size: 65. Females: 27 (41.5%). Age: not stated. Presentation: Patients with IPMN undergoing MRI and surgery. Setting: secondary care, Korea.
Index tests	Index test: MRI. Further details: Technical specifications: Intera Achieva 3.0-T. Performed by: radiologist. Criteria for positive diagnosis: signal intensity of normal pancreatic parenchyma at the mural nodule, septum, cystic wall, ductal wall, and solid lesion of the IPMNs
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 4 (6.2%)
Comparative	
Notes	A second observer with 1 more false positive (with correspondingly 1 less true negative) was also available. The sensitivity and specificity are for combined conventional- and diffusion-weighted scan. The accuracy was lower with conventional scan

Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection		DOMAIN 1: Patient Selection	
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - MRI		DOMAIN 2: In-terpreted without knowledge of the results of the reference standard?	
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Low	Low
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Jin 2013a

Study characteristics		Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.	

Patient characteristics and setting	Sample size: 162. Females: 99 (61.1%). Age: 64 years. Presentation: Patients with pancreatic cysts who underwent surgery. Setting: secondary care, further details not available.
Index tests	Index test: EUS-FNA. Further details: Technical specifications: model and manufacturer not stated. Performed by: endoscopist. Criteria for positive diagnosis: cellular atypia.
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection DOMAIN 1: Pa			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA **DOMAIN 2: In**
cerous (low or i

Jin 2013a (Continued)

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Jin 2015

Study characteristics		Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.	
Patient characteristics and setting	Sample size: 86. Females: not stated. Age: not stated. Presentation:	

	Patients with mucinous pancreatic cysts undergoing operative resection. Setting: secondary care, USA.
Index tests	Index test: EUS-FNA. Further details: Technical specifications: EUS model not stated; 22-gauge needle. Performed by: not stated. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: 1 (1.3%). Number of patients who were excluded from the analysis: 9 (10.6%)
Comparative	
Notes	Results were reported for only 76 out of 77 participants with mucinous cysts. The final results were possible only for these participants

Methodological quality **Methodological quality**

Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS FNA **DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS FNA**

If a threshold was used, was it pre-specified?	Yes		
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Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Kalha 2003

Study characteristics		Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.	
Patient characteristics and setting	Sample size: 24. Females: not stated. Age: not stated. Presentation: Patients undergoing EUS-FNA and surgery for cystic pancreatic lesions. Setting: secondary care, USA.	

Kalha 2003 (Continued)

Index tests	Index test: EUS-FNA. Further details: Technical specifications: EUS model or needle size not stated. Performed by: not stated. Criteria for positive diagnosis: cyst CEA fluid \geq 500 ng/mL
Target condition and reference standard(s)	Target condition: cancerous versus benign or precancerous. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Of 84 participants, 60 who were observed were excluded because the reference standard was not adequate for these participants

Methodological quality

Methodological

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection

DOMAIN 1: Pa

Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous versus benign or precancerous - EUS FNA (cytology)

DOMAIN 2: In

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Kalha 2003 (Continued)

		Unclear	Low
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Kamata 2016a

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 70. Females: 39 (55.7%). Age: 62 years. Presentation: Inclusion criteria <ul style="list-style-type: none"> • People with pancreatic cyst. Exclusion criteria <ul style="list-style-type: none"> • People with multiple cysts. • People with intraductal pancreatic cancer foci. Setting: secondary care, Japan.

Kamata 2016a (Continued)

Index tests	Index test: EUS. Further details: Technical specifications: GF-UCT260; Olympus Medical Systems, Tokyo, Japan. Performed by: endoscopist. Criteria for positive diagnosis: presence of mural nodules.
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) or benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: 0 (0%). Number of patients who were excluded from the analysis: 419 (85.7%)
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) or benign - EUS **DOMAIN 2: In**
cerous (low or i

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Kamata 2016a (Continued)

		Unclear	Low
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Kato 1995

Study characteristics	Study character
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 24. Females: not stated. Age: not stated. Presentation: Patients with pancreatic masses. Setting: secondary care, Japan.
Index tests	Index test: PET. Further details: Technical specifications: HEADTOME-IV (Shimadzu Corporation). Performed by: not stated. Criteria for positive diagnosis: not stated.

Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision, open laparotomy biopsy or clinical follow-up for at least 3 years. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous versus benign - PET **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Unclear		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High

DOMAIN 3: Reference Standard **DOMAIN 3: R**

Is the reference standards likely to correctly classify the target	Unclear		
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Kato 1995 (Continued)

condition?			
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	No		
Were all patients included in the analysis?	Unclear		
		High	

Kim 2015

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 123. Females: not stated. Age: not stated. Presentation: Patients with surgically proven and histopathologically confirmed IPMN and who had undergone MRI examinations with diffusion-weighted imaging before surgery. Setting: secondary care, Korea.
Index tests	Index test: MRI. Further details: Technical specifications: Verio or Trio (Siemens Medical Solutions), Signa HDTx (GE Medical Systems), Achieva (Philips Healthcare). Performed by: radiologist. Criteria for positive diagnosis: signal intensity of normal pancreatic parenchyma at the mural nodule, septum, cystic wall, ductal wall, and solid lesion of the IPMNs
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision.

	Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 30 (24.4%)
Comparative	
Notes	25 participants were excluded due to lack of diffusion-weighted MRI or subquality MRI. The sensitivities and specificities reported by other radiologists were lower

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - MRI **DOMAIN 2: In**
cerous (low or i

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Low	Low

DOMAIN 3: Reference Standard **DOMAIN 3: R**

Is the reference standards likely to correctly classify the target condition?	Yes		
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Kim 2015 (Continued)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Klau 2011

Study characteristics		Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.	
Patient characteristics and setting	Sample size: 29. Females: 10 (34.5%). Age: 61 years. Presentation: Patients with solid focal pancreatic lesions who had undergone surgery. Setting: secondary care, Germany.	
Index tests	Index test: MRI. Further details: Technical specifications: 1.5 T Magnetom Avanto, Siemens. Performed by: radiologist. Criteria for positive diagnosis: perfusion fraction < 0.1105	
Target condition and reference standard(s)	Target condition: cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.	

Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Sensitivities and specificities for other cut-off values were lower

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	High

DOMAIN 2: Index Test Cancerous versus benign - MRI **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High

DOMAIN 3: Reference Standard **DOMAIN 3: R**

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Unclear	

Kobayashi 2012

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 36. Females: 15 (41.7%). Age: 66 years. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, Japan.
Index tests	Index test: EUS. Further details: Technical specifications: UM20, UM2000; Olympus. Performed by: endoscopists. Criteria for positive diagnosis: lateral spread of the nodule > 15 mm
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	

Kobayashi 2012 (Continued)

Notes	Of 238 participants with IPMN, only 46 who had undergone surgical resection were included in the analysis; another criterion for diagnosis with lower diagnostic test accuracy was also available		
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS			
If a threshold was used, was it pre-specified?	Unclear		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			

Kobayashi 2012 (Continued)

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Kubo 2001

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 51. Females: 19 (37.3%). Age: 67 years. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, Japan.
Index tests	Index test: EUS. Further details: Technical specifications: GF-UM2, UM3, UM20; Olympus. Performed by: endoscopists. Criteria for positive diagnosis: <ul style="list-style-type: none"> • in main duct type, tumour > 10 mm dilated MPD; • in branch duct type, large cystic tumour (> 40 mm) with irregular thick septum; or • large mural nodule (> 10 mm).
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality				Methodological
Item	Authors' judgement	Risk of bias	Applicability concerns	
DOMAIN 1: Patient Selection				DOMAIN 1: Pa
Was a consecutive or random sample of patients enrolled?	Unclear			
Was a case-control design avoided?	Yes			
Did the study avoid inappropriate exclusions?	Unclear			
		Unclear	High	
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (low grade dysplasia) - EUS				DOMAIN 2: In - EUS
If a threshold was used, was it pre-specified?	Unclear			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes			
		Low	Low	
DOMAIN 3: Reference Standard				DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes			
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear			
		Unclear	Low	
DOMAIN 4: Flow and Timing				DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear			

Kubo 2001 (Continued)

Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Kucera 2012

Study characteristics	Study characteristics		
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.		
Patient characteristics and setting	Sample size: 47. Females: 15 (31.9%). Age: 66 years. Presentation: Patients with IPMN who had undergone EUS-FNA with cyst fluid analysis and surgical resection. Setting: secondary care, USA.		
Index tests	Index test: EUS-FNA. Further details: Technical specifications: GF-UC30P and GF-UC140P, Olympus. Performed by: endoscopist and cytologist. Criteria for positive diagnosis: CEA > 200 ng/mL.		
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes	Of 87 participants who had undergone surgical resection for IPMN, 40 were excluded because they had not undergone EUS-FNA		
Methodological quality	Methodological quality		
Item	Authors' judgement	Risk of bias	Applicability concerns

DOMAIN 1: Patient Selection		DOMAIN 1: Pa	
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA (CEA > 200 ng/ml)		DOMAIN 2: In	
If a threshold was used, was it pre-specified?	Unclear		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FL	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		

Kucera 2012 (Continued)

Were all patients included in the analysis?	No		
		High	

Le Baleur 2011a

Study characteristics		Study characteristics	
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: unclear.		
Patient characteristics and setting	Sample size: 60. Females: 59 (98.3%). Age: 43 years. Presentation: Patients with MCN who had undergone surgical resection. Setting: secondary care, France.		
Index tests	Index test: CT. Further details: Technical specifications: not stated. Performed by: not stated. Criteria for positive diagnosis: presence of mural nodule.		
Target condition and reference standard(s)	Target condition: pre-malignant (low- or intermediate-grade dysplasia) versus malignant (high-grade dysplasia or invasive carcinoma). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes	Sensitivity and specificity for other parameters related to size of tumour were available and were lower		
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection		DOMAIN 1: Pa	

Le Baleur 2011a (Continued)

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High
DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - CT			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		

	Unclear	
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Lee 2014

Study characteristics		Study characteristics	
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.		
Patient characteristics and setting	Sample size: 84. Females: 29 (34.5%). Age: 65 years. Presentation: Patients with branch duct IPMN who had undergone surgical resection. Setting: secondary care, Korea.		
Index tests	Index test: EUS. Further details: Technical specifications: not stated. Performed by: endoscopists. Criteria for positive diagnosis: an EUS score composed of cyst size, mural nodule height, associated main pancreatic duct dilation, thick septum, and patulous papilla ≥ 7		
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection		DOMAIN 1: Patient Selection	
Was a consecutive or random sample of patients enrolled?	Unclear		

Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS			
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	No		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		High	

Study characteristics		Study characteristics	
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.		
Patient characteristics and setting	Sample size: 41. Females: 27 (65.9%). Age: 64 years. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, France.		
Index tests	Index test: EUS-FNA. Further details: Technical specifications: Pentax-FG 32 UA 120°. Performed by: endoscopists. Criteria for positive diagnosis: CEA > 200 ng/mL. Second criteria for positive diagnosis: carbohydrate antigen 19-9 > 1000 U/mL		
Target condition and reference standard(s)	Target conditions: 1. Cancerous (invasive carcinoma) versus precancerous (dysplasia). 2. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes	6 different criteria for diagnosis were used. All 6 are listed		
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		

Maire 2008 (Continued)

Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS FNA (CEA > 200 ng/ml)

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS FNA (CEA > 200 ng/ml)

If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA (CEA > 200 ng/ml)

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA (CEA > 200 ng/ml)

If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA (Ca 19.9 > 1000 U/ml)

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA (Ca 19.9 > 1000 U/ml)

If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High

DOMAIN 3: Reference Standard

DOMAIN 3: Reference Standard

Is the reference standards likely to correctly classify the target?	Yes		
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Maire 2008 (Continued)

condition?			
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

McHenry 2002

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 45. Females: not stated. Age: not stated. Presentation: Patients with cystic pancreatic lesion who had undergone surgical resection. Setting: secondary care, USA.
Index tests	Index test: EUS-FNA. Further details: Technical specifications: Pentax echoendoscope. Performed by: not stated. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: precancerous or cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.

Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High
DOMAIN 2: Index Test Cystic lesion subgroup analysis - Precancerous or cancerous versus benign - EUS FNA			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		

McHenry 2002 (Continued)

		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Nakagawa 2009

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 34. Females: not stated. Age: not stated. Presentation: Patients with cystic pancreatic lesion who had undergone surgical resection and EUS. Setting: secondary care, Japan.
Index tests	Index test: EUS. Further details: Technical specifications: GF-UWP230 or GF-UC2000P (Olympus). Performed by: endoscopists. Criteria for positive diagnosis: height of protruding lesion > 4.1 mm Index test: CT. Further details: Technical specifications: GE LightSpeed Ultra, GE LightSpeed 16; GE Medical Systems. Performed by: radiologists. Criteria for positive diagnosis: height of protruding lesion > 4.1 mm
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.

Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS			
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT			
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		High	High

Nakagawa 2009 (Continued)

DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FL	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Nara 2009

Study characteristics	Study character
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 123. Females: 53 (43.1%). Age: 65 years. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, Japan.
Index tests	Index test: CT. Further details: Technical specifications: single-slice helical CT or MDCT. Performed by: radiologist. Criteria for positive diagnosis: irregularly shaped hypoattenuating solid mass detected adjacent to or surrounding an IPMN on contrast-enhanced CT

Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	High

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Low	Low

DOMAIN 3: Reference Standard **DOMAIN 3: R**

Is the reference standards likely to correctly classify the target condition?	Yes		
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Nara 2009 (Continued)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Unclear	

Ogawa 2008

Study characteristics

Study character

Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 64. Females: 20 (31.3%). Age: 65 years. Presentation: Patients with surgically proven and histopathologically confirmed IPMN. Setting: secondary care, Japan.
Index tests	Index test: CT. Further details: Technical specifications: Aquilion; Toshiba. Performed by: radiologist. Criteria for positive diagnosis: main pancreatic duct - the maximum diameter, the presence of a septum, and the presence of a mural nodule and its maximum size (length of major axis); the type (unilocular or multilocular) of lesion, the maximum size of the lesion, the presence of wall thickness
Target condition and reference standard(s)	Target conditions: 1. Cancerous (invasive carcinoma) versus precancerous (dysplasia). 2. Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia). Reference standard: surgical excision.

	Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 5 (7.8%)		
Comparative			
Notes	Only analysis at lesion level was available.		
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT			
If a threshold was used, was it pre-specified?	Unclear		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Unclear	Low
DOMAIN 2: Index Test Precancerous or cancerous (intermediate or high grade dysplasia or invasive carcinoma) versus precancerous (low grade dysplasia) - CT			
If a threshold was used, was it pre-specified?	Unclear		

Ogawa 2008 (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Unclear	Low

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	No		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Ogawa 2014

Study characteristics	Study character
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 38. Females: 12 (31.6%). Age: 68 years. Presentation: Patients with IPMN undergoing surgery and MRI. Setting: secondary care, Japan.

Index tests	Index test: MRI. Further details: Technical specifications: EXCELART Vantage, Toshiba. Performed by: radiologist. Criteria for positive diagnosis: presence of positive signal in diffusion-weighted imaging
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 3 (7.9%)
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - MRI **DOMAIN 2: In**
cerous (low or i

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		

Ogawa 2014 (Continued)

		Low	Low
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FI	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Otomi 2014

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 32. Females: 17 (53.1%). Age: 63 years. Presentation: Patients with pancreatic lesions undergoing PET/CT prior to surgery other than pancreatic adenocarcinoma. Setting: secondary care, Japan.
Index tests	Index test: PET. Further details: Technical specifications: F100 & CYPRIS (Sumitomo Heavy Industries) and Aquido (Toshiba) CT scanner.

	Performed by: radiologist. Criteria for positive diagnosis: SUVmax > 2.4.
Target condition and reference standard(s)	Target condition: precancerous or cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Sensitivity and specificity for other parameters such as visualisation and SUVmean were available

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	High

DOMAIN 2: Index Test Precancerous or cancerous versus benign - PET (SUV max > 2.4) **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High

DOMAIN 3: Reference Standard **DOMAIN 3: R**

Otomi 2014 (Continued)

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Unclear	

Pais 2007

Study characteristics

Study character

Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 74. Females: 36 (48.6%). Age: 65 years. Presentation: Patients with IPMN undergoing surgery and EUS-FNA. Setting: secondary care, USA.
Index tests	Index test: EUS-FNA. Further details: Technical specifications: Olympus GF-UM20, GF-UM130, or GF-UM160; 22-gauge needle. Performed by: endoscopist and cytologist. Criteria for positive diagnosis: presence of hyperchromasia, nuclear crowding, and loss of nuclear uniformity, nucleolar prominence, or chromatin abnormalities
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision.

	Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	High
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS FNA			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Unclear	Low
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		

Pais 2007 (Continued)

Were the reference standard results interpreted without knowledge of the results of the index tests?	No		
		High	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	No		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		High	

Sahani 2006

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 25. Females: 12 (48.0%). Age: 69 years. Presentation: Patients with IPMN undergoing surgery. Setting: secondary care, USA.
Index tests	Index test: CT. Further details: Technical specifications: LightSpeed QX/I (GE Medical Systems). Performed by: radiologist. Criteria for positive diagnosis: presence of mural nodules, papillary projections, or a solid mass in the dilated duct or within the cystic lesion Index test: MRI. Further details: Technical specifications: 1.5-T system Signa (GE Medical Systems). Performed by: radiologist. Criteria for positive diagnosis: presence of mural nodules, papillary projections, or a solid mass in the dilated duct or within the cystic lesion

Target condition and reference standard(s)	Target condition: precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality	Methodological quality
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Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection	DOMAIN 1: Patient Selection
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Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Precancerous or cancerous (intermediate or high grade dysplasia or invasive carcinoma) versus precancerous (low grade dysplasia) - CT	DOMAIN 2: Index Test Precancerous or cancerous (intermediate or high grade dysplasia or invasive carcinoma) versus precancerous (low grade dysplasia) - CT
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If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		High	Low

DOMAIN 2: Index Test Precancerous or cancerous (intermediate or high grade dysplasia or invasive carcinoma) versus precancerous (low grade dysplasia) - MRI	DOMAIN 2: Index Test Precancerous or cancerous (intermediate or high grade dysplasia or invasive carcinoma) versus precancerous (low grade dysplasia) - MRI
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Sahani 2006 (Continued)

If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		High	Low

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FL

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Saito 2013

Study characteristics		Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.	
Patient characteristics and setting	Sample size: 48. Females: 16 (33.3%). Age: 69 years. Presentation:	

	Patients with IPMN who had undergone surgical resection. Setting: secondary care, Japan.
Index tests	Index test: PET. Further details: Technical specifications: Aquiduo (Toshiba Medical Systems), Advance NXi (GE Healthcare), and Discovery ST (GE Healthcare). Performed by: radiologist. Criteria for positive diagnosis: SUVmax > 2 and retention index < -10
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Sensitivity and specificity for SUVmax > 2 are also available

Methodological quality **Methodological quality**

Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	High
DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - PET (SUV max 2-2.5) DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - PET (SUV max 2-2.5)			
If a threshold was used, was it pre-specified?	No		

Saito 2013 (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: FL	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Unclear	

Salla 2007

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: consecutive patients.
Patient characteristics and setting	Sample size: 8. Females: 3 (37.5%). Age: 63 years. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, Greece.

Index tests	Index test: EUS-FNA. Further details: Technical specifications: equipment not stated; 22-gauge needle. Performed by: endoscopist. Criteria for positive diagnosis: not stated.
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality				Methodological
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Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	High

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS FNA				DOMAIN 2: In
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If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Salla 2007 (Continued)

		Unclear	High
DOMAIN 3: Reference Standard			DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Unclear	

Sedlack 2002

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 34. Females: 18 (52.9%). Age: 55 years. Presentation: Patients with cystic lesions of pancreas who had undergone EUS and surgical resection. Setting: secondary care, USA.
Index tests	Index test: EUS. Further details: Technical specifications: GFU-130, Olympus. Performed by: endoscopist. Criteria for positive diagnosis: If 1 or more of the following EUS criteria were met

Sedlack 2002 (Continued)

	<ul style="list-style-type: none"> • Wall thickness of 3 mm or greater, macroseptation (all cyst compartments > 10 mm diameter). • Presence of a mass or intramural growth. • Cystic dilation of the main pancreatic duct. <p>Index test: EUS-FNA. Further details: Technical specifications: GFUC-30P, Olympus; 22-gauge needle. Performed by: endoscopist. Criteria for positive diagnosis: CEA >= 50 ng/mL. Second criteria for positive diagnosis: not stated.</p>
Target condition and reference standard(s)	<p>Target condition: precancerous or cancerous versus benign. Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.</p>
Flow and timing	<p>Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated</p>
Comparative	
Notes	

Methodological quality **Methodological**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Pa**

Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Precancerous or cancerous versus benign - EUS **DOMAIN 2: In**

If a threshold was used, was it pre-specified?	Yes		
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Sedlack 2002 (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 2: Index Test Precancerous or cancerous versus benign - EUS FNA

DOMAIN 2: In

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 2: Index Test Precancerous or cancerous versus benign - EUS FNA (CEA > 50 ng/ml)

DOMAIN 2: In

If a threshold was used, was it pre-specified?	Unclear		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cystic lesion subgroup analysis - Precancerous or cancerous versus benign - EUS FNA

DOMAIN 2: In
- EUS FNA

If a threshold was used, was it pre-specified?	Unclear		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
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Sedlack 2002 (Continued)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Smith 2016

Study characteristics		Study character	
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.		
Patient characteristics and setting	Sample size: 138. Females: 99 (71.7%). Age: 62 years. Presentation: Patients with IPMN or MCN. Setting: secondary care, USA.		
Index tests	Index test: EUS-FNA. Further details: Technical specifications: not stated. Performed by: not stated. Criteria for positive diagnosis: high-grade atypia or worse. Second criteria for positive diagnosis: abnormal cytology.		
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians.		

	Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: 0 (0%). Number of patients who were excluded from the analysis: 11 (8%)
Comparative	
Notes	Diagnostic accuracy was also available for another threshold (abnormal cytology) with lower diagnostic accuracy

Methodological quality **Methodological quality**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Patient Selection**

Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA **DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA**

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Unclear	Low

DOMAIN 3: Reference Standard **DOMAIN 3: Reference Standard**

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge	Unclear		

Smith 2016 (Continued)

of the results of the index tests?			
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	No		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Takanami 2011

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 59. Females: 3 (5.1%). Age: 66 years. Presentation: Patients with IPMN with mural nodules who had undergone PET/CT and surgical resection. Setting: secondary care, Japan.
Index tests	Index test: PET. Further details: Technical specifications: Biograph LSO DUO PET/CT scanner, Siemens. Performed by: radiologist. Criteria for positive diagnosis: SUVmax > 2.3.
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 43 (72.9%)

Comparative			
Notes	Only 16 of 43 people with IPMN were included in the analysis. Sensitivity was also available for SUV _{max} 2.0 and 2.5		
Methodological quality			
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - PET (SUV max 2-2.5)			
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		High	High
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			

Takanami 2011 (Continued)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Takeshita 2008

Study characteristics	Study character
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 53. Females: 25 (47.2%). Age: 65 years. Presentation: Patients with IPMN who had undergone surgery. Setting: secondary care, Japan.
Index tests	Index test: CT. Further details: Technical specifications: LightSpeed QX/I; GE Medical Systems. Performed by: radiologist. Criteria for positive diagnosis: presence of mural nodule and main ductal dilatation (> 5 mm) or presence of mural nodule and cystic tumour size > 3 cm
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: 7 (13.2%)
Comparative	
Notes	Sensitivity and specificity for other parameters were available

Methodological quality				Methodological
Item	Authors' judgement	Risk of bias	Applicability concerns	
DOMAIN 1: Patient Selection				DOMAIN 1: Pa
Was a consecutive or random sample of patients enrolled?	Unclear			
Was a case-control design avoided?	Yes			
Did the study avoid inappropriate exclusions?	Unclear			
		Unclear	High	
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (low grade dysplasia) - CT				DOMAIN 2: In - CT
If a threshold was used, was it pre-specified?	No			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear			
		High	High	
DOMAIN 3: Reference Standard				DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes			
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear			
		Unclear	Low	
DOMAIN 4: Flow and Timing				DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear			

Takeshita 2008 (Continued)

Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Tan 2009

Study characteristics		Study characteristics	
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: neither.		
Patient characteristics and setting	Sample size: 20. Females: 9 (45.0%). Age: 62 years. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, China.		
Index tests	Index test: CT. Further details: Technical specifications: LightSpeed QX/I or LightSpeed 16; GE Medical Systems. Performed by: radiologist. Criteria for positive diagnosis: not stated.		
Target condition and reference standard(s)	Target condition: precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection		DOMAIN 1: Pa	

Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Precancerous or cancerous (intermediate or high grade dysplasia or invasive carcinoma) versus DOMAIN 2: Index Test Precancerous (low grade dysplasia) - CT			
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Low	High
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		

	High	
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Taouli 2000

Study characteristics	Study characteristics
Patient sampling	Type of study: retrospective study. Consecutive or random sample: neither.
Patient characteristics and setting	Sample size: 36. Females: 17 (47.2%). Age: 61 years. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, France.
Index tests	Index test: CT. Further details: Technical specifications: Elscint CT Twin; Elscint. Performed by: radiologist. Criteria for positive diagnosis: dilatation of MPD > 10 mm.
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Sensitivity and specificity for other parameters were available

Methodological quality **Methodological quality**

Item	Authors' judgement	Risk of bias	Applicability concerns	
DOMAIN 1: Patient Selection DOMAIN 1: Patient Selection				
Was a consecutive or random sample of patients enrolled?	No			
Was a case-control design avoided?	Yes			

Did the study avoid inappropriate exclusions?	No		
		High	High
DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT			DOMAIN 2: In
If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
		Low	High
DOMAIN 3: Reference Standard			DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Study characteristics		Study characteristics	
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: neither.		
Patient characteristics and setting	Sample size: 29. Females: 13 (44.8%). Age: 65 years. Presentation: Patients with IPMN who had undergone surgical resection. Setting: secondary care, Japan.		
Index tests	Index test: PET. Further details: Technical specifications: Headtome/Set 2400W; Shimadzu Corporation. Performed by: radiologist. Criteria for positive diagnosis: SUVmax > 2.5.		
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.		
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated		
Comparative			
Notes			
Methodological quality		Methodological quality	
Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - PET (SUV max 2-2.5)		DOMAIN 2: In-terpreted without knowledge of the results of the reference standard?	
If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High
DOMAIN 3: Reference Standard		DOMAIN 3: Reference Standard	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: Flow and Timing	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Yamao 2001

Study characteristics	Study characteristics
Patient sampling	Type of study: unclear whether prospective or retrospective study. Consecutive or random sample: neither.

Patient characteristics and setting	Sample size: 49. Females: 18 (36.7%). Age: 63 years. Presentation: Patients with IPMN undergoing surgical resection. Setting: secondary care, Japan.
Index tests	Index test: CT. Further details: Technical specifications: CT9200 (Yokogawa), HiSpeed Advantage (GE). Performed by: radiologist. Criteria for positive diagnosis: wall-thickening, presence of nodule, and heterogenous pattern Index test: EUS. Further details: Technical specifications: JF-UM20 and GF-UM240 (Olympus). Performed by: endoscopist. Criteria for positive diagnosis: wall-thickening, presence of nodule, and heterogenous pattern
Target condition and reference standard(s)	Target conditions: 1. Cancerous (invasive carcinoma) versus precancerous (dysplasia). 2. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: 1 (2%). Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	The study reported 3 x 3 table for CT scan and EUS. 1 patient was excluded from analysis, but this differed between CT and EUS

Methodological quality				Methodological quality
Item	Authors' judgement	Risk of bias	Applicability concerns	
DOMAIN 1: Patient Selection				DOMAIN 1: Pa
Was a consecutive or random sample of patients enrolled?	No			
Was a case-control design avoided?	Yes			

Did the study avoid inappropriate exclusions?	No		
		High	High

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS

DOMAIN 2: In

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT

DOMAIN 2: In

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS

DOMAIN 2: In
cerous (low or i

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - CT

DOMAIN 2: In
cerous (low or i

If a threshold was used, was it pre-specified?	Yes		
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Yamao 2001 (Continued)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 3: Reference Standard

DOMAIN 3: R

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low

DOMAIN 4: Flow and Timing

DOMAIN 4: FI

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Zhan 2011

Study characteristics

Study character

Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 21. Females: 3 (14.3%). Age: not stated. Presentation: Patients with MCN undergoing operative resection. Setting: secondary care, China.

Index tests	Index test: EUS. Further details: Technical specifications: model and manufacturer not stated. Performed by: endoscopist. Criteria for positive diagnosis: different criteria were reported for IPMN and MCN without any information on how these were distinguished prior to FNA
Target condition and reference standard(s)	Target condition: cancerous (invasive carcinoma) versus precancerous (dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	Other criteria with lower sensitivity and specificity were available

Methodological quality

Methodological

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection

DOMAIN 1: Pa

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS

DOMAIN 2: In

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Zhan 2011 (Continued)

		Unclear	High
DOMAIN 3: Reference Standard			DOMAIN 3: R
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing			DOMAIN 4: FI
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Zhan 2013

Study characteristics	Study character
Patient sampling	Type of study: retrospective study. Consecutive or random sample: unclear.
Patient characteristics and setting	Sample size: 20. Females: 6 (30.0%). Age: 59 years. Presentation: Patients with MCN undergoing operative resection. Setting: secondary care, China.
Index tests	Index test: EUS-FNA. Further details: Technical specifications: GF-UCT-2000-OL5 (Olympus). Performed by: endoscopist. Criteria for positive diagnosis: cytology

	Second criteria for positive diagnosis: CEA > 692.8 ng/mL.
Target condition and reference standard(s)	Target condition: cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia). Reference standard: surgical excision. Further details: Technical specifications: not applicable. Performed by: clinicians. Criteria for positive diagnosis: not stated.
Flow and timing	Number of indeterminates for whom the results of reference standard were available: not stated. Number of patients who were excluded from the analysis: not stated
Comparative	
Notes	

Methodological quality **Methodological quality**

Item	Authors' judgement	Risk of bias	Applicability concerns
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DOMAIN 1: Patient Selection **DOMAIN 1: Patient Selection**

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	High

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA **DOMAIN 2: Index Test Cancerous (low or intermediate grade dysplasia) - EUS FNA**

If a threshold was used, was it pre-specified?	Yes		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		Unclear	Low

DOMAIN 2: Index Test Cancerous (high grade dysplasia or invasive carcinoma) versus precancerous (low or intermediate grade dysplasia) - EUS FNA (CEA > 692.8 ng/ml) **DOMAIN 2: Index Test Cancerous (low or intermediate grade dysplasia) - EUS FNA (CEA > 692.8 ng/ml)**

If a threshold was used, was it pre-specified?	No		
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
		High	High
DOMAIN 3: Reference Standard		DOMAIN 3: R	
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
		Unclear	Low
DOMAIN 4: Flow and Timing		DOMAIN 4: F	
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

CEA: carcinoembryonic antigen
 CT: computed tomography
 EUS: endoscopic ultrasound
 FNA: fine-needle aspiration
 IPMN: intraductal pancreatic mucinous neoplasm
 MCN: mucinous cystic neoplasm
 MDCT: multidetector computed tomography
 MPD: main pancreatic duct
 MRI: magnetic resonance imaging
 PET: positron emission tomography
 SUV: standard uptake value

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aburime 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Adamek 2000	This study was not included as no pancreatic mass was present in the patient(s) tested
Adimoolam 2011	There was no comparison of whether cancer was present or not
Afify 2003	There was no comparison of whether cancer was present or not
Agarwal 2004	This study was not included as no pancreatic mass was present in the patient(s) tested
Agarwal 2008a	This study was not included as no pancreatic mass was present in the patient(s) tested
Agarwal 2008b	This study was not included as no pancreatic mass was present in the patient(s) tested
Agarwal 2008c	This study was not included as no pancreatic mass was present in the patient(s) tested
Aguilar-Saavedra 2011	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Ahmad 2001	There was no comparison of whether cancer was present or not
Ahmad 2003	There was no comparison of whether cancer was present or not
Ainsworth 2010	There was no comparison of whether cancer was present or not
Aithal 2001	There was no comparison of whether cancer was present or not
Aithal 2002	There was no comparison of whether cancer was present or not
Akahoshi 1998	This study was not included as no pancreatic mass was present in the patient(s) tested
Akwei 2011	There was no comparison of whether cancer was present or not
Al-Haddad 2007	There was no comparison of whether cancer was present or not
Al-Haddad 2010a	This study was not included as no pancreatic mass was present in the patient(s) tested
Al-Haddad 2010b	There was no comparison of whether cancer was present or not

(Continued)

Al-Haddad 2014	There was no comparison of whether cancer was present or not
Al-Jebreen 2004	There was no comparison of whether cancer was present or not
Al-Najami 2015	This study was not included as no pancreatic mass was present in the patient(s) tested
Alizadeh 2014	There was no comparison of whether cancer was present or not
Aljebreen 2007	Inadequate reference standard (nature of follow-up not stated)
Alsohaibani 2008	This study was not included as no pancreatic mass was present in the patient(s) tested
Alsohaibani 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Alston 2014	There was no comparison of whether cancer was present or not
Amin 2006	This study was not included as no pancreatic mass was present in the patient(s) tested
Andersen 1994	This study was not included as no pancreatic mass was present in the patient(s) tested
Antonini 2015	There was no comparison of whether cancer was present or not
Arabul 2012	There was no comparison of whether cancer was present or not
Ardengh 2007a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities were used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ardengh 2007b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ardengh 2008a	There was no comparison of whether cancer was present or not
Ardengh 2008b	There was no comparison of whether cancer was present or not
Ardengh 2013	Inadequate reference standards
Argimak 2009	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography

(Continued)

Arikawa 2007	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Arlt 2013	The study was not classed as primary research (i.e. not a review or editorial or comment)
Asagi 2013	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Aslanian 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Asnacios 2003	There was no comparison of whether cancer was present or not
Atef 2013	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Attasaranya 2007	There was no comparison of whether cancer was present or not
Awadallah 2008	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Azizi 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Baba 2004	Although this study provides diagnostic accuracy data for pancreatic lesions, it presents information on branch type and non-branch type first, then presents the diagnostic test accuracy only for branch type and not for the overall cohort. This is therefore not a representative population
Baek 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Baghbanian 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Baiocchi 2008	Overlap with Baiocchi 2012
Baiocchi 2010	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Baiocchi 2012	Inadequate reference standard (criteria for diagnosing malignancy during clinical follow-up not stated)

(Continued)

Bali 2011	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Bang 2012a	There was no comparison of whether cancer was present or not
Bang 2012b	There was no comparison of whether cancer was present or not
Bang 2013a	There was no comparison of whether cancer was present or not
Bang 2013b	The study was not classed as primary research (i.e. not a review or editorial or comment)
Bang 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Barber 2011	There was no comparison of whether cancer was present or not
Bares 1994	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Barkin 1977	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Baron 1997	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Barral 2013a	There was no comparison of whether cancer was present or not
Barral 2013b	There was no comparison of whether cancer was present or not

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Barresi 2014	There was no comparison of whether cancer was present or not
Barron 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Bartsch 1998	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Basir 2003	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Bassi 2003	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Beal 2015a	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Beal 2015b	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Becker 2001	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Beliao 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Bentz 1998	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Bergeron 2015	There was no comparison of whether cancer was present or not

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Bernstein 2013	There was no comparison of whether cancer was present or not
Berzosa 2015	There was no comparison of whether cancer was present or not
Bhutani 1995	There was no comparison of whether cancer was present or not
Bhutani 1997	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Bick 2015	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Bighi 1989	This study was not included as no pancreatic mass was present in the patient(s) tested
Binmoeller 1998a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Binmoeller 1998b	This study was not included as no pancreatic mass was present in the patient(s) tested
Bluen 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Bournet 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Bournet 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Bournet 2012	There was no comparison of whether cancer was present or not
Bournet 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Boutros 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Brand 2002	This study was not included as no pancreatic mass was present in the patient(s) tested
Brand 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Brenin 1995	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Brimiene 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Brugge 2000	The study was not classed as primary research (i.e. not a review or editorial or comment)
Brugge 2004a	The study was not classed as primary research (i.e. not a review or editorial or comment)
Brugge 2004b	There was no comparison of whether cancer was present or not
Bruno 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Buchholz 2005	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography

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Buchs 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Butt 2015a	There was no comparison of whether cancer was present or not
Butt 2015b	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Caglar 2013	There was no comparison of whether cancer was present or not
Cahn 1996	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Caldelari 2011	There was no comparison of whether cancer was present or not
Camellini 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Cantley 2014	There was no comparison of whether cancer was present or not
Carbognin 2006	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Carlinfante 2014	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Carroll 1997	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Casneuf 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Catanzaro 2003	There was no comparison of whether cancer was present or not
Catanzaro 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Cermak 2012	There was no comparison of whether cancer was present or not
Chai 2013	There was no comparison of whether cancer was present or not
Chang 1994	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Chang 1997	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Chang 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Chaudhari 2007	There was no comparison of whether cancer was present or not

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Chaudhari 2008	There was no comparison of whether cancer was present or not
Chaya 2006	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Chebib 2014	There was no comparison of whether cancer was present or not
Chen 2001	There was no comparison of whether cancer was present or not
Chen 2003	There was no comparison of whether cancer was present or not
Chen 2007	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Chen 2014	There was no comparison of whether cancer was present or not
Cheng 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Cheng 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Chiu 2005	This study was not included as no pancreatic mass was present in the patient(s) tested
Chiu 2006	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Cho 2005	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Cho 2013	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Choi 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Choi 2013	There was no comparison of whether cancer was present or not
Choi 2016	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Chung 2009	Inappropriate index test

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Cizginer 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Clave 1999	This study was not included as no pancreatic mass was present in the patient(s) tested
Cocieru 2011	There was no comparison of whether cancer was present or not
Collins 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Collins 2013	There was no comparison of whether cancer was present or not
Collins 2015	There was no comparison of whether cancer was present or not
Cone 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Corominas-Cishek 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Cosgrove 2015	The study was not classed as primary research (i.e. not a review or editorial or comment)
Crippa 2010	The study was not classed as primary research (i.e. not a review or editorial or comment)
Cuillerier 1996	There was no comparison of whether cancer was present or not
D'Onofrio 2007	There was no comparison of whether cancer was present or not

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D'Onofrio 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Dadabhai 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Dadds 2012	There was no comparison of whether cancer was present or not
Dani 2000	There was no comparison of whether cancer was present or not
Dawwas 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Dawwas 2013	The study was not classed as primary research (i.e. not a review or editorial or comment)
De Jong 2010	Should be included under de Jong 2012
de Jong 2011	There was no comparison of whether cancer was present or not
De Tejada 2008	There was no comparison of whether cancer was present or not
Decalan 1995	There was no comparison of whether cancer was present or not
Del Vecchio 2016	Inadequate reference standards
Delbeke 1999	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
DelMaschio 1991	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if

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	negative, patients must have been followed for at least 6 months
Deng 2008	This study was not included as no pancreatic mass was present in the patient(s) tested
Deshpande 2008	There was no comparison of whether cancer was present or not
DeWitt 2004	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
DeWitt 2005	The study was not classed as primary research (i.e. not a review or editorial or comment)
DeWitt 2008	This study was not included as no pancreatic mass was present in the patient(s) tested
Di Cataldo 2014	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Diederichs 2000	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Diehl 1999	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Dietrich 2008	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Dim 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
DiMagno 1977	This study was not included as no pancreatic mass was present in the patient(s) tested
Dinkel 1990	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Do 2014	There was no comparison of whether cancer was present or not
Draganov 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Eguia 2013	There was no comparison of whether cancer was present or not
Elmas 1996	Inadequate reference standards

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Eloubeidi 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Eloubeidi 2003a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Eloubeidi 2003b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Eloubeidi 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Eloubeidi 2006a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Eloubeidi 2006b	This study was not included as no pancreatic mass was present in the patient(s) tested
Eloubeidi 2006c	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage

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Eloubeidi 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Eloubeidi 2008a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Eloubeidi 2008b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Eloubeidi 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Ergul 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Erickson 1997	This study was not included as no pancreatic mass was present in the patient(s) tested
Erickson 2000	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Erickson 2001	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Ernst 1998	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Erturk 2006a	The study was not classed as primary research (i.e. not a review or editorial or comment)
Erturk 2006b	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Fabbri 2013	There was no comparison of whether cancer was present or not
Fabbri 2015a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Fabbri 2015b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Faigel 1997	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Fan 2013	There was no comparison of whether cancer was present or not
Fan 2015	There was no comparison of whether cancer was present or not
Fanning 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Faravelli 1990	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Felgueroso 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Fernandez-Esparrach 2007a	There was no comparison of whether cancer was present or not

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Fernandez-Esparrach 2007b	There was no comparison of whether cancer was present or not
Figueiredo 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Fischer 2002	This study was not included as no pancreatic mass was present in the patient(s) tested
Fischer 2009	There was no comparison of whether cancer was present or not
Fisher 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Fisher 2011	There was no comparison of whether cancer was present or not
Frampton 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Friess 1995	This study was not included as no pancreatic mass was present in the patient(s) tested
Fritscher-Ravens 1998	This study was not included as no pancreatic mass was present in the patient(s) tested
Fritscher-Ravens 1999	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Fritscher-Ravens 2000	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases

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	during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Fritscher-Ravens 2001a	This study was not included as no pancreatic mass was present in the patient(s) tested
Fritscher-Ravens 2001b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Fritscher-Ravens 2002	This study was not included as no pancreatic mass was present in the patient(s) tested
Frossard 2003	There was no comparison of whether cancer was present or not
Fugazzola 1991	There was no comparison of whether cancer was present or not
Furuhashi 2015	There was no comparison of whether cancer was present or not
Furuhata 2012	There was no comparison of whether cancer was present or not
Fusari 2010	There was no comparison of whether cancer was present or not
Fusaroli 2010	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Fusaroli 2014	The study was not classed as primary research (i.e. not a review or editorial or comment)
Gaa 1999	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Gambitta 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Ganc 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Ganc 2015	Inadequate reference standards
Gaspar 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Gill 2008	The study was not classed as primary research (i.e. not a review or editorial or comment)
Gimeno-Garcia 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Giorgetti 2010	Inadequate reference standard (nature of follow-up not stated)
Giovannini 1995	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Giovannini 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Glasbrenner 2000	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Goh 2006a	The study was not classed as primary research (i.e. not a review or editorial or comment)

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Goh 2008	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Gomez 2006	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Gomez 2008	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Gong 2004	This study was not included as no pancreatic mass was present in the patient(s) tested
Gordon 2014	Inadequate reference standards
Gowland 1981	This study was not included as no pancreatic mass was present in the patient(s) tested
Green 2002	The study was not classed as primary research (i.e. not a review or editorial or comment)
Grenacher 2004	This study was not included as no pancreatic mass was present in the patient(s) tested
Gress 1997	This study was not included as no pancreatic mass was present in the patient(s) tested
Gress 2001	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Grieser 2013	There was no comparison of whether cancer was present or not
Guo 2008	There was no comparison of whether cancer was present or not
Gupta 1995	This study was not included as no pancreatic mass was present in the patient(s) tested
Gupta 2008	There was no comparison of whether cancer was present or not
Haba 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Haba 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but

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	not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hammel 1995	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Hammel 1998	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Han 2016	Inadequate reference standards
Hanada 2009	There was no comparison of whether cancer was present or not
Hanninen 2002	This study was not included as no pancreatic mass was present in the patient(s) tested
Hanninen 2005	This study was not included as no pancreatic mass was present in the patient(s) tested
Harewood 2001a	The study was not classed as primary research (i.e. not a review or editorial or comment)
Harewood 2001b	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Harewood 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hasan 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Hasenberg 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hasyagar 2004	There was no comparison of whether cancer was present or not
Hayashi 2013	There was no comparison of whether cancer was present or not
Hebert-Magee 2015	The study was not classed as primary research (i.e. not a review or editorial or comment)
Heinrich 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but

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	not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Henkes 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Heo 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Herman-Sucharska 1999	This study was not included as no pancreatic mass was present in the patient(s) tested
Hernandez 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Herrmann 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Higashi 2002a	The study was not classed as primary research (i.e. not a review or editorial or comment)
Higashi 2002b	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Higashi 2003	The study was not classed as primary research (i.e. not a review or editorial or comment)
Hijioka 2014	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Hikichi 2009	Inadequate reference standard (details of clinical follow-up not stated)
Hilendarov 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hilendarov 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other

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	imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hilendarov 2012	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Hilendarov 2013	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Ho 1996	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ho 2004	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hocke 2006	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hocke 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hollerbach 2004	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Holt 2008	There was no comparison of whether cancer was present or not
Holt 2014	The study was not classed as primary research (i.e. not a review or editorial or comment)
Hong 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Honselmann 2016	Inadequate reference standards
Horatagis 2003	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Horwhat 2004	This study was not included as no pancreatic mass was present in the patient(s) tested
Horwhat 2006	This study was not included as no pancreatic mass was present in the patient(s) tested
Hou 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Hu 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Huang 2010	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Huang 2011	This study was not included as no pancreatic mass was present in the patient(s) tested

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Hunt 2009	There was no comparison of whether cancer was present or not
Hussain 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Hwang 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Hwang 2011	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Ibrahim 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ichikawa 2001	There was no comparison of whether cancer was present or not
Iftimia 2012	The study was not classed as primary research (i.e. not a review or editorial or comment)
Iglesias 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Iglesias-Garcia 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Iglesias-Garcia 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Iglesias-Garcia 2009a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases

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	during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Iglesias-Garcia 2009b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Iglesias-Garcia 2010	There was no comparison of whether cancer was present or not
Iglesias-Garcia 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Iglesias-Garcia 2013a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Iglesias-Garcia 2013b	The study was not classed as primary research (i.e. not a review or editorial or comment)
Iguchi 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ikeura 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Ikeura 2015a	This study was not included as no pancreatic mass was present in the patient(s) tested
Ikeura 2015b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but

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	not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Imazu 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Imdahl 1999	This study was not included as no pancreatic mass was present in the patient(s) tested
Inokuma 1995	This study was not included as no pancreatic mass was present in the patient(s) tested
Iordache 2016	Inadequate reference standards
Ippolito 2015	There was no comparison of whether cancer was present or not
Irie 2002	There was no comparison of whether cancer was present or not
Ironsides 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ishigami 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Ishii 2012	There was no comparison of whether cancer was present or not
Ishikawa 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Itoh 2005	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Itoi 2005a	This study was not included as no pancreatic mass was present in the patient(s) tested
Itoi 2005b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Itoi 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases

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	during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Irokawa 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Irokawa 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Iwashita 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Iwashita 2015	This study was not included as no pancreatic mass was present in the patient(s) tested
Izuishi 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Jabbar 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Jadvar 2001	This study was not included as no pancreatic mass was present in the patient(s) tested
Jahng 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Jahromi 2014	There was no comparison of whether cancer was present or not
Jang 2012	There was no comparison of whether cancer was present or not
Jang 2015	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Jani 2006	The study was not classed as primary research (i.e. not a review or editorial or comment)

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Jani 2008	There was no comparison of whether cancer was present or not
Janssen 2007	This study was not included as no pancreatic mass was present in the patient(s) tested
Jayasekeran 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Jeong 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Jhala 2007	This study was not included as no pancreatic mass was present in the patient(s) tested
Jin 2013b	This study was not included as no pancreatic mass was present in the patient(s) tested
Jing 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Johnson 1999	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kadayifci 2014	The study was not classed as primary research (i.e. not a review or editorial or comment)
Kadayifci 2016	Inadequate reference standards
Kaffes 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Kaimakliotis 2015	Inappropriate index test
Kalb 2013	There was no comparison of whether cancer was present or not
Kalra 2003	The study was not classed as primary research (i.e. not a review or editorial or comment)
Kamata 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kamata 2016b	Inadequate reference standards
Kamin 1980	This study was not included as no pancreatic mass was present in the patient(s) tested

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Kamisawa 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kanazawa 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Kang 2013	Reference to be included under Kim 2015 .
Kang 2014	There was no comparison of whether cancer was present or not
Kang 2016	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Katanuma 2013	There was no comparison of whether cancer was present or not
Katz 2007	The study was not classed as primary research (i.e. not a review or editorial or comment)
Kauhanen 2009a	This study was not included as no pancreatic mass was present in the patient(s) tested
Kauhanen 2009b	This study was not included as no pancreatic mass was present in the patient(s) tested
Kauhanen 2015	Inadequate reference standards
Kawada 2012	There was no comparison of whether cancer was present or not
Kawada 2014	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Kawada 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kawada 2016	Inappropriate target condition
Kawamoto 2006	There was no comparison of whether cancer was present or not
Keil 2008	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive

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	+ negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Keswani 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Khalid 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Khalid 2006	Same as Kim 2015
Khan 2010	There was no comparison of whether cancer was present or not
Khashab 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Khashab 2013	There was no comparison of whether cancer was present or not
Khodadadian 2001	This study was not included as no pancreatic mass was present in the patient(s) tested
Khurana 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Khurana 2014	There was no comparison of whether cancer was present or not
Kida 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Kim 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kim 2009	There was no comparison of whether cancer was present or not
Kim 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all

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	patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kim 2012a	There was no comparison of whether cancer was present or not
Kim 2012b	There was no comparison of whether cancer was present or not
Kim 2012c	This study was not included as no pancreatic mass was present in the patient(s) tested
Kim 2013a	There was no comparison of whether cancer was present or not
Kim 2013b	This study was not included as no pancreatic mass was present in the patient(s) tested
Kim 2013c	This study was not included as no pancreatic mass was present in the patient(s) tested
Kim 2013d	There was no comparison of whether cancer was present or not
Kim 2014a	This study was not included as no pancreatic mass was present in the patient(s) tested
Kim 2014b	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Kim 2014c	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Kim 2014d	There was no comparison of whether cancer was present or not
Kim 2015a	Inappropriate index test
Kin 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kitano 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Klapman 2003	This study was not included as no pancreatic mass was present in the patient(s) tested
Klapman 2004	This study was not included as no pancreatic mass was present in the patient(s) tested

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Klapman 2005	This study was not included as no pancreatic mass was present in the patient(s) tested
Kliment 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kliment 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kokhanenko 2001	This study was not included as no pancreatic mass was present in the patient(s) tested
Kongkam 2015	Inadequate reference standards
Kopelman 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Koranda 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Korenblit 2016	Inadequate reference standards
Koyama 2001	This study was not included as no pancreatic mass was present in the patient(s) tested
Kriger 2011	This study was not included as the index test was not performed to distinguish between cancerous, precancerous, and benign lesions
Krishna 2009a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Krishna 2009b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Krishna 2009c	This study was not included as no pancreatic mass was present in the patient(s) tested
Krishna 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Krishna 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Krishna 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Krishnan 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Kubiliun 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kubo 2009	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage

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Kudo 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kula 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kumon 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Kumon 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Kumon 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Kung 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Kursawa 1991	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kwong 2015	Inadequate reference standards
Kyokane 1996	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Kysucan 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Lackner 1980	The study was not classed as primary research (i.e. not a review or editorial or comment)

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Larghi 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Larino-Noia 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Le Baleur 2009	There was no comparison of whether cancer was present or not
Le Baleur 2011b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
LeBlanc 2004	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
LeBlanc 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2005a	There was no comparison of whether cancer was present or not
Lee 2005b	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Lee 2006	There was no comparison of whether cancer was present or not

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Lee 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2008a	There was no comparison of whether cancer was present or not
Lee 2008b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Lee 2010a	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Lee 2010b	This study was not included as no pancreatic mass was present in the patient(s) tested
Lee 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2013a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2013b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but

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	not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2013c	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2013d	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Lee 2014b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2014c	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lee 2014d	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Leeds 2013	There was no comparison of whether cancer was present or not
Legmann 1998	This study was not included as no pancreatic mass was present in the patient(s) tested
Lehmann 1998	This study was not included as no pancreatic mass was present in the patient(s) tested
Lemke 2004	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if

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	negative, patients must have been followed for at least 6 months
Levy 1995	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Levy 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Levy 2007	This study was not included as no pancreatic mass was present in the patient(s) tested
Levy 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Lightdale 1994	The study was not classed as primary research (i.e. not a review or editorial or comment)
Lim 2005	There was no comparison of whether cancer was present or not
Lim 2013	There was no comparison of whether cancer was present or not
Lin 2003	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lin 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lin 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Linder 2006	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other

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	imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Liu 2010a	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Liu 2010b	This study was not included as no pancreatic mass was present in the patient(s) tested
Liu 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lopez 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lozano 2011	There was no comparison of whether cancer was present or not
Lu 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lu 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Lytras 2005	This study was not included as no pancreatic mass was present in the patient(s) tested

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Mackie 1979	This study was not included as no pancreatic mass was present in the patient(s) tested
Madan 2012	There was no comparison of whether cancer was present or not
Madura 1997	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Maguchi 2006	The study was not classed as primary research (i.e. not a review or editorial or comment)
Maire 2003	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Makaiova 2005	This study was not included as no pancreatic mass was present in the patient(s) tested
Malak 2016	Inadequate reference standards
Malleo 2012	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Mallery 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Maluf 2005	There was no comparison of whether cancer was present or not
Maluf-Filho 2007	There was no comparison of whether cancer was present or not
Mamoon 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Manfredi 2009	There was no comparison of whether cancer was present or not
Mansoor 2012	There was no comparison of whether cancer was present or not
Mansour 2006	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Mao 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Marchevsky 2003	This study was not included as no pancreatic mass was present in the patient(s) tested
Marotta 1991	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography

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Martin 1998	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Martinez 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Marzioni 2015	Inadequate reference standards; details of clinical follow-up not available
Matsubara 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Matsubayashi 2015	The study was not classed as primary research (i.e. not a review or editorial or comment)
Matsuda 2012	There was no comparison of whether cancer was present or not
Matsumoto 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Matsumoto 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Matsumoto 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Maurea 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Mavrogenis 2015	This study was not included as no pancreatic mass was present in the patient(s) tested
Mayerle 2016	Inadequate reference standards
McClellan 2003	This study was not included as no pancreatic mass was present in the patient(s) tested
McDowell 1997	There was no comparison of whether cancer was present or not
Mehan 2009	There was no comparison of whether cancer was present or not
Mehmood 2015	This study was not included as no pancreatic mass was present in the patient(s) tested
Meijer 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Meijer 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Mera 1999	There was no comparison of whether cancer was present or not
Mertz 2000	This study was not included as no pancreatic mass was present in the patient(s) tested
Mesihovic 2005	This study was not included as no pancreatic mass was present in the patient(s) tested

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Micames 2007	The study was not classed as primary research (i.e. not a review or editorial or comment)
Michaels 2006	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Midwinter 1999	This study was not included as no pancreatic mass was present in the patient(s) tested
Mishra 2006	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Mitsuhashi 2006	There was no comparison of whether cancer was present or not
Miyabe 2015	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Moehler 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Moparty 2007	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Moris 2016	Inappropriate target population
Morozova 2014	There was no comparison of whether cancer was present or not
Morozova 2015	Inappropriate target population
Murayama 2011	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Nadig 2012	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Nagamachi 2013	Inadequate reference standards
Nagula 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Nakai 2015	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography

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Nakamoto 2000	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Nakamoto 2003	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Napoleon 2010a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Napoleon 2010b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Napoleon 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Nattermann 1995	There was no comparison of whether cancer was present or not
Nayar 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if

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	negative, patients must have been followed for at least 6 months
Nayar 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Nguyen 1998	This study was not included as no pancreatic mass was present in the patient(s) tested
Nguyen 2007	This study was not included as no pancreatic mass was present in the patient(s) tested
Nguyen 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Nicaud 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Nieto 2007	Details of clinical follow-up not available
Nijhawan 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Nikiforova 2013	There was no comparison of whether cancer was present or not
Nishihara 1996	Inappropriate target condition
Nitzsche 2002	This study was not included as no pancreatic mass was present in the patient(s) tested
Nobrega 1994	This study was not included as no pancreatic mass was present in the patient(s) tested
Noda 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Noma 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Noone 2004	This study was not included as no pancreatic mass was present in the patient(s) tested
Norton 2001	This study was not included as no pancreatic mass was present in the patient(s) tested
Nougaret 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases

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	during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
O'Toole 2004	There was no comparison of whether cancer was present or not
Ogawa 2008b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ogura 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Oguz 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ohno 2009	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Ohta 2012	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Ohtsuka 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Okada 1979	This study was not included as no pancreatic mass was present in the patient(s) tested
Okada 1981	This study was not included as no pancreatic mass was present in the patient(s) tested
Okasha 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but

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	not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Okasha 2015	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Olson 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Ooi 1998	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Ootaki 2012	There was no comparison of whether cancer was present or not
Opacic 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Oppong 2015	Inadequate reference standards
Osman 2016	Inadequate reference standards
Othman 2011	The study was not classed as primary research (i.e. not a review or editorial or comment)
Ozkan 2016	Inadequate reference standards
Paik 2015	This study was not included as no pancreatic mass was present in the patient(s) tested
Palacios-Gerona 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Palaniappan 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Palazzo 1993	This study was not included as no pancreatic mass was present in the patient(s) tested
Palazzo 2011	The study was not classed as primary research (i.e. not a review or editorial or comment)

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Pan 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Panaro 1978	This study was not included as no pancreatic mass was present in the patient(s) tested
Papanikolaou 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Papos 1999	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Papos 2002a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Papos 2002b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Park 2014a	There was no comparison of whether cancer was present or not
Park 2014b	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Park 2016a	Inadequate reference standards

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Park 2016b	Inadequate reference standards
Pasanen 1992	This study was not included as no pancreatic mass was present in the patient(s) tested
Pasanen 1993	This study was not included as no pancreatic mass was present in the patient(s) tested
Patoureaux 2013	There was no comparison of whether cancer was present or not
Paye 2000	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Pedrazzoli 2005	The study was not classed as primary research (i.e. not a review or editorial or comment)
Pellise 2003	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Perri 2012	The study was not classed as primary research (i.e. not a review or editorial or comment)
Perrone 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Petrone 2012	There was no comparison of whether cancer was present or not
Pezzilli 2013	There was no comparison of whether cancer was present or not
Pitman 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Pitman 2013a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if

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	negative, patients must have been followed for at least 6 months
Pitman 2013b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Pitman 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Pomerri 1991	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Pongpornsup 2011	There was no comparison of whether cancer was present or not
Qian 2003	There was no comparison of whether cancer was present or not
Qian 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Qin 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Quentin 2005	There was no comparison of whether cancer was present or not
Qureshi 2013	There was no comparison of whether cancer was present or not
Raddaoui 2011	This study was not included as no pancreatic mass was present in the patient(s) tested

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Rajput 1998	This study was not included as no pancreatic mass was present in the patient(s) tested
Raman 2013	There was no comparison of whether cancer was present or not
Ramesh 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Ramesh 2015	There was no comparison of whether cancer was present or not
Ramesh 2016	Inadequate reference standards
Ramirez-Luna 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Rana 2011	There was no comparison of whether cancer was present or not
Ranney 2012	There was no comparison of whether cancer was present or not
Rao 2011	There was no comparison of whether cancer was present or not
Rasmussen 2001	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Rasmussen 2004	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Raut 2002	This study was not included as no pancreatic mass was present in the patient(s) tested

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Raut 2003	This study was not included as no pancreatic mass was present in the patient(s) tested
Redelman 2014	This study was not included as no pancreatic mass was present in the patient(s) tested
Reicher 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Repak 2009	There was no comparison of whether cancer was present or not
Ribeiro 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Richter 1996	This study was not included as no pancreatic mass was present in the patient(s) tested
Richter 2001	This study was not included as no pancreatic mass was present in the patient(s) tested
Riditid 2015	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Rocca 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Roch 2014	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Rodriguez 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Rodriguez 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Rodriguez-D'Jesus 2013	There was no comparison of whether cancer was present or not
Rogart 2011	There was no comparison of whether cancer was present or not
Romagnuolo 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Rong 2012	There was no comparison of whether cancer was present or not
Rosch 1990a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Rosch 1990b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Rosch 1991a	There was no comparison of whether cancer was present or not
Rosch 1991b	This study was not included as no pancreatic mass was present in the patient(s) tested
Rosch 2000	This study was not included as no pancreatic mass was present in the patient(s) tested
Rose 1999	This study was not included as no pancreatic mass was present in the patient(s) tested
Rosique 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Rudolph 2001	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if

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	negative, patients must have been followed for at least 6 months
Ruf 2006	This study was not included as no pancreatic mass was present in the patient(s) tested
Ryozawa 2005	This study was not included as no pancreatic mass was present in the patient(s) tested
Saftoiu 2006	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Saftoiu 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Saftoiu 2010a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Saftoiu 2010b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Saftoiu 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Saftoiu 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all

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	patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Saftoiu 2013	The study was not classed as primary research (i.e. not a review or editorial or comment)
Saftoiu 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sahai 2012	The study was not classed as primary research (i.e. not a review or editorial or comment)
Sahani 2006b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sahani 2011	There was no comparison of whether cancer was present or not
Sai 2003	There was no comparison of whether cancer was present or not
Sakamoto 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sakamoto 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Salvia 2012	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Sandrasegaran 2011	There was no comparison of whether cancer was present or not

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Santhosh 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sarbia 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sariya 2003	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Savides 2006	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Savides 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Savoy 2007	This study was not included as no pancreatic mass was present in the patient(s) tested
Saxena 2014	There was no comparison of whether cancer was present or not
Schick 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases

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	during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Schima 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Schmidt 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Schneider 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Schrader 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Schraibman 2011	There was no comparison of whether cancer was present or not
Scott 2000	There was no comparison of whether cancer was present or not
Seicean 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Seicean 2016	Inadequate reference standards
Sendino 2010	There was no comparison of whether cancer was present or not
Sendler 2000	Inadequate reference standards

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Serikawa 2006	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Shah 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Shen 2013	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Shimizu 2010	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Shimizu 2013a	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Shimizu 2013b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Shimizu 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Shimizu 2015	Inappropriate index test
Shin 2002	This study was not included as no pancreatic mass was present in the patient(s) tested
Shin 2010	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Siddiqui 2009	There was no comparison of whether cancer was present or not
Siddiqui 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Siddiqui 2011	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Siddiqui 2012	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Siddiqui 2013	There was no comparison of whether cancer was present or not
Siech 1998	There was no comparison of whether cancer was present or not
Simon 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sina 2014	The study was not classed as primary research (i.e. not a review or editorial or comment)
Singer 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Singhi 2014	There was no comparison of whether cancer was present or not
Singhi 2016	Inadequate reference standards
Singu 2008	There was no comparison of whether cancer was present or not
Soares 2015a	Inadequate reference standards
Soares 2015b	Inadequate reference standards
Sole 2005	There was no comparison of whether cancer was present or not
Song 2007	There was no comparison of whether cancer was present or not
Song 2010	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Sperti 1994	There was no comparison of whether cancer was present or not
Sperti 2001	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sperti 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sperti 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sreenarasimhaiah 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sreenarasimhaiah 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sreenarasimhaiah 2013	The study was not classed as primary research (i.e. not a review or editorial or comment)
Sreenarasimhaiah 2015	There was no comparison of whether cancer was present or not
Staib 1997	This study was not included as no pancreatic mass was present in the patient(s) tested

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Starkov 2008	This study was not included as no pancreatic mass was present in the patient(s) tested
Stelow 2003	There was no comparison of whether cancer was present or not
Storch 2006	This study was not included as no pancreatic mass was present in the patient(s) tested
Storch 2007	This study was not included as no pancreatic mass was present in the patient(s) tested
Story 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Strand 2014	There was no comparison of whether cancer was present or not
Strauss 2016	Inadequate reference standards
Strobel 2013	The study was not classed as primary research (i.e. not a review or editorial or comment)
Strohm 1984	This study was not included as no pancreatic mass was present in the patient(s) tested
Su 2007	There was no comparison of whether cancer was present or not
Sugimoto 2015	Inadequate reference standards
Sugiyama 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Suits 1999	This study was not included as no pancreatic mass was present in the patient(s) tested
Sun 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sur 2015	Inadequate reference standards
Suzuki 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but

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	not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Suzuki 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Sverko 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Swobodnik 1983	This study was not included as no pancreatic mass was present in the patient(s) tested
Szafranska 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Tada 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Tadic 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Takahashi 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

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Talar-Wojnarowska 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Tallini 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Taouli 2002	The study was not classed as primary research (i.e. not a review or editorial or comment)
Tarantino 2014a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Tarantino 2014b	There was no comparison of whether cancer was present or not
Tarantino 2014c	There was no comparison of whether cancer was present or not
Tatsumi 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Tatsuta 1985	This study was not included as no pancreatic mass was present in the patient(s) tested
Taylor 2007	The study was not classed as primary research (i.e. not a review or editorial or comment)
Tervahartiala 1997	This study was not included as no pancreatic mass was present in the patient(s) tested
Tessler 2006	This study was not included as no pancreatic mass was present in the patient(s) tested
Theruvath 2010	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Thomas 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if

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	negative, patients must have been followed for at least 6 months
Thomas 2010a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Thomas 2010b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Tlostanova 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Togliani 2015	This study was not included as no pancreatic mass was present in the patient(s) tested
Touchefeu 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Trifunovic 2004	This study was not included as no pancreatic mass was present in the patient(s) tested
Tummala 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Turowska 2007	This study was not included as no pancreatic mass was present in the patient(s) tested

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Uehara 2011	This study was not included as no pancreatic mass was present in the patient(s) tested
Uehara 2015	Inadequate reference standards
Uekitani 2016	Inadequate reference standards
Valinas 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
van Gulik 1999	This study was not included as no pancreatic mass was present in the patient(s) tested
van Kouwen 2004	The study was not classed as primary research (i.e. not a review or editorial or comment)
van Kouwen 2005	This study was not included as no pancreatic mass was present in the patient(s) tested
Vanbiervliet 2014	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Varadarajulu 2004a	There was no comparison of whether cancer was present or not
Varadarajulu 2004b	This study was not included as no pancreatic mass was present in the patient(s) tested
Varadarajulu 2014a	There was no comparison of whether cancer was present or not
Varadarajulu 2014b	There was no comparison of whether cancer was present or not
Vasile 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Verzola 2000	This study was not included as no pancreatic mass was present in the patient(s) tested
Vilgrain 1989	There was no comparison of whether cancer was present or not

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Vilgrain 1995	There was no comparison of whether cancer was present or not
Vilmann 1995	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Virtue 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Visser 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Visser 2008	There was no comparison of whether cancer was present or not
Voss 2000	There was no comparison of whether cancer was present or not
Votrubova 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Vullierme 2007	There was no comparison of whether cancer was present or not
Wachs 2010	There was no comparison of whether cancer was present or not
Wakabayashi 2008	This study was not included as no pancreatic mass was present in the patient(s) tested
Wakatsuki 2004	There was no comparison of whether cancer was present or not

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Wakatsuki 2005	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Walter 2015	Inadequate reference standards
Wang 2005	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Wang 2007a	There was no comparison of whether cancer was present or not
Wang 2007b	This study was not included as no pancreatic mass was present in the patient(s) tested
Wang 2009	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Wang 2011a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Wang 2011b	This study was not included as no pancreatic mass was present in the patient(s) tested
Wang 2012	There was no comparison of whether cancer was present or not
Wani 2011	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Wani 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Warda 2015	Inadequate reference standards

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Watanabe 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Waters 2008	There was no comparison of whether cancer was present or not
Waxman 2001	The study was not classed as primary research (i.e. not a review or editorial or comment)
Wegener 1995	There was no comparison of whether cancer was present or not
Wiersema 1994	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Wiersema 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Wiesenauer 2003	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Will 2007	This study was not included as no pancreatic mass was present in the patient(s) tested
Will 2008	This study was not included as no pancreatic mass was present in the patient(s) tested
Will 2010	This study was not included as no pancreatic mass was present in the patient(s) tested
Williams 1999	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Wilson 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Winner 2015	There was no comparison of whether cancer was present or not
Wittmann 2006	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases

(Continued)

	during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Woolf 2013	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Wright 2014	There was no comparison of whether cancer was present or not
Wu 2007a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Wu 2007b	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Wu 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Wu 2014	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Wyse 2009	This study was not included as no pancreatic mass was present in the patient(s) tested
Xiao 2009	There was no comparison of whether cancer was present or not
Xu 2012	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Xu 2013	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Xu 2014	There was no comparison of whether cancer was present or not
Yamada 2010a	There was no comparison of whether cancer was present or not

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Yamada 2010b	This study was not included as no pancreatic mass was present in the patient(s) tested
Yamaguchi 1990	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Yamao 2003	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Yamashita 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Yan 2014	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Yang 2014	There was no comparison of whether cancer was present or not
Yang 2015a	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Yang 2015b	Inadequate reference standards
Yantiss 2008	There was no comparison of whether cancer was present or not
Yao 2012	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Yeh 1999	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography

(Continued)

Yim 2005	There was no comparison of whether cancer was present or not
Yin 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Yin 2015	Inadequate reference standards
Ylagan 2002	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Yoshioka 2015	There was no comparison of whether cancer was present or not
Yuan 2007	There was no comparison of whether cancer was present or not
Yun 2007	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Yusuf 2009	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Zamboni 2012	This study was not included as no pancreatic mass was present in the patient(s) tested
Zaruba 2013	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography
Zdanyte 2004	There was no comparison of whether cancer was present or not
Zeiderman 1991	This study did not use an index test such as CT, MRI, PET, EUS-FNA, and EUS elastography

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Zhang 2010a	There was no comparison of whether cancer was present or not
Zhang 2010b	This study was not included as no pancreatic mass was present in the patient(s) tested
Zhang 2010c	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Zhang 2010d	There was no comparison of whether cancer was present or not
Zhang 2011	Diagnostic accuracy data were not available for this study. We classed any of the following as acceptable forms of data: (2 x 2 table OR sensitivity + specificity + number with and without disease OR positive + negative predictive values + number of positive and negative tests) OR total test positive + total test negative + total disease positive + total disease present + total disease absent + accuracy percentage
Zhang 2012	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Zhang 2015	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Zhong 2012	There was no comparison of whether cancer was present or not
Zhu 2008	There was no comparison of whether cancer was present or not
Zhu 2013	This study was not included as no pancreatic mass was present in the patient(s) tested
Ziak 2011	There was no comparison of whether cancer was present or not
Zimny 1997	This study was not included as no pancreatic mass was present in the patient(s) tested
Zimny 1998	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all

(Continued)

	patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Zimny 1999	The study was not classed as primary research (i.e. not a review or editorial or comment)
Zubarik 2004	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months
Zyrek-Betts 2008	This study included an inadequate reference standard. Our criteria for a reference standard included the following: all surgery, or with negative follow-up of at least 6 months; if EUS-FNA or other imaging modalities used for reference standard (either positive or negative), not accepted unless all patients (positive and negative) were followed up for at least 6 months. Clear evidence of metastases during follow-up in patients with positive diagnosis (an increase in size is not sufficient). Biopsy (but not EUS-FNA cytology) is acceptable for positive results (< 6 months) but not for negative results - if negative, patients must have been followed for at least 6 months

CT: computed tomography

EUS: endoscopic ultrasound

FNA: fine-needle aspiration

MRI: magnetic resonance imaging

PET: positron emission tomography

DATA

Presented below are all the data for all of the tests entered into the review.

Tests. Data tables by test

Test	No. of studies	No. of participants
1 Cancerous versus benign or precancerous - EUS-FNA (cytology)	1	45
2 Cancerous versus benign or precancerous - EUS-FNA (CEA > 500 ng/mL)	1	24
3 Cancerous versus benign or precancerous - PET	1	76
4 Cancerous versus benign - EUS	2	133
5 Cancerous versus benign - EUS-FNA	3	147
6 Cancerous versus benign - PET	3	99
7 Cancerous versus benign - PET (SUVmax > 3.5)	1	80
8 Cancerous versus benign - CT	2	123
9 Cancerous versus benign - MRI	1	29
10 Precancerous or cancerous versus benign - EUS	1	34
11 Precancerous or cancerous versus benign - EUS-FNA	3	52
12 Precancerous or cancerous versus benign - EUS-FNA (CEA > 50 ng/mL)	1	11
13 Precancerous or cancerous versus benign - PET (SUVmax > 2.4)	1	32
14 Precancerous or cancerous versus benign - CT	1	48
15 Precancerous or cancerous versus benign - MRI	1	27
16 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS	5	156
17 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS-FNA	3	158
18 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS-FNA (CEA > 200 ng/mL)	1	41

19 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT	6	326
20 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - MRI	1	32
21 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS	4	196
22 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA	3	310
23 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CEA > 200 ng/mL)	3	160
24 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CA 19-9 > 1000 U/mL)	1	41
25 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CEA > 692.8 ng/mL)	1	20
26 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - PET (SUVmax 2 to 2.5)	4	124
27 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - CT	3	139
28 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - MRI	3	189
29 Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) - EUS	1	51

30 Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) - CT	1	46
31 Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) - CT	3	106
32 Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) - MRI	2	71
33 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) or benign - EUS	1	70
34 Cystic lesion subgroup analysis - Cancerous versus benign - EUS-FNA	1	26
35 Cystic lesion subgroup analysis - Cancerous versus benign - PET	1	80
36 Cystic lesion subgroup analysis - Precancerous or cancerous versus benign - EUS-FNA	2	34

Test 1. Cancerous versus benign or precancerous - EUS-FNA (cytology).

Review: Imaging modalities for characterising focal pancreatic lesions

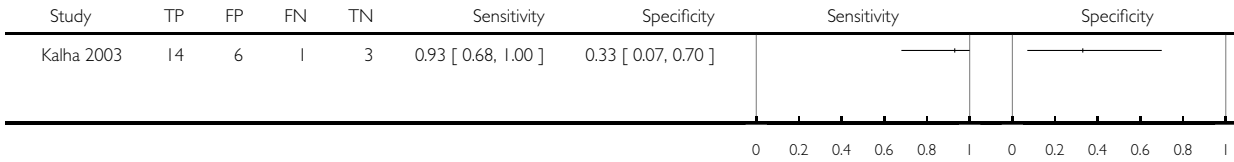
Test: 1 Cancerous versus benign or precancerous - EUS-FNA (cytology)

Study	TP	FP	FN	TN	Sensitivity	Specificity	Sensitivity	Specificity
McHenry 2002	19	0	5	21	0.79 [0.58, 0.93]	1.00 [0.84, 1.00]		

Test 2. Cancerous versus benign or precancerous - EUS-FNA (CEA > 500 ng/mL).

Review: Imaging modalities for characterising focal pancreatic lesions

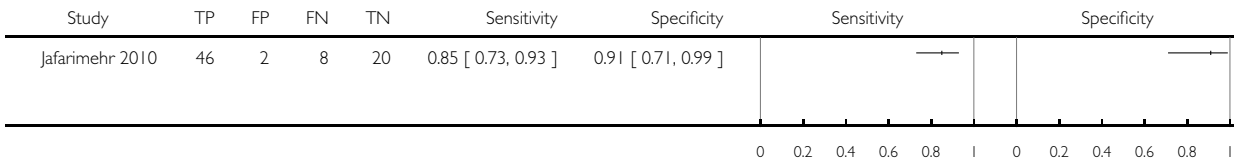
Test: 2 Cancerous versus benign or precancerous - EUS-FNA (CEA > 500 ng/mL)



Test 3. Cancerous versus benign or precancerous - PET.

Review: Imaging modalities for characterising focal pancreatic lesions

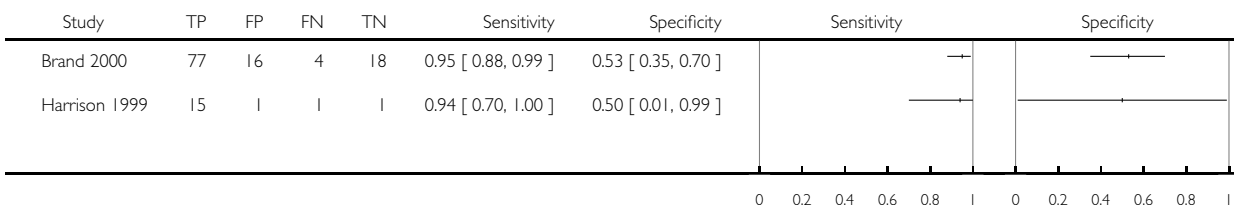
Test: 3 Cancerous versus benign or precancerous - PET



Test 4. Cancerous versus benign - EUS.

Review: Imaging modalities for characterising focal pancreatic lesions

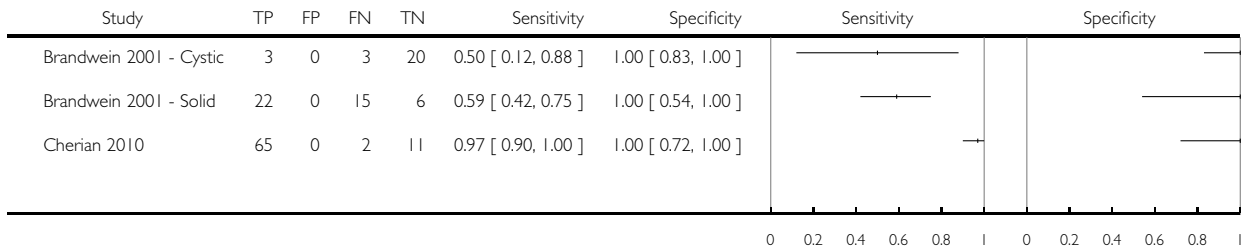
Test: 4 Cancerous versus benign - EUS



Test 5. Cancerous versus benign - EUS-FNA.

Review: Imaging modalities for characterising focal pancreatic lesions

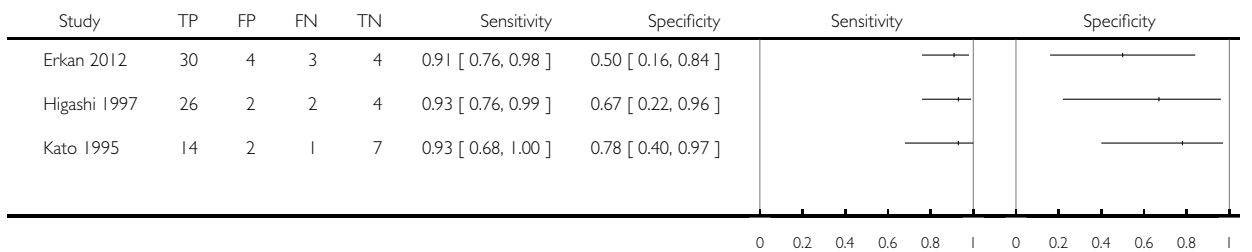
Test: 5 Cancerous versus benign - EUS-FNA



Test 6. Cancerous versus benign - PET.

Review: Imaging modalities for characterising focal pancreatic lesions

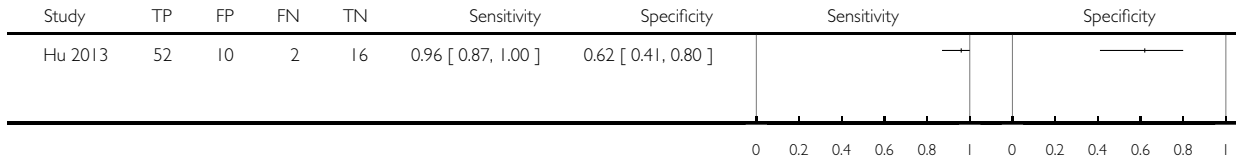
Test: 6 Cancerous versus benign - PET



Test 7. Cancerous versus benign - PET (SUVmax > 3.5).

Review: Imaging modalities for characterising focal pancreatic lesions

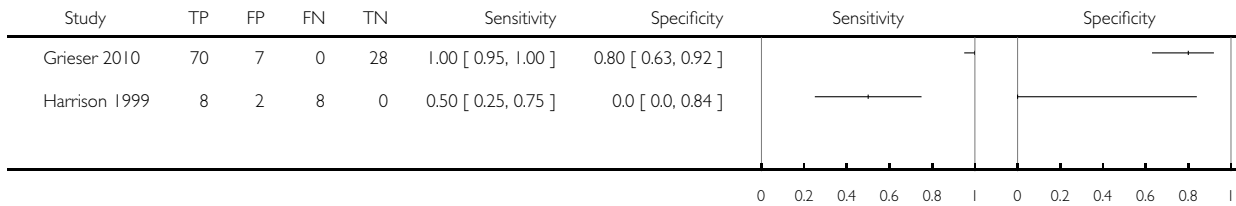
Test: 7 Cancerous versus benign - PET (SUVmax > 3.5)



Test 8. Cancerous versus benign - CT.

Review: Imaging modalities for characterising focal pancreatic lesions

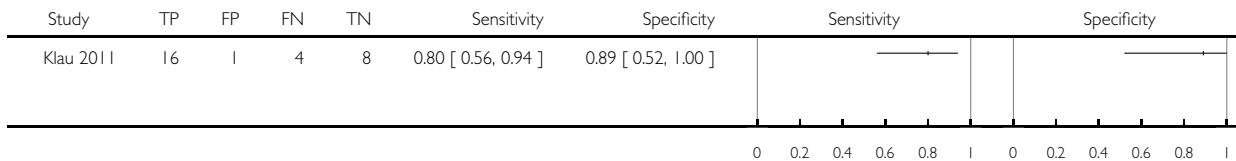
Test: 8 Cancerous versus benign - CT



Test 9. Cancerous versus benign - MRI.

Review: Imaging modalities for characterising focal pancreatic lesions

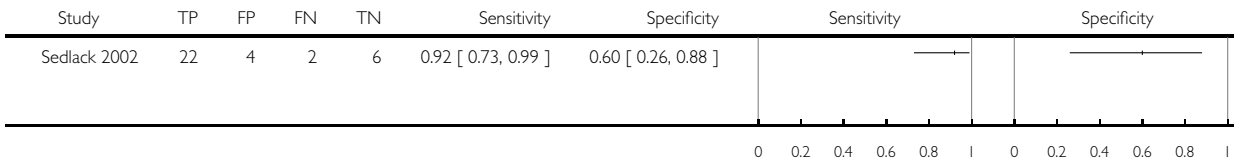
Test: 9 Cancerous versus benign - MRI



Test 10. Precancerous or cancerous versus benign - EUS.

Review: Imaging modalities for characterising focal pancreatic lesions

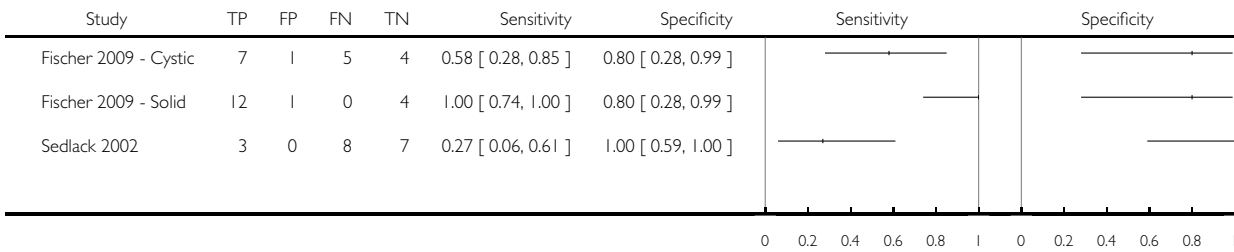
Test: 10 Precancerous or cancerous versus benign - EUS



Test 11. Precancerous or cancerous versus benign - EUS-FNA.

Review: Imaging modalities for characterising focal pancreatic lesions

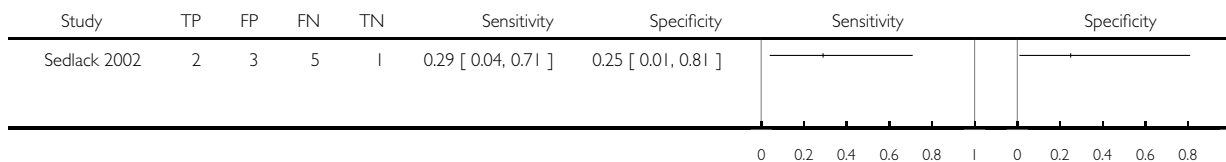
Test: 11 Precancerous or cancerous versus benign - EUS-FNA



Test 12. Precancerous or cancerous versus benign - EUS-FNA (CEA > 50 ng/mL).

Review: Imaging modalities for characterising focal pancreatic lesions

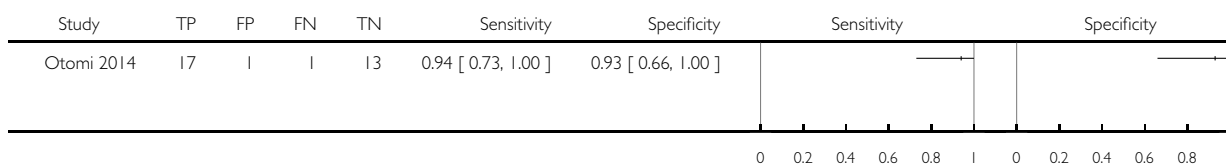
Test: 12 Precancerous or cancerous versus benign - EUS-FNA (CEA > 50 ng/mL)



Test 13. Precancerous or cancerous versus benign - PET (SUVmax > 2.4).

Review: Imaging modalities for characterising focal pancreatic lesions

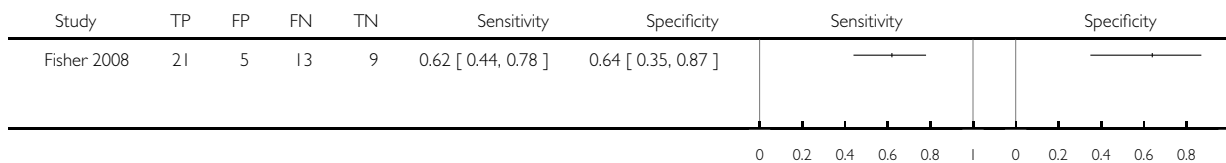
Test: 13 Precancerous or cancerous versus benign - PET (SUVmax > 2.4)



Test 14. Precancerous or cancerous versus benign - CT.

Review: Imaging modalities for characterising focal pancreatic lesions

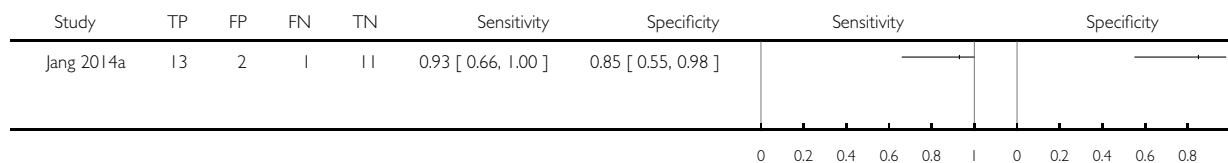
Test: 14 Precancerous or cancerous versus benign - CT



Test 15. Precancerous or cancerous versus benign - MRI.

Review: Imaging modalities for characterising focal pancreatic lesions

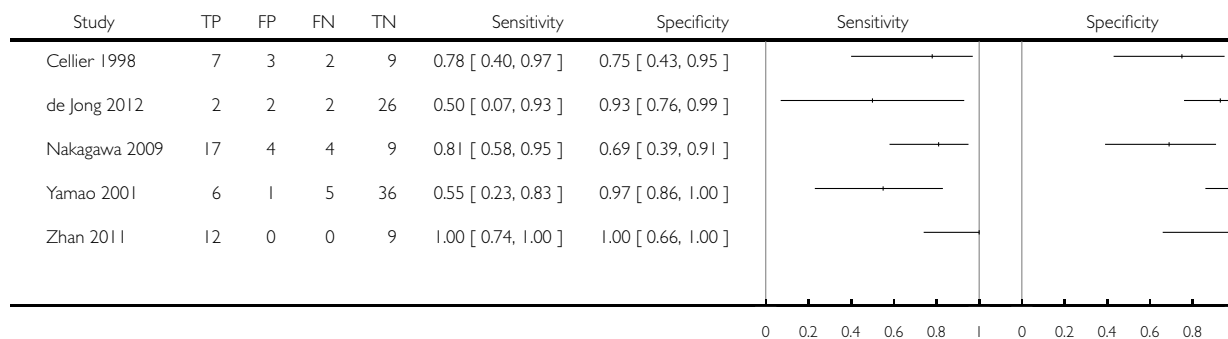
Test: 15 Precancerous or cancerous versus benign - MRI



Test 16. Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS.

Review: Imaging modalities for characterising focal pancreatic lesions

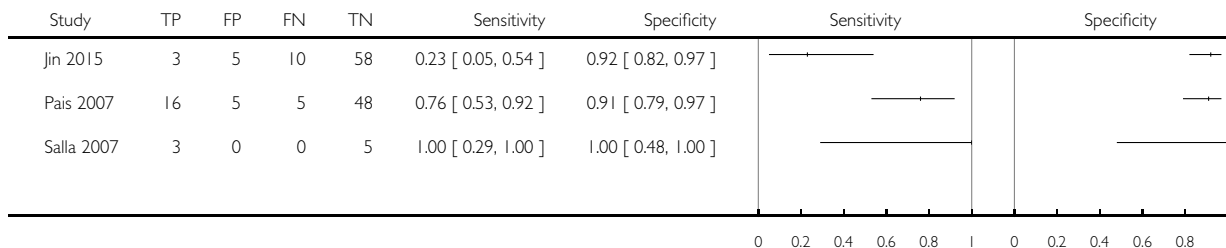
Test: 16 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS



Test 17. Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS-FNA.

Review: Imaging modalities for characterising focal pancreatic lesions

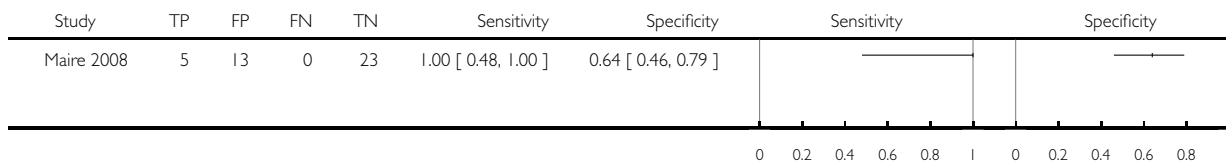
Test: 17 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS-FNA



Test 18. Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS-FNA (CEA > 200 ng/mL).

Review: Imaging modalities for characterising focal pancreatic lesions

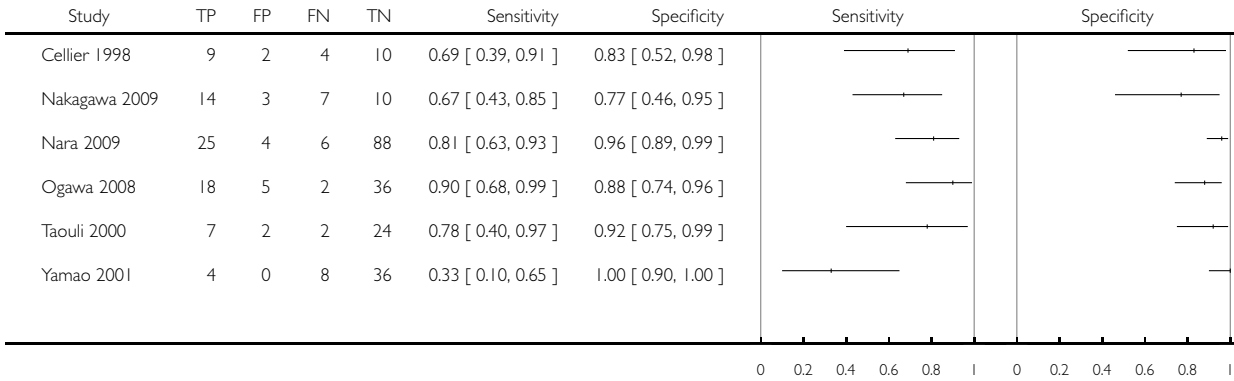
Test: 18 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - EUS-FNA (CEA > 200 ng/mL)



Test 19. Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT.

Review: Imaging modalities for characterising focal pancreatic lesions

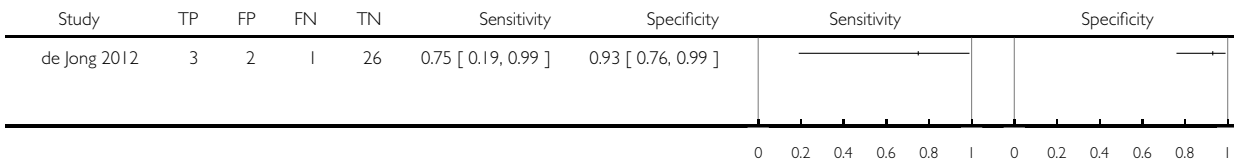
Test: 19 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - CT



Test 20. Cancerous (invasive carcinoma) versus precancerous (dysplasia) - MRI.

Review: Imaging modalities for characterising focal pancreatic lesions

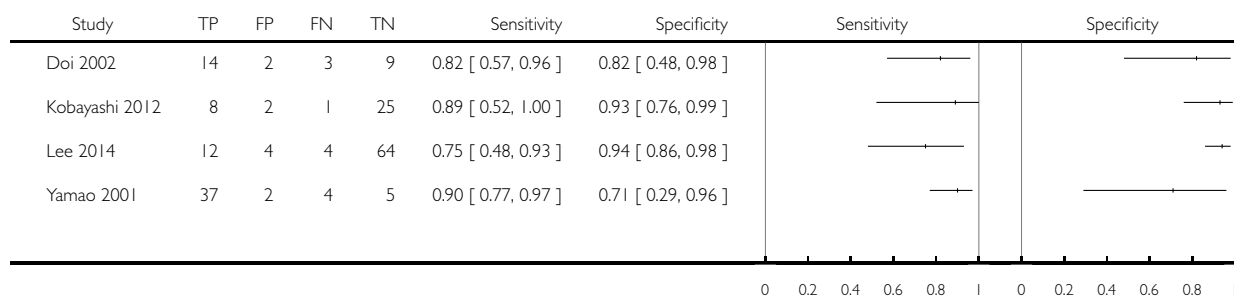
Test: 20 Cancerous (invasive carcinoma) versus precancerous (dysplasia) - MRI



Test 21. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS.

Review: Imaging modalities for characterising focal pancreatic lesions

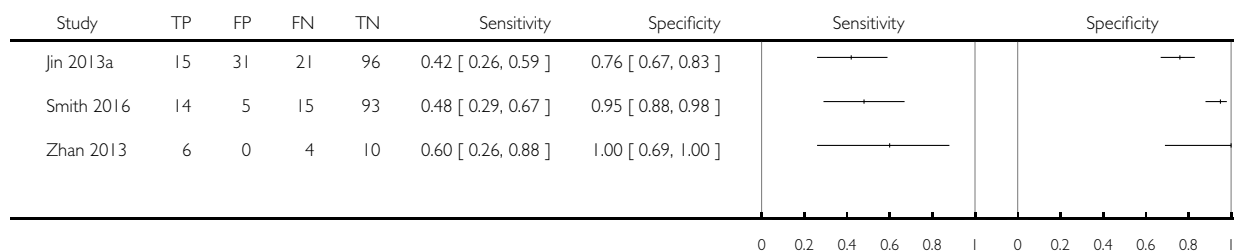
Test: 21 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS



Test 22. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA.

Review: Imaging modalities for characterising focal pancreatic lesions

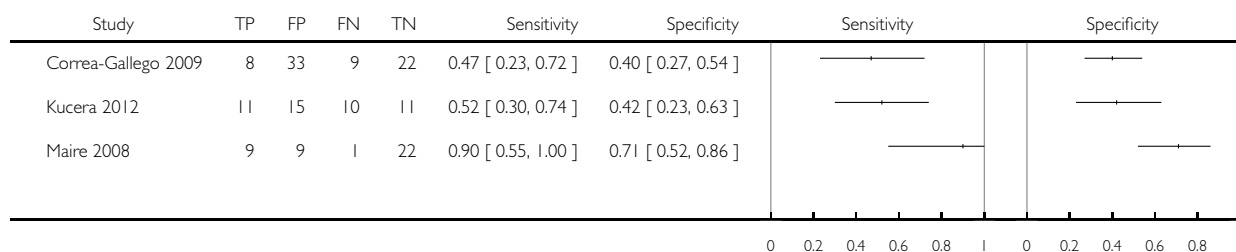
Test: 22 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA



Test 23. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CEA > 200 ng/mL).

Review: Imaging modalities for characterising focal pancreatic lesions

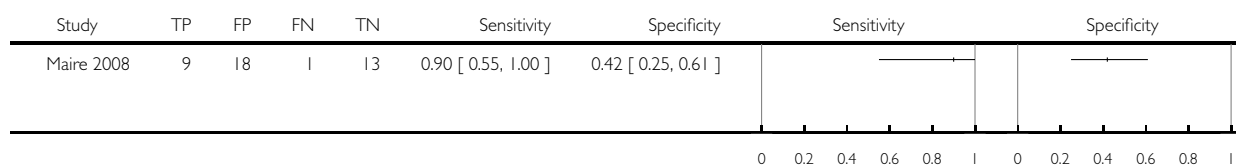
Test: 23 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CEA > 200 ng/mL)



Test 24. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CA 19-9 > 1000 U/mL).

Review: Imaging modalities for characterising focal pancreatic lesions

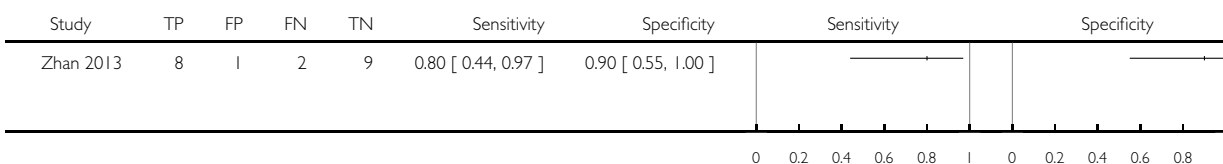
Test: 24 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CA 19-9 > 1000 U/mL)



Test 25. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CEA > 692.8 ng/mL).

Review: Imaging modalities for characterising focal pancreatic lesions

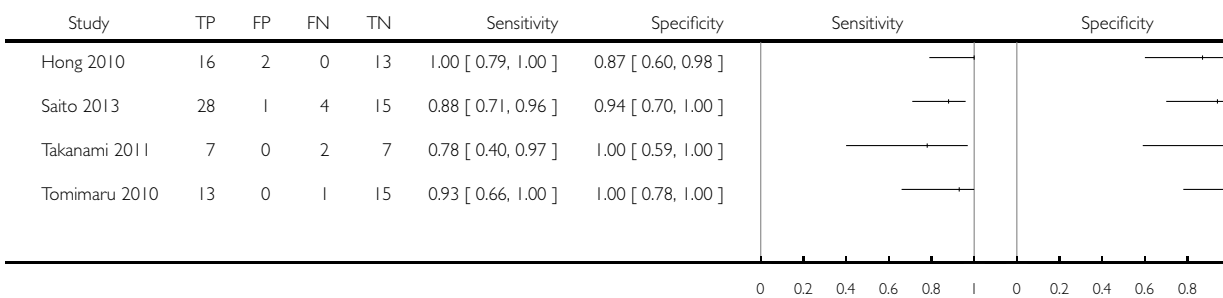
Test: 25 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - EUS-FNA (CEA > 692.8 ng/mL)



Test 26. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - PET (SUVmax 2 to 2.5).

Review: Imaging modalities for characterising focal pancreatic lesions

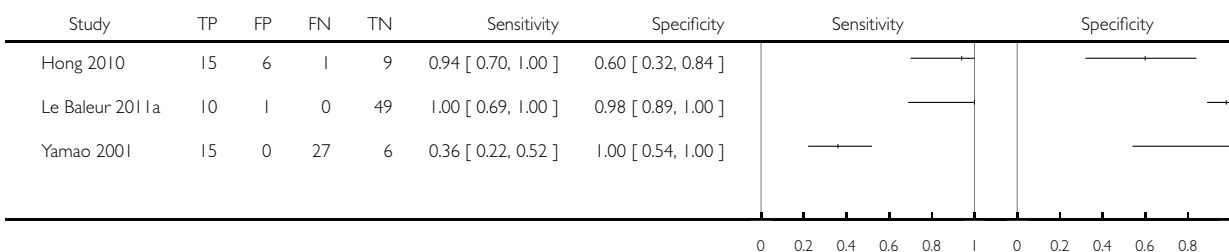
Test: 26 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - PET (SUVmax 2 to 2.5)



Test 27. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - CT.

Review: Imaging modalities for characterising focal pancreatic lesions

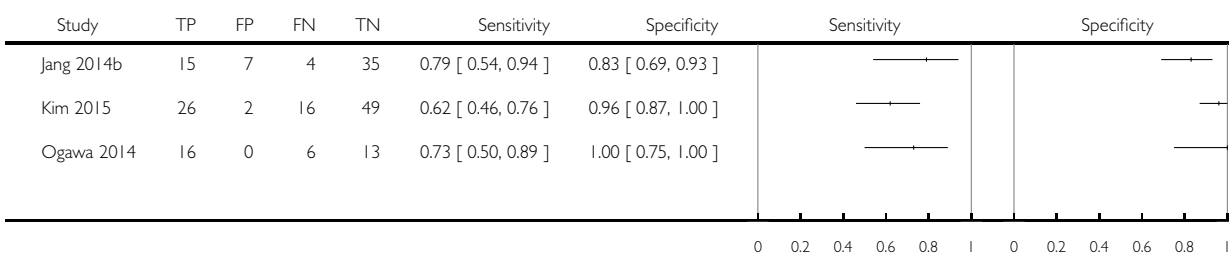
Test: 27 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - CT



Test 28. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - MRI.

Review: Imaging modalities for characterising focal pancreatic lesions

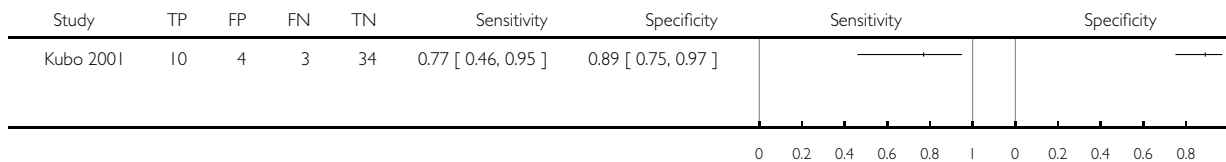
Test: 28 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) - MRI



Test 29. Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) - EUS.

Review: Imaging modalities for characterising focal pancreatic lesions

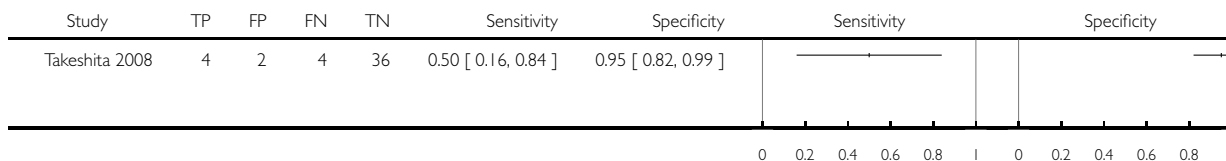
Test: 29 Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) - EUS



Test 30. Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) - CT.

Review: Imaging modalities for characterising focal pancreatic lesions

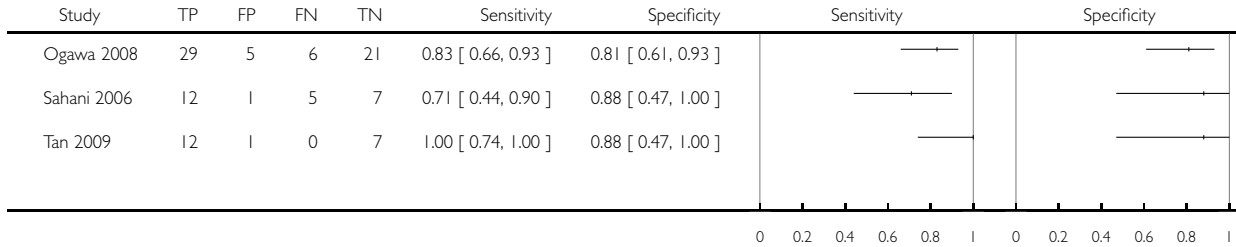
Test: 30 Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia) - CT



Test 31. Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) - CT.

Review: Imaging modalities for characterising focal pancreatic lesions

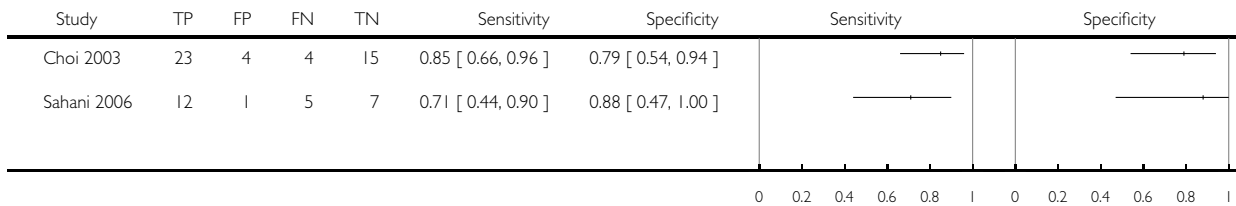
Test: 31 Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) - CT



Test 32. Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) - MRI.

Review: Imaging modalities for characterising focal pancreatic lesions

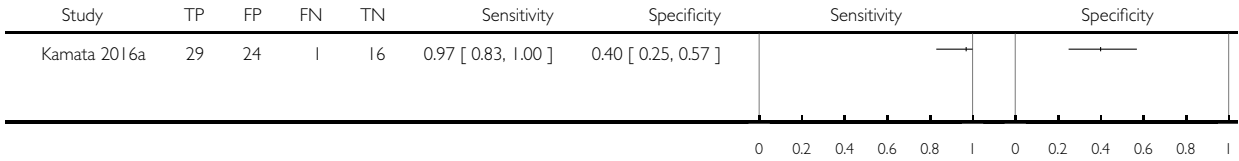
Test: 32 Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) - MRI



Test 33. Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) or benign - EUS.

Review: Imaging modalities for characterising focal pancreatic lesions

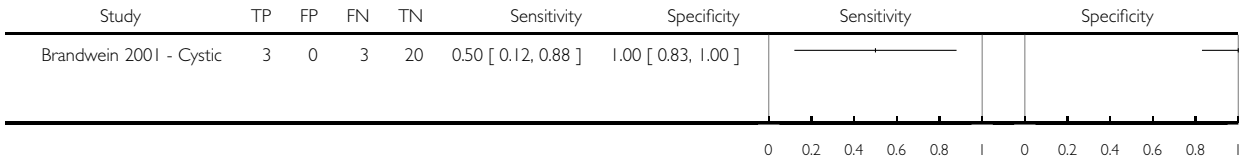
Test: 33 Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia) or benign - EUS



Test 34. Cystic lesion subgroup analysis - Cancerous versus benign - EUS-FNA.

Review: Imaging modalities for characterising focal pancreatic lesions

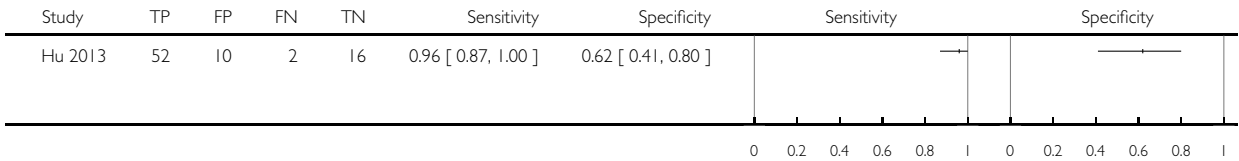
Test: 34 Cystic lesion subgroup analysis - Cancerous versus benign - EUS-FNA



Test 35. Cystic lesion subgroup analysis - Cancerous versus benign - PET.

Review: Imaging modalities for characterising focal pancreatic lesions

Test: 35 Cystic lesion subgroup analysis - Cancerous versus benign - PET



Test 36. Cystic lesion subgroup analysis - Precancerous or cancerous versus benign - EUS-FNA.

Review: Imaging modalities for characterising focal pancreatic lesions

Test: 36 Cystic lesion subgroup analysis - Precancerous or cancerous versus benign - EUS-FNA

Study	TP	FP	FN	TN	Sensitivity	Specificity	Sensitivity	Specificity
Fischer 2009 - Cystic	7	0	5	4	0.58 [0.28, 0.85]	1.00 [0.40, 1.00]		
Sedlack 2002	3	0	8	7	0.27 [0.06, 0.61]	1.00 [0.59, 1.00]		

ADDITIONAL TABLES

Table 1. QUADAS-2 classification

Domain	Signalling question	Signalling question	Signalling question	Risk of bias	Concerns for applicability
1: Patient sampling	Was a consecutive or random sample of patients enrolled?	Was a case-control design avoided?	Did the study avoid inappropriate exclusions?	Could the selection of participants have introduced bias?	Are there concerns that the included participants and setting do not match the review question?
	Yes: all consecutive patients or random sample of patients with focal pancreatic lesions were enrolled No: selected patients were enrolled Unclear: this was not clear from the report	Yes: case-control design was avoided No: case-control design was not avoided Unclear: this was not clear from the report	Yes: the study avoided inappropriate exclusions (i.e. difficult-to-diagnose patients) No: the study excluded patients inappropriately Unclear: this was not clear from the report	Low risk: 'yes' for all signalling questions High risk: 'no' or 'unclear' for at least 1 signalling question	Low concern: the selected participants represent the patients in whom the tests will be used in clinical practice (please see diagnostic pathway (Figure 1)) High concern: there is high concern that participant selection

Table 1. QUADAS-2 classification (Continued)

					was performed in such a way that the included participants did not represent the patients in whom the tests will be used in clinical practice
2: Index test(s)	Were the index test results interpreted without knowledge of the results of the reference standard?	If a threshold was used, was it prespecified?	-	Could the conduct or interpretation of the index test have introduced bias?	Are there concerns that the index test, its conduct, or its interpretation differ from the review question?
	Yes: index test results were interpreted without knowledge of the results of the reference standard No: index test results were interpreted with knowledge of the results of the reference standard Unclear: this was not clear from the report	Yes: if the criteria for a positive test were prespecified No: if the criteria for a positive test were not prespecified Unclear: this was not clear from the report	-	Low risk: 'yes' for all signalling questions High risk: 'no' or 'unclear' for at least 1 of the 2 signalling questions	High concern: there is high concern that the conduct or interpretation of the index test differs from the way it is likely to be used in clinical practice Low concern: there is low concern that the conduct or interpretation of the index test differs from the way it is likely to be used in clinical practice
3: Target condition and reference standard(s)	Is the reference standard likely to classify the target condition correctly?	Were the reference standard results interpreted without knowledge of the results of the index tests?	-	Could the reference standard, its conduct, or its interpretation have introduced bias?	Are there concerns that the target condition as defined by the reference standard does not match the review question?
	Yes: histopathological examination of the entire lesion by surgical resection No: histopathological examination (irrespective of how the tissues were obtained	-	Low risk: 'yes' for all signalling questions High risk: 'no' or 'unclear' for at least 1 of the 2 signalling questions	Low concern: histopathological examination of the entire lesion by surgical resection High concern: histopathological examination (irrespec-	-

Table 1. QUADAS-2 classification (Continued)

	<p>for histopathological examination) in patients with positive test (for cancerous or precancerous lesions) and clinical follow-up by a doctor (with or without sequential follow-up with imaging) of all patients with negative test for a period of at least 6 months and for a maximum period of 24 months</p> <p>Unclear: this was not clear from the report. Such studies will be excluded</p> <p>Yes: reference standard results were interpreted without knowledge of the results of the index test</p> <p>No: reference standard results were interpreted with knowledge of the results of the index test</p> <p>Unclear: this was not clear from the report</p>			<p>tive of how the tissues were obtained for histopathological examination) in patients with positive test (for cancerous or precancerous lesions) and clinical follow-up by a doctor (with or without sequential follow-up with imaging) of all patients with negative test for a period of at least 6 months and for a maximum period of 24 months</p>	
4: Flow and timing	<p>Was there an appropriate interval between index test and reference standard?</p> <p>Yes: histopathological examination of the entire lesion (gold standard) - performed within 2 months (chosen arbitrarily)</p>	<p>Did all patients receive the same reference standard?</p> <p>Yes: histopathological examination of the entire lesion by surgical resection</p> <p>No: histopathological examination (irrespective of how the tis-</p>	<p>Were all patients included in the analysis?</p> <p>Yes: all patients meeting the selection criteria (selected participants) were included in the analysis, or data on all of the selected par-</p>	<p>Could the patient flow have introduced bias?</p>	-

Table 1. QUADAS-2 classification (Continued)

	<p>Histopathological examination (irrespective of how the tissues were obtained for histopathological examination) in patients with positive test (for cancerous or precancerous lesions) performed within 2 months and clinical follow-up (including sequential follow-up with imaging) of all patients with negative test for a period of at least 6 months</p> <p>No: the histopathological examination was performed beyond 2 months of the index tests</p> <p>The clinical follow-up (including sequential follow-up imaging) was performed less than 6 months after the index test, because some tumours may be slow-growing</p> <p>Unclear: this was not clear from the report</p>	<p>issues were obtained for histopathological examination) in patients with positive test (for cancerous or precancerous lesions) and clinical follow-up by a doctor (with or without sequential follow-up with imaging) of all patients with negative test for a period of at least 6 months and for a maximum period of 24 months</p> <p>Unclear: this was not clear from the report. Such studies will be excluded</p>	<p>participants were available so that a 2 x 2 table including all selected participants could be constructed</p> <p>No: not all patients meeting the selection criteria were included in the analysis, or the 2 x 2 table could not be constructed using data on all selected participants</p> <p>Unclear: this was not clear from the report</p>
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Table 2. Summary sensitivity and specificity of different tests for different target conditions

Comparison	Name of test	Sensitivity	Specificity
Cancerous versus benign or precancerous	EUS-FNA (cytology)	0.79 (95% CI 0.60 to 0.91)	1.00 (95% CI 0.85 to 1.00)
Cancerous versus benign or precancerous	EUS-FNA (CEA > 500 ng/mL)	0.93 (95% CI 0.70 to 0.99)	0.33 (95% CI 0.12 to 0.65)

Table 2. Summary sensitivity and specificity of different tests for different target conditions (Continued)

Cancerous versus benign or precancerous	PET (criteria unspecified)	0.85 (95% CI 0.73 to 0.92)	0.91 (95% CI 0.72 to 0.97)
Cancerous versus benign	EUS	0.95 (95% CI 0.84 to 0.99)	0.53 (95% CI 0.31 to 0.74)
Cancerous versus benign	EUS-FNA (cytology)	0.79 (95% CI 0.07 to 1.00)	1.00 (95% CI 0.91 to 1.00)
Cancerous versus benign	PET (criteria unspecified)	0.92 (95% CI 0.80 to 0.97)	0.65 (95% CI 0.39 to 0.85)
Cancerous versus benign	PET (SUV _{max} > 3.5)	0.96 (95% CI 0.87 to 0.99)	0.62 (95% CI 0.43 to 0.78)
Cancerous versus benign	CT	0.98 (95% CI 0.00 to 1.00)	0.76 (95% CI 0.02 to 1.00)
Cancerous versus benign	MRI	0.80 (95% CI 0.58 to 0.92)	0.89 (95% CI 0.57 to 0.98)
Precancerous or cancerous versus benign	EUS	0.92 (95% CI 0.74 to 0.98)	0.60 (95% CI 0.31 to 0.83)
Precancerous or cancerous versus benign	EUS-FNA (cytology)	0.73 (95% CI 0.01 to 1.00)	0.94 (95% CI 0.15 to 1.00)
Precancerous or cancerous versus benign	EUS-FNA (CEA > 50 ng/mL)	0.29 (95% CI 0.08 to 0.64)	0.25 (95% CI 0.05 to 0.70)
Precancerous or cancerous versus benign	PET (SUV _{max} 2.4)	0.94 (95% CI 0.74 to 0.99)	0.93 (95% CI 0.69 to 0.99)
Precancerous or cancerous versus benign	CT	0.62 (95% CI 0.45 to 0.76)	0.64 (95% CI 0.39 to 0.84)
Precancerous or cancerous versus benign	MRI	0.93 (95% CI 0.69 to 0.99)	0.85 (95% CI 0.58 to 0.96)
Cancerous (invasive carcinoma) versus precancerous (dysplasia)	EUS	0.78 (95% CI 0.45 to 0.94)	0.91 (95% CI 0.61 to 0.98)
Cancerous (invasive carcinoma) versus precancerous (dysplasia)	EUS-FNA (cytology)	0.66 (95% CI 0.03 to 0.99)	0.92 (95% CI 0.73 to 0.98)
Cancerous (invasive carcinoma) versus precancerous (dysplasia)	EUS-FNA (CEA > 200 ng/mL)	1.00 (95% CI 0.57 to 1.00)	0.64 (95% CI 0.48 to 0.78)
Cancerous (invasive carcinoma) versus precancerous (dysplasia)	CT	0.72 (95% CI 0.50 to 0.87)	0.92 (95% CI 0.81 to 0.97)

Table 2. Summary sensitivity and specificity of different tests for different target conditions (Continued)

Cancerous (invasive carcinoma) versus precancerous (dysplasia)	MRI	0.75 (95% CI 0.30 to 0.95)	0.93 (95% CI 0.77 to 0.98)
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)	EUS	0.86 (95% CI 0.74 to 0.92)	0.91 (95% CI 0.83 to 0.96)
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)	EUS-FNA (cytology)	0.47 (95% CI 0.24 to 0.70)	0.91 (95% CI 0.32 to 1.00)
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)	EUS-FNA (CEA > 200 ng/mL)	0.58 (95% CI 0.28 to 0.83)	0.51 (95% CI 0.19 to 0.81)
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)	EUS-FNA (CA 19-9 > 1000 U/mL)	0.90 (95% CI 0.60 to 0.98)	0.42 (95% CI 0.26 to 0.59)
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)	EUS-FNA (CEA > 692.8 ng/mL)	0.80 (95% CI 0.49 to 0.94)	0.90 (95% CI 0.60 to 0.98)
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)	PET (SUV _{max} > 2 to 2.5)	0.90 (95% CI 0.79 to 0.96)	0.94 (95% CI 0.81 to 0.99)
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)	CT	0.87 (95% CI 0.00 to 1.00)	0.96 (95% CI 0.00 to 1.00)
Cancerous (high-grade dysplasia or invasive carcinoma) versus precancerous (low- or intermediate-grade dysplasia)	MRI	0.69 (95% CI 0.44 to 0.86)	0.93 (95% CI 0.43 to 1.00)
Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia)	EUS	0.77 (95% CI 0.50 to 0.92)	0.89 (95% CI 0.76 to 0.96)

Table 2. Summary sensitivity and specificity of different tests for different target conditions (Continued)

Cancerous (invasive carcinoma) versus precancerous (low-grade dysplasia)	CT	0.50 (95% CI 0.22 to 0.78)	0.95 (95% CI 0.83 to 0.99)
Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia)	CT	0.83 (95% CI 0.68 to 0.92)	0.83 (95% CI 0.64 to 0.93)
Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia)	MRI	0.80 (95% CI 0.58 to 0.92)	0.81 (95% CI 0.53 to 0.95)
Precancerous or cancerous (intermediate- or high-grade dysplasia or invasive carcinoma) versus precancerous (low-grade dysplasia) or benign	EUS	0.97 (95% CI 0.83 to 0.99)	0.40 (95% CI 0.26 to 0.55)
Cystic lesion subgroup analysis	Cancerous versus benign - EUS-FNA (cytology)	0.50 (95% CI 0.19 to 0.81)	1.00 (95% CI 0.84 to 1.00)
Cystic lesion subgroup analysis	Cancerous versus benign - PET (SUV _{max} > 3.5)	0.96 (95% CI 0.87 to 0.99)	0.62 (95% CI 0.43 to 0.78)
Cystic lesion subgroup analysis	Precancerous or cancerous versus benign - EUS-FNA (cytology)	0.43 (95% CI 0.19 to 0.71)	1.00 (95% CI 0.74 to 1.00)

CA 19-9: carbohydrate antigen 19-9

CEA: carcinoembryonic antigen

CI: confidence interval

CT: computed tomography

EUS: endoscopic ultrasound

FNA: fine-needle aspiration

MRI: magnetic resonance imaging

PET: positron emission tomography

SUV_{max}: maximum standardised uptake values

APPENDICES

Appendix I. Glossary of terms

Ablation: destruction of tissue.

Adenocarcinoma: cancer arising from cells that secrete digestive enzymes (proteins that help with the breakdown of food into simple substances that the gut can absorb).

Algorithm: order in which diagnostic tests are performed and actions taken depending upon the results of the tests (in this context).

Asymptomatic: not showing any signs of disease or illness.

Benign: non-cancerous (in this context).

Biomarkers: substances in an organism that indicate disease or illness.

Chemotherapy: medication used to treat or control cancer (in this context).

Contraindication: something that causes a specific treatment or procedure to be withheld because it would cause harm.

Cystic: related to an abnormal enclosed sac found within the body that is filled with a fluid or semifluid substance.

Cytology: the study of cells obtained from a tissue to determine whether the cell is cancerous (in this context).

Density: the measure of how compact something is (in this context).

Diffuse: spread out.

Disseminated: spread of cancer (in this context).

Dysplasia: abnormal growth or development of cell; precancerous (in this context).

Focal: characterised as being a specific or limited area of disease (in this context).

Gastrointestinal: related to the stomach and intestines.

Histological: examination of tissues under a microscope.

Histopathological: examination of tissues under a microscope to determine the changes related to a disease or illness.

Hormone: a chemical substance secreted by the body's cells that acts on other cells of the body, stimulating them to perform their role or suppressing the functions of the cells. Hormones are generally transported in the blood or other body fluids (e.g. stomach juice) from the cell that secretes the hormones to the cell on which they act.

Immunocytochemistry: examination of tissues under a microscope using special stains that bind to specific types of cells or tissues.

Ionising radiation: radiation consisting of particles, X-rays, or gamma rays with sufficient energy to cause ionisation in the medium through which it passes, thereby damaging cells (in this context).

Laparoscopy: a surgical procedure in which an instrument is inserted through a small incision in the abdomen to view the organs or permit a surgical procedure using small instruments.

Lesions: abnormal changes in the structure of all or part of an organ due to disease (in this context).

Malignancies: cancers.

Metastases: the spread of cancer beyond its original source.

Modality: method.

Morphological: related to structure.

Mortality: death.

Peptic: related to stomach or the upper part of the intestine.

Percutaneous: performed through the skin.

Perioperative: around the time of surgery.

Prognosis: outcomes resulting from disease or illness or related to the treatment of disease or illness.

Proteomic: related to the study of proteins.

Radiological: related to X-rays or ultrasound.

Resection: removal of all or part of an organ.

Steatorrhoea: excessive fat in stools.

Surveillance: close observation.

Vascularity: the degree of vessels (tubes that carry blood in humans).

Appendix 2. Cochrane search strategy

#1 (pancreas OR pancreatic)

#2 (CT OR tomodesitometry OR PET OR MRI OR NMRI OR zeugmatogra* OR ((computed OR computerised OR computerized OR emission OR positron OR magneti* OR MR OR NMR OR proton OR acoustic OR ARFI) AND (tomogra* OR scan OR scans OR imaging)) OR endosonogra* OR EUS OR ((echogra* OR ultrason* OR ultrasound) AND endoscop*) OR elastogr* OR sonoelastogr* OR acoustogra*)

#3 #1 AND #2

Appendix 3. MEDLINE search strategy

1. exp Pancreas/

2. exp Pancreatic Neoplasms/di [Diagnosis]

3. exp Pancreatitis, Chronic/di [Diagnosis]

4. exp Pancreatic Cyst/di [Diagnosis]

5. (pancreas or pancreatic).ti,ab.

6. 1 or 2 or 3 or 4 or 5

7. (sensitiv: or diagnos:).mp. or di.fs.

8. 6 and 7

9. (CT or tomodesitometry or PET or MRI or NMRI or zeugmatogra* or ((computed or computerised or computerized or emission or positron or magneti* or MR or NMR or proton or acoustic or ARFI) and (tomogra* or scan or scans or imaging))).ti,ab.

10. exp Tomography, X-Ray Computed/ or Positron-Emission Tomography/ or exp Magnetic Resonance Imaging/

11. 9 or 10

12. exp Endosonography/

13. (endosonogra* or EUS).ti,ab.

14. 12 or 13

15. exp Ultrasonography/

16. (echogra* or ultrason* or ultrasound).ti,ab.

17. 15 or 16

18. exp Endoscopy, Gastrointestinal/

19. endoscop*.ti,ab.

20. 18 or 19

21. 17 and 20

22. 14 or 21

23. exp Elasticity Imaging Techniques/

24. (elastogr* or sonoelastogr* or acoustogra*).ti,ab.

25. 23 or 24

26. 11 or 22 or 25

27. 8 and 26

Appendix 4. Embase search strategy

1. exp pancreas/

2. exp pancreas tumor/di [Diagnosis]

3. exp chronic pancreatitis/di [Diagnosis]

4. exp pancreas cyst/di [Diagnosis]

5. (pancreas or pancreatic).ti,ab.

6. 1 or 2 or 3 or 4 or 5

7. sensitiv:.tw. or diagnostic accuracy.sh. or diagnostic.tw.

8. 6 and 7

9. (CT or tomodesitometry or PET or MRI or NMRI or zeugmatogra* or ((computed or computerised or computerized or emission or positron or magneti* or MR or NMR or proton or acoustic or ARFI) and (tomogra* or scan or scans or imaging))).ti,ab.

10. exp computer assisted tomography/ or positron emission tomography/ or exp nuclear magnetic resonance imaging/
11. 9 or 10
12. endoscopic echography/
13. (endosonogra* or EUS).ti,ab.
14. 12 or 13
15. exp ultrasound/
16. (echogra* or ultrason* or ultrasound).ti,ab.
17. 15 or 16
18. exp gastrointestinal endoscopy/
19. endoscop*.ti,ab.
20. 18 or 19
21. 17 and 20
22. 14 or 21
23. exp elastography/
24. (elastogr* or sonoelastogr* or acoustogra*).ti,ab.
25. 23 or 24
26. 11 or 22 or 25
27. 8 and 26

Appendix 5. Science Citation Index Expanded search strategy

#1 TS=(pancreas OR pancreatic)

#2 TS=(CT OR tomodesitometry OR PET OR MRI OR NMRI OR zeugmatogra* OR ((computed OR computerised OR computerized OR emission OR positron OR magneti* OR MR OR NMR OR proton OR acoustic OR ARFI) AND (tomogra* OR scan OR scans OR imaging)) OR endosonogra* OR EUS OR ((echogra* OR ultrason* OR ultrasound) AND endoscop*) OR elastogr* OR sonoelastogr* OR acoustogra*)

#3 TS=(sensitiv* or "predictive value" or diagnostic or accuracy)

#4 #1 AND #2 AND #3

CONTRIBUTIONS OF AUTHORS

L Best, K Gurusamy, and V Rawji wrote sections of the review. SP Pereira and BR Davidson critically commented on the review.

DECLARATIONS OF INTEREST

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LMJB: none known.

VR: none known.

SPP: none known.

BRD: none known.

KSG: none known.

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

1. We have included sensitivity-maximising diagnostic filters for searching MEDLINE and Embase databases because the original searches without the filters retrieved more than 50,000 references (Haynes 2004; Wilczynski 2005). We also made some modifications to the search strategy because we needed to balance the possibility of missing some studies against the risk of not being able to complete the review. We decided that it is useful to have evidence from major studies rather than having no information at all.
2. We did not search the Cochrane Register of Diagnostic Test Accuracy Studies, as we believe it is no longer maintained.
3. We have performed the related search function through MEDLINE (OvidSP) rather than MEDLINE (PubMed) and also performed a cited reference search in MEDLINE (via OvidSP).
4. We have reworded the [Statistical analysis and data synthesis](#) section to bring this in line with our recent reviews. There were no material differences to the plan of statistical analysis except that we also planned to perform a bivariate analysis, which takes into account the correlation between sensitivity and specificity for tests with explicit thresholds as well. We did this because the summary sensitivity and specificity (and hence the positive likelihood ratio and negative likelihood ratio from which the post-test probabilities can be calculated) are available from the bivariate model.
5. We have simplified the analysis in the presence of sparse data based on the article by Takwoingi and colleagues (Takwoingi 2015).
6. We have presented the post-test probabilities only for the median prevalence in the comparison to avoid presenting readers with an overwhelming amount of data.