



Cochrane
Library

Cochrane Database of Systematic Reviews

Iridotomy to slow progression of visual field loss in angle-closure glaucoma (Review)

Le JT, Rouse B, Gazzard G

Le JT, Rouse B, Gazzard G.

Iridotomy to slow progression of visual field loss in angle-closure glaucoma.

Cochrane Database of Systematic Reviews 2018, Issue 6. Art. No.: CD012270.

DOI: 10.1002/14651858.CD012270.pub2.

www.cochranelibrary.com

TABLE OF CONTENTS

HEADER	1
ABSTRACT	1
PLAIN LANGUAGE SUMMARY	2
SUMMARY OF FINDINGS FOR THE MAIN COMPARISON	3
BACKGROUND	5
OBJECTIVES	6
METHODS	6
RESULTS	9
Figure 1.	10
Figure 2.	13
Figure 3.	14
DISCUSSION	14
AUTHORS' CONCLUSIONS	15
ACKNOWLEDGEMENTS	16
REFERENCES	16
CHARACTERISTICS OF STUDIES	19
DATA AND ANALYSES	25
Analysis 1.1. Comparison 1 Iridotomy vs No treatment, Outcome 1 Angle Width.	25
Analysis 1.2. Comparison 1 Iridotomy vs No treatment, Outcome 2 Adverse events.	26
ADDITIONAL TABLES	26
APPENDICES	26
CONTRIBUTIONS OF AUTHORS	28
DECLARATIONS OF INTEREST	29
SOURCES OF SUPPORT	29
DIFFERENCES BETWEEN PROTOCOL AND REVIEW	29

[Intervention Review]

Iridotomy to slow progression of visual field loss in angle-closure glaucoma

Jimmy T Le^{1a}, Benjamin Rouse^{1b}, Gus Gazzard^{2,3}

¹Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA. ²NIHR Biomedical Research Centre, Moorfields Eye Hospital NHS Foundation Trust, London, UK. ³UCL Institute of Ophthalmology, London, UK

^aJoint first author. ^bJoint first author

Contact address: Jimmy T Le, Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe Street, Baltimore, Maryland, 21205, USA. jle6@jhu.edu.

Editorial group: Cochrane Eyes and Vision Group.

Publication status and date: New, published in Issue 6, 2018.

Citation: Le JT, Rouse B, Gazzard G. Iridotomy to slow progression of visual field loss in angle-closure glaucoma. *Cochrane Database of Systematic Reviews* 2018, Issue 6. Art. No.: CD012270. DOI: 10.1002/14651858.CD012270.pub2.

Copyright © 2018 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

ABSTRACT

Background

Primary angle-closure glaucoma is a type of glaucoma associated with a physically obstructed anterior chamber angle. Obstruction of the anterior chamber angle blocks drainage of fluids (aqueous humor) within the eye and may raise intraocular pressure (IOP). Elevated IOP is associated with glaucomatous optic nerve damage and visual field loss. Laser peripheral iridotomy (often just called 'iridotomy') is a procedure to eliminate pupillary block by allowing aqueous humor to pass directly from the posterior to anterior chamber through use of a laser to create a hole in the iris. It is commonly used to treat patients with primary angle-closure glaucoma, patients with primary angle closure (narrow angles and no signs of glaucomatous optic neuropathy), and patients who are primary angle-closure suspects (patients with reversible obstruction). The effectiveness of iridotomy on slowing progression of visual field loss, however, is uncertain.

Objectives

To assess the effects of iridotomy compared with no iridotomy for primary angle-closure glaucoma, primary angle closure, and primary angle-closure suspects.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL; 2017, Issue 9) which contains the Cochrane Eyes and Vision Trials Register; MEDLINE Ovid; Embase Ovid; PubMed; LILACS; ClinicalTrials.gov; and the ICTRP. The date of the search was 18 October 2017.

Selection criteria

Randomized or quasi-randomized controlled trials that compared iridotomy to no iridotomy in primary angle-closure suspects, patients with primary angle closure, or patients with primary angle-closure glaucoma in one or both eyes were eligible.

Data collection and analysis

Two authors worked independently to extract data on study characteristics, outcomes for the review, and risk of bias in the included studies. We resolved differences through discussion.

Main results

We identified two trials (2502 eyes of 1251 participants) that compared iridotomy to no iridotomy. Both trials recruited primary angle suspects from Asia and randomized one eye of each participant to iridotomy and the other to no iridotomy. Because the full trial reports are not yet available for both trials, no data are available to assess the effectiveness of iridotomy on slowing progression of visual field loss, change in IOP, need for additional surgeries, number of medications needed to control IOP, mean change in best-corrected visual acuity, and quality of life. Based on currently reported data, one trial showed evidence that iridotomy increases angle width at 18 months (by 12.70°, 95% confidence interval (CI) 12.06° to 13.34°, involving 1550 eyes, moderate-certainty evidence) and may be associated with IOP spikes at one hour after treatment (risk ratio 24.00 (95% CI 7.60 to 75.83), involving 1468 eyes, low-certainty evidence). The risk of bias of the two studies was overall unclear due to lack of availability of a full trial report.

Authors' conclusions

The available studies that directly compared iridotomy to no iridotomy have not yet published full trial reports. At present, we cannot draw reliable conclusions based on randomized controlled trials as to whether iridotomy slows progression of visual field loss at one year compared to no iridotomy. Full publication of the results from the studies may clarify the benefits of iridotomy.

PLAIN LANGUAGE SUMMARY

Iridotomy to slow progression of visual field loss in angle-closure glaucoma

What was the aim of this review?

The aim of this Cochrane Review was to find out whether iridotomy compared to no iridotomy can slow progression of visual field loss in (1) people with primary angle-closure glaucoma, (2) people with primary angle closure, and (3) people who are suspected of having primary angle closure. We collected and analyzed all relevant clinical trials to answer this question and found two studies awaiting full publication of results.

Key messages

At the time of review, it is uncertain whether iridotomy can slow progression of visual field loss. When they become available, full publication of the results from the two studies may clarify the benefits of iridotomy.

What did we study in this review?

Glaucoma is a group of eye diseases that cause damage to the nerve in the eye. If untreated, glaucoma can lead to blindness. Primary angle-closure glaucoma is a type of glaucoma which happens when the drainage canals ("angles") in the eyes get blocked, like a sink with something covering the drain. This blockage may lead to increased eye pressure and hence a decrease of the total area in which objects can be seen in side vision ('visual field').

Iridotomy involves using a laser to create a hole in the eye's iris, the colorful disc around the pupil. This opening allows fluid to flow again, which helps control eye pressure and may slow progression of visual field loss.

What were the main results of this review?

At the time of conducting this review, we identified two trials with publication of the full trial results still under preparation. Both trials recruited participants from Asia. One eye of each participant received iridotomy and the other eye did not receive iridotomy. No data are available to assess the effectiveness of iridotomy on slowing progression of visual field loss. Low- to moderate-quality evidence from one trial suggests that iridotomy increases width of the drainage angle ('angle width') at 18 months post-treatment and may be associated with adverse events, such as 'spikes' of increased eye pressure at one hour post-treatment.

How up to date is the review?

We searched for studies that have been published up to 18 October 2017.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Iridotomy compared to no iridotomy for patients with primary angle-closure suspect, primary angle closure, or primary angle-closure glaucoma						
Patient or population: patients with primary angle-closure suspect, primary angle closure, or primary angle-closure glaucoma Setting: hospital or out-patient Intervention: iridotomy Comparison: no iridotomy						
Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	No. of eyes (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no iridotomy	Risk with Iridotomy				
Proportion of progressive visual field loss at 1 year	Not reported	Not reported	-	-	-	
Intraocular pressure: mean IOP at 1 year	Not reported	Not reported	-	-	-	
Gonioscopic findings: mean angle width at 1 year	The mean angle width was 11.3° in the no iridotomy group	The mean angle width in the iridotomy group was 12.7° higher (12.06° higher to 13.34° higher)	MD 12.7 (12.06 to 13.34)	1550 (1 RCT)	⊕⊕⊕○ MODERATE ¹	Participants in the study were primary angle-closure suspects. Data were only available at 18 months
Need for additional surgery: proportion of participants who received additional surgery to control IOP at 1 year	Not reported	Not reported	-	-	-	

Medications: mean number of medications used to control IOP at 1 year	Not reported	Not reported	-	-	-	
Quality of life measures	Not reported	Not reported	-	-	-	
Adverse events - IOP spike (rise greater than or equal to 8 mmHg) at 1 hour	4 per 1000	98 per 1000 (31 to 310)	RR 24.00 (7.60 to 75.83)	1468 (1 RCT)	⊕⊕○○ LOW ¹²	Participants in the study were primary angle-closure suspects

* **The risk in the intervention group** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; RR: Risk ratio; MD: Mean difference; IOP: Intraocular pressure

GRADE Working Group grades of evidence

High-certainty: We are very confident that the true effect lies close to that of the estimate of the effect

Moderate-certainty: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Low-certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

Very low-certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

¹ Downgraded by one level for risk of bias, as the study is at unclear risk of bias for incomplete outcome data, selective outcome reporting, and other sources of bias due to the lack of availability of a full trial report.

² Downgraded by one level for imprecision, as the confidence interval of the risk ratio between the groups is wide.

BACKGROUND

Description of the condition

Glaucoma refers to a group of similar diseases defined by progressive damage to the optic nerve (optic neuropathy). This damage occurs in a characteristic pattern with associated structural and functional changes, including visual field loss (Foster 2002). Elevated intraocular pressure (IOP) is associated with glaucomatous optic nerve damage. IOP can rise when aqueous humor, a clear fluid that continuously flows through the anterior chamber to nourish and pressurize the eye, does not drain properly (AAO 2015; EGS 2014; Mapstone 1968). There are two broad subtypes of glaucoma, angle-closure and open-angle, in which the drainage pathway for aqueous humor is occluded or not, respectively (AAO 2015).

Primary angle-closure glaucoma, the focus of this review, involves appositional (reversible) or synechial (adhesional) closure of the anterior chamber angle (AAO 2015; Emanuel 2014). Two main mechanisms have been hypothesized as responsible for angle closure: (1) pupillary block; and (2) anterior displacement of the iris. In the former, contact between the iris and lens at the pupillary margin increases resistance to aqueous outflow, as the iris bows forward and comes into contact with the trabecular meshwork (iridotrabecular contact (ITC)) (AAO 2015). In the latter, a large or anteriorly-positioned ciliary body pushes the peripheral iris forward, often leading to continued ITC (AAO 2015).

For this review, we follow a recently proposed classification of angle-closure glaucoma (Table 1) (AAO 2015; Aung 2001; Foster 2000; Foster 2002; Ng 2012). This definition rests on the idea of describing an 'occludable' angle, using terms such as 'narrow' to specify the anatomical predisposition to angle closure, further qualified by degrees of ITC, presence of IOP elevated above the population-based norm, and presence of peripheral anterior synechiae (PAS). The drainage angle is assessable by gonioscopy with a diagnostic contact prism. In brief:

- primary angle-closure suspects (PACS) are patients who have reversible ITC of 180° or more on gonioscopy; however, there is no evidence of permanent aqueous outflow obstruction, damage to the angle (i.e. no PAS), rise in IOP, or glaucomatous optic neuropathy;
- primary angle closure (PAC) patients have ITC of 180° or more plus elevated IOP or PAS or both, but no signs of glaucomatous optic neuropathy; and
- primary angle-closure glaucoma (PACG) patients have ITC of 180° or more in the presence of glaucomatous optic nerve damage (with or without PAS or elevated IOP at the time of examination).

Epidemiology

Glaucoma is among the leading causes of blindness and, particularly due to the irreversible nature of the disease, a pressing public health challenge (Bourne 2013; Kingman 2004; Resnikoff 2004). The World Health Organization characterizes glaucoma as one of its priority eye diseases, and researchers have approximated that about five million people today are blind as a consequence of glaucoma (Osborne 2003; Quigley 2006). A recent systematic review found a global prevalence of glaucoma in the 40 to 80 years age group of 3.54%, and estimated that prevalence will reach 76 million by 2020 and 111.8 million by 2040 (Tham 2014).

Although angle-closure glaucoma is less common than open-angle glaucoma, it is often more severe and more likely to result in irreversible blindness if left untreated (AAO 2015). Among the 64.3 million people with glaucoma aged 40 to 80 years, 20.2 million were estimated to have PACG in 2013; in this sub-population, 14.5 million were estimated to be living in Asia (Quigley 2006; Tham 2014). For example, the number of people in China with PACS, PAC, and PACG has been estimated as 28.2 million, 9.1 million, and 3.5 million, respectively (Foster 2001). Moreover 91% of the 1.7 million cases of bilateral blindness in this population are attributable to PACG (Foster 2001). The risk of progression from PACS to PAC and from PAC to PACG has also been estimated as 22% and 29%, respectively, over five years (Thomas 2003a; Thomas 2003b). PACG is less common among people of European descent, with pooled prevalence of PACG for people aged 40 years or older estimated to be 0.4% (Day 2012). Other risk factors for angle-closure diseases include female sex, older age, and family history of angle closure (AAO 2015; Bonomi 2002; Day 2012).

Treatment options

Treatments for angle-closure glaucoma include medical interventions and surgical interventions (with or without laser) that open the angle to remove blockage of the normal flow of aqueous humor, lower IOP and equalize pressure across the anterior and posterior chambers of the eye. Medical options include miotics such as topical pilocarpine. Other agents, including beta-blockers, alpha2-agonists, carbonic anhydrase inhibitors and prostaglandin analogs, can also lower IOP but do not remove the risk of disease progression from PACS to PAC and PACG (AAO 2015; See 2011). Surgical options include lens extraction, iridoplasty, iridectomy, iridotomy, and trabeculectomy (Azura-Blanco 2016; See 2011). Today, the standard first-line treatment for angle closure is iridotomy.

Description of the intervention

Laser peripheral iridotomy ('iridotomy') is an outpatient procedure in which an opening is created in the peripheral iris using a neodymium-doped yttrium aluminum garnet (Nd:YAG) or argon laser mounted on a slit lamp biomicroscope (AAO 2015;

Nolan 2000). Iridotomy is based on the same principle as iridectomy, which involves surgical removal of part of the iris. Iridotomy has largely replaced iridectomy: there are approximately 51 iridotomies for every iridectomy performed (Ramulu 2007).

Iridotomy has some limitations. Changes in aqueous pressure gradients and iris configuration after iridotomy may increase contact between the lens and the iris, theoretically leading to a risk of more rapid development of cataracts (Caronia 1996; Lim 2005). Other potential risks include the rare occurrence of corneal endothelial damage localized to the surgery site, dysphotopsias or stray light symptoms, and the development of posterior synechiae (Pollack 1981; Quigley 1981; Robin 1984). Posterior synechiae can limit vision in dimly-lit environments and complicate later cataract surgery or other ocular procedures.

How the intervention might work

Iridotomy eliminates the pressure gradient caused by pupillary block by making an opening in the peripheral iris; this hole-created with laser-allows free circulation of aqueous humor from posterior to anterior chambers even if the pupil is blocked (Fleck 1997; Friedman 2001; Ng 2012). By restoring a more posterior iris position, this opening may prevent progression of PAS and further IOP rise, minimize subsequent optic nerve damage, and slow progression of visual field loss. In cases of suspected angle closure, iridotomy is often used as a prophylactic measure to prevent further progression of angle closure (AAO 2015).

Why it is important to do this review

Glaucoma is a leading cause of blindness worldwide. Iridotomy is the most common procedure to treat patients with PACG. Iridotomy has also been used prophylactically in the contralateral eye of people who have previously been diagnosed with PAC or PACG in one eye (Ang 2000; Edwards 1982; Snow 1977). Yet, iridotomy does not directly correct the underlying anatomical defects related to angle closure, and it is unclear if iridotomy is sufficient for long-term control of IOP in patients with PACG (See 2011). Additionally, a recent survey of glaucoma specialists to set priorities for comparative effectiveness research on the management of angle-closure disease identified that understanding the role of iridotomy for the prevention of angle-closure glaucoma is an important unmet evidence gap (Yu 2015). A systematic review of the evidence is needed to evaluate the benefits and risks of iridotomy in patients with PACS, PAC, and PACG.

OBJECTIVES

To assess the effects of iridotomy compared with no iridotomy for primary angle-closure glaucoma, primary angle closure, and primary angle-closure suspect.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomized controlled trials (RCTs). As we anticipated few RCTs on this intervention, we planned to include quasi-randomized trials. We defined quasi-randomized trials as studies that employed a method of allocating patients to a treatment arm that is not strictly random (e.g. by date of birth, hospital record number, in alternation, etc.). We included studies irrespective of their publication status and language. We included reports of secondary analyses of included RCTs and grouped them with the RCT.

Types of participants

We included studies of participants with gonioscopically-narrow angles-i.e. participants with PACS, PAC, or PACG in one or both eyes. We did not restrict by age, gender or ethnicity.

Types of interventions

We included only trials that compared iridotomy versus no iridotomy or sham treatment. We applied no restrictions with respect to IOP-lowering medications.

Types of outcome measures

Primary outcomes

Proportion of participants with any progression of visual field loss at one year. We planned to assess progression of visual field loss using criteria as defined in included studies as measured using any validated tool, such as automated Humphrey Field Analyzer, Heidelberg Edge Perimeter, or Oculus. We also planned to consider other time points during follow-up as reported in the included studies and to assess this outcome for studies involving participants with PAC or PACG.

Secondary outcomes

The secondary outcomes for comparison of interventions included the following.

1. Mean change in IOP from baseline to one year, measured by any method of applanation tonometry, e.g. Goldmann or Perkins.
2. Gonioscopic findings in the participant, including angle width and presence of PAS, as reported by the investigators, at one year.
3. Need for additional surgery, as defined by the proportion of participants who received additional surgery to control IOP within one year after iridotomy.
4. Number of medications used to control IOP at one year.
5. Mean change in best corrected visual acuity (BCVA) as measured by logMAR from baseline to one year after iridotomy.
6. Quality-of-life data, as recorded by the investigators.

To improve comparability and consistency, we have adapted some of the above outcomes from previous Cochrane Reviews (Friedman 2006; Zhang 2015). If trials did not report outcomes at one year, we considered longer-term outcomes closest to one year.

Adverse events

We reported adverse effects-including IOP spikes, persistent IOP elevation, hyphema and other adverse effects-as they were recorded by the investigators.

Search methods for identification of studies

Electronic searches

The Cochrane Eyes and Vision Information Specialist conducted systematic searches in the following databases for RCTs and quasi-randomized trials. There were no language or publication year restrictions. The date of the search was 18 October 2017.

- Cochrane Central Register of Controlled Trials (CENTRAL; 2017, Issue 9) (which contains the Cochrane Eyes and Vision Trials Register) in the Cochrane Library (searched 18 October 2017) (Appendix 1);
- MEDLINE Ovid (1946 to 18 October 2017) (Appendix 2);
- Embase.com (1980 to 18 October 2017) (Appendix 3);
- PubMed (1948 to 18 October 2017) (Appendix 4);
- LILACS (1982 to 18 October 2017) (Appendix 5);
- US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov (www.clinicaltrials.gov; searched 18 October 2017) (Appendix 6);
- World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP)(www.who.int/ictip; searched 18 October 2017) (Appendix 7).

Searching other resources

We searched the references of included studies for information about further trials. We did not conduct manual searches of journals or conference proceedings for this review.

Data collection and analysis

Selection of studies

Two review authors independently screened titles and abstracts identified in the electronic searches using [Covidence](#). We classified each title and abstract as 'Yes' (relevant), 'Maybe' (maybe relevant), or 'No' (not relevant). We retrieved full-text articles for records classified as 'Yes' or 'Maybe' and reviewed them against the eligibility criteria of the review. We contacted the trial authors to clarify any details necessary to make a complete assessment of the relevance or design of the study. We documented reasons for exclusion for each study assessed as not eligible after reviewing the full-text reports. We resolved discrepancies between review authors by discussion at each stage of the selection process.

Data extraction and management

Two review authors independently extracted data from included studies into a web-based, electronic data collection form using [Covidence](#). We extracted information on the study design (e.g. study setting, countries where recruitment took place, sample size, study duration and follow-up time, study design, analysis choice, sources of funding, and potential conflicts of interests); characteristics of the participants (e.g. inclusion/exclusion criteria, underlying disease conditions, and medical history, including visual acuity and other vision-related characteristics); interventions and comparators (e.g. type of laser, duration and timing); and outcomes (e.g. domain, specific measurement, specific metric, method of aggregation, and the time frame). Where 2 × 2 tables or means and standard deviations (or standard errors) were not available, we planned to include effect estimates (e.g. odds ratios and regression coefficients), confidence intervals, test statistics, or P values. We contacted study investigators for any missing or unclear information and proceeded with available information when we received no response within two weeks.

The two authors then compared the extracted data and resolved discrepancies by discussion and, when necessary, through consultation with the third author. One review author completed data entry into Review Manager 5 (RevMan 5) (Review Manager 2014); and a second author verified the data entered.

Assessment of risk of bias in included studies

Two review authors independently assessed the risk of bias in included studies following the guidance given in Chapter 8 of the

Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2011). Specific items we considered included random sequence generation and allocation concealment (selection bias); masking of participants and study personnel (performance bias); masking of outcome assessors (detection bias); missing data and intention-to-treat analysis (attrition bias); selective outcome reporting (reporting bias); and other potential sources of bias. We assigned each item as having 'low risk,' 'high risk,' or, if the information provided is insufficient to make an assessment, 'unclear risk' using the criteria described in Chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We documented reasons for those assessments.

We resolved discrepancies through discussion. We contacted the study investigators as appropriate.

Measures of treatment effect

We intended to report risk ratios (RR) with 95% confidence intervals (CIs) for any dichotomous outcomes (i.e. proportion of participants with any evidence of progression of visual field loss and proportion of participants who needed additional surgery to control IOP) and mean differences in change from baseline with 95% CIs for continuous outcomes (i.e. mean change in IOP, progressive field loss, number of medications used, and mean change in BCVA). We intended to conduct separate analyses for outcomes in the eyes of participants with PACG, PAC, and PACS. If any trials on eyes with narrow angles compared eyes within individuals (e.g. one eye was randomized to the treatment while the other was randomized to observation), then we planned to note whether or not the study investigators included statistical methods accounting for the correlation between eyes belonging to the same individual.

Unit of analysis issues

We planned for our unit of analysis to be one study eye per individual participant, therefore accounting for non-independence of eyes would not be necessary. When both eyes from the same individual were randomized, we planned to use the estimates that had accounted for the correlation.

Dealing with missing data

We addressed any missing study data for the outcomes of interest or any unclear information by writing to the authors. We planned to consider multiple imputation or other imputation approaches for missing data. In the event that the quality of the available data prevented any meaningful analysis, we planned to omit the study from the analyses and would have noted this decision in the discussion.

Assessment of heterogeneity

We assessed clinical and methodological heterogeneity by examining participant characteristics, iridotomy procedures, and outcomes by carefully reviewing the available data and taking into consideration potential risk of bias. We planned to assess statistical heterogeneity by assessing forest plots and examining the I^2 value (Deeks 2011; Higgins 2003). The I^2 value describes the proportion of total variation across studies that is due to heterogeneity rather than chance (Higgins 2011). We considered I^2 greater than 70% as the cut-off point to identify the presence of considerable heterogeneity (Higgins 2011). We planned to give consideration to the consistency of the effect estimates. For example, had we found that all effect estimates were in the same direction, we might have reported a meta-analysis even though there might have been substantial statistical heterogeneity.

Assessment of reporting biases

We intended to examine selective outcome reporting as part of the 'Risk of bias' assessment, by comparing the outcomes reported in included studies and outcomes listed in study registration or study protocols (where available). We planned to examine funnel plots of intervention effect estimates for evidence of asymmetry, if there were a sufficient number of included studies (i.e. 10 or more). An asymmetrical funnel plot may imply possible publication bias or exaggeration of treatment effects in small, low-quality studies (Sterne 2001).

Data synthesis

We planned to follow Chapter 9 of the *Cochrane Handbook for Systematic Reviews of Interventions* for data analysis (Deeks 2011). In the absence of substantial clinical and methodological heterogeneity, we would have used a random-effects model to compute a quantitative synthesis. Had the number of studies included in the quantitative synthesis been less than three with no evidence of substantial statistical heterogeneity, we would have considered a fixed-effect meta-analysis. We provided a descriptive, qualitative synthesis of studies and their results, based on the information available.

Subgroup analysis and investigation of heterogeneity

We planned to consider the following pre-specified subgroups: (1) with or without use of IOP-lowering medications; and (2) by ethnic/racial groups. The effect of iridotomy may vary based on the use of IOP-lowering medication; and ethnicity/race is a known risk factor for angle-closure glaucoma (AAO 2015).

Sensitivity analysis

We planned to conduct two sensitivity analyses to determine the effect of excluding studies at high risk of bias for incomplete outcome data (i.e. the amount or distribution of missing outcomes differ between treatment groups) (Higgins 2011); and the effect of

excluding studies that were quasi-randomized trials. If appropriate, we would have also conducted additional sensitivity analyses to determine the impact of any post-hoc decisions made during the review process.

'Summary of findings' table

We prepared a 'Summary of findings' table for each available outcome. We assessed the certainty of the evidence using the GRADE approach with GRADEpro software ([GRADEpro 2015](#)). BR did the initial assessment, which was checked by JL. We considered risk of bias, inconsistency, indirectness, and imprecision when judging the certainty of the evidence. We included the following outcomes in the summary.

1. Proportion of participants with progressive visual field loss at one year.
2. Mean change in IOP from baseline to one year.
3. Gonioscopic findings in the participants at one year.
4. Need for additional surgery within one year.
5. Number of medications used to control IOP at one year.
6. Quality of life measures.
7. Adverse effects as documented.

RESULTS

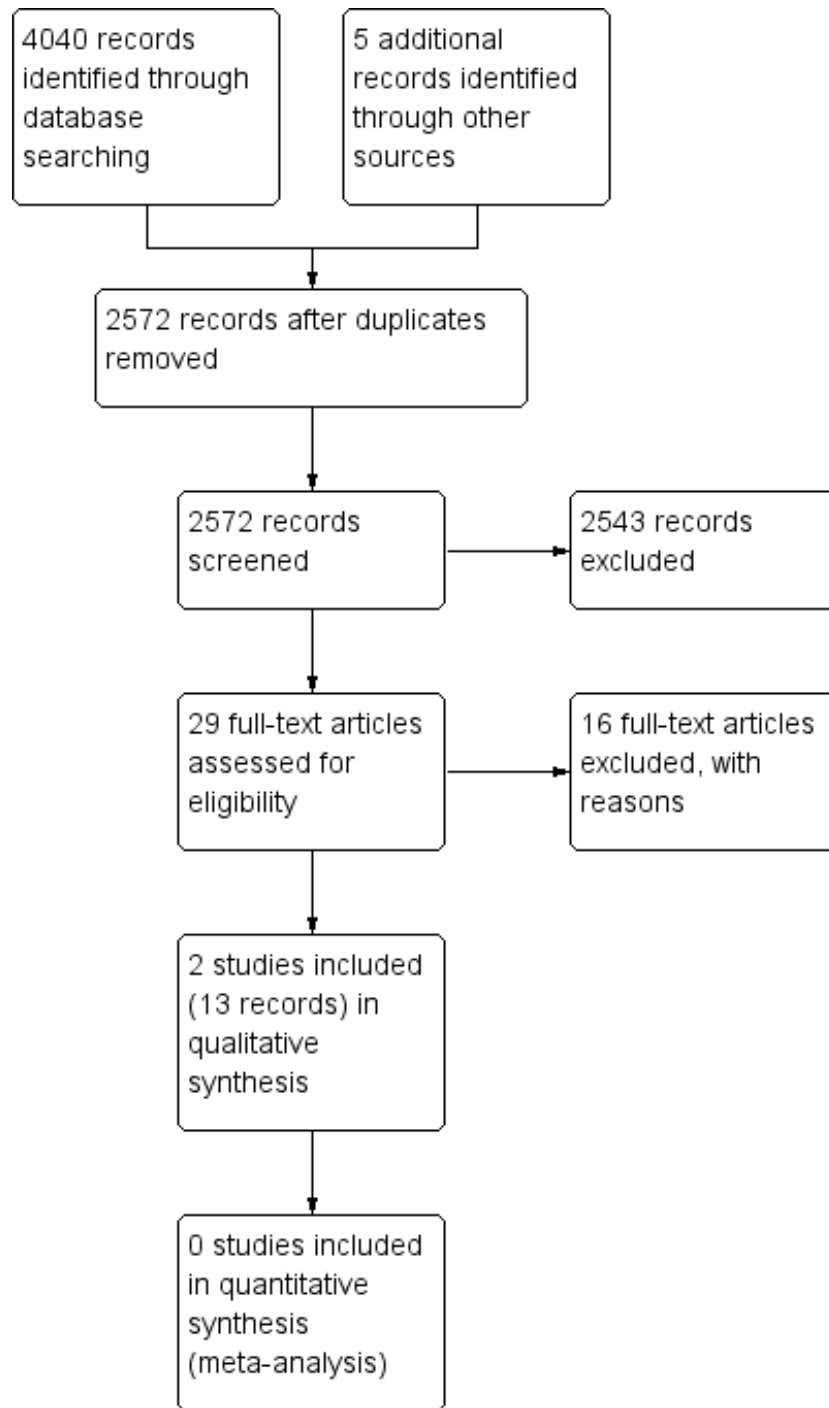
Description of studies

Results of the search

Our search, which we conducted on 18 October 2017, returned 4040 titles and abstracts. We identified five additional potentially relevant records through reviewing reference lists. After removing duplicates, we screened 2572 unique records ([Figure 1](#)). Of the records screened, we classified 29 records as 'relevant' or 'maybe relevant' and reviewed the full-text reports of these records. We excluded 16 records (14 records described studies using a non-randomized design; 2 records described studies using iridoplasty as the intervention). The remaining 13 records represented two studies with outcomes partially reported: the Asymptomatic Narrow

Angles - Laser Iridotomy Study ([ANA-LIS](#)); and the Zhongshan Angle Closure Prevention ([ZAP](#)) Trial. At the time of conducting this review, the preparations of the full reports of both trials are underway (per correspondence with trial authors) ([ANA-LIS](#); [ZAP](#)).

Figure 1. Study flow diagram.



Included studies

We included two RCTs (2502 eyes, 1251 participants) in this review (ANA-LIS and ZAP) (Characteristics of included studies). Both trials compared iridotomy versus no iridotomy. Both trials used a paired-eye design, where one eye from each participant was randomized to the iridotomy group and the fellow eye to the no iridotomy group. A full report with results is not available for either trial. For the ANA-LIS trial, preliminary results were reported in a conference abstract (ANA-LIS; Mani 2016 report). For the ZAP trial, safety results for up to two weeks post-treatment and anterior chamber angle configuration results for up to 18 months of follow-up are reported in published journal articles (ZAP; Jiang 2012 report; Jiang 2014 report). The other reports we identified for the two included studies include trial registry records, design papers, and results for nested observational studies.

Types of participants

Both trials included only participants with bilateral asymptomatic primary angle-closure suspects. ZAP further specified that participants with an IOP rise greater than 15 mmHg from baseline in the dark room prone provocative test were excluded (ZAP; Jiang 2010 report).

The ANA-LIS trial reported that participants came from three hospital sites in Singapore (ANA-LIS; Mani 2016 report). Participants in the ZAP trial were enrolled from a tertiary specialized hospital in Guangzhou, China. In both trials, there were more female participants than male participants (76% in ANA-LIS and 83% in ZAP) and the populations comprised older adults (mean age of 62.8 years in ANA-LIS and 59.4 years in ZAP).

Types of interventions

Both trials used neodymium:yttrium-aluminum-garnet (Nd:YAG) laser iridotomy in the laser group while the control group received no iridotomy. In ANA-LIS, investigators noted that laser peripheral iridotomy was performed in one randomly selected eye per patient by sequential argon and Nd:YAG laser after pretreatment with 2% pilocarpine instilled into the eye (ANA-LIS; How 2012 report). In this trial, argon settings of 500 mW to 1000 mW power with a spot size of 50 μm for a duration of 0.05 seconds and a yttrium-aluminum-garnet setting of 2 mJ to 5 mJ were used (ANA-LIS; How 2012 report). In the ZAP trial, the trial authors noted specifically that participants also received one drop of brimonidine 0.15% and pilocarpine 2% in the intervention eye 15 minutes before treatment (ZAP; Jiang 2012 report). Iridotomy was performed using the YAG laser, starting at an initial setting of 1.5 mJ (ZAP; Jiang 2012 report).

Types of outcomes

Proportion of participants with progressive visual field loss

The ANA-LIS trial specified measuring visual field loss by automated perimetry as an outcome in the trial registration (ANA-LIS; NCT00347178 report). It is unclear how the ZAP trial assesses visual field loss. At the time of this review, no data are available on the proportion of participants with progressive visual field loss at one year.

Mean change in IOP

Both the ANA-LIS and ZAP trial specified measuring changes in IOP (ANA-LIS; NCT00347178 report; ZAP; ISRCTN45213099 report). At the time of this review, no data are available on the mean change in IOP at one year. The ZAP trial reported findings for this outcome at the 1-hour and 2-weeks follow-up periods (ZAP; Jiang 2012 report). We did not assess these results because they fall outside of our pre-specified time point of one year and are intended to assess acute risks of treatment rather than benefit.

Gonioscopic findings

Both the ANA-LIS and ZAP trial specified reporting on gonioscopic findings (ANA-LIS; NCT00347178 report; ZAP; ISRCTN45213099 report). The ZAP trial reported angle width as measured by a Goldmann-type, 1-mirror gonioscopic lens as well as anterior segment optical coherence tomography at 18 months (ZAP; Jiang 2014 report). At the time of this review, no other data are available on gonioscopic findings at one year.

Need for additional surgery

Neither the ANA-LIS nor the ZAP trial specified measuring need for additional surgery. At the time of this review, no data are available on the need for additional surgery at one year.

Number of medications to control IOP

Neither the ANA-LIS nor the ZAP trial specified measuring number of medications to control IOP. At the time of this review, no data are available on the number of medications to control IOP at one year.

Mean change in BCVA

Neither the ANA-LIS nor the ZAP trial specified measuring change in BCVA. At the time of this review, no data are available on the mean change in BCVA at one year.

Quality of life

Neither the ANA-LIS nor the ZAP trial specified measuring quality of life. At the time of this review, no data are available on quality of life.

Adverse events

Both the ANA-LIS and ZAP trial specified reporting adverse events. The ZAP trial has reported adverse events in terms of IOP spikes (defined as IOP increase ≥ 8 mmHg at 1 hour post-treatment) (ZAP; Jiang 2012 report). At the time of this review, no other data are available on adverse events.

Excluded studies

We excluded 16 articles after reviewing full-text reports (Figure 1): 14 reports were not of RCTs and two reports examined iridoplasty. We provide our reasons for exclusion in the [Characteristics of excluded studies](#).

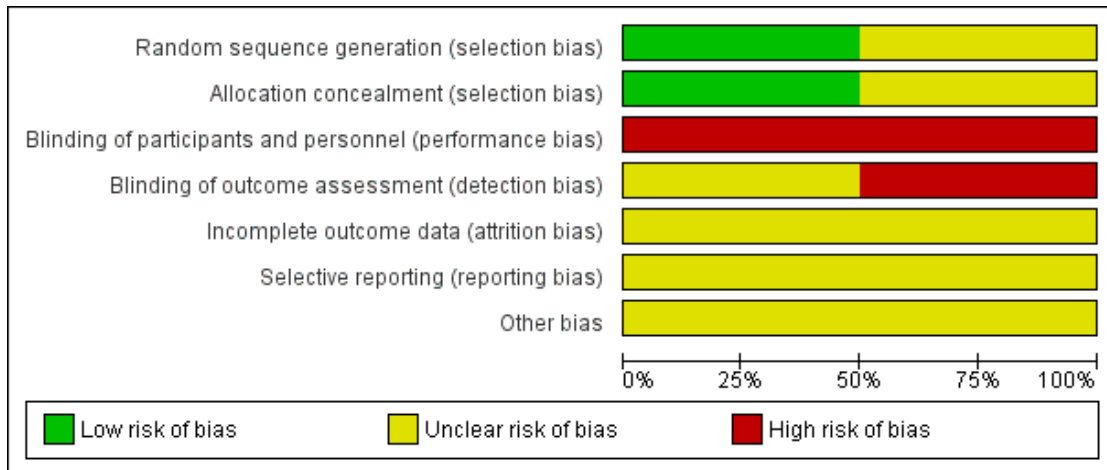
Risk of bias in included studies

A summary of risk of bias assessments for each trial is shown in [Figure 2](#) and [Figure 3](#). No information on method of randomization or allocation is available for the ANA-LIS trial, and we assessed this trial as having unclear risk of selection bias. We assessed the ZAP trial at low risk of bias for both reporting the random sequence generation procedure and allocation concealment before randomization (ZAP; Jiang 2010 report). The trial registry record for ANA-LIS describes this trial as an “open-label” trial, therefore we assessed this trial as having high risk of bias for performance and detection bias (ANA-LIS; NCT00347178 report). The ZAP trial registry record describes the trial as “not masked” and we assessed this trial as having high risk of performance bias (ZAP; ISRCTN45213099 report). The research nurse who assessed IOP using Goldmann applanation tonometry in the ZAP trial “was unaware of the treatment status of each eye” (ZAP; Jiang 2012 report). Gonioscopy was performed by “an examiner who was masked to the findings collected at other visits” (ZAP; Jiang 2014 report). No information has been reported on the masking of outcome assessors for other outcomes. Accordingly, we assessed this trial as having unclear risk of detection bias overall. Because the full trial reports are not yet available, we assessed both trials as having unclear risk of bias for incomplete outcome data, selective reporting, and other potential sources of bias. We have noted that neither trial received industry funding.

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
ANA-LIS	?	?	-	-	?	?	?
ZAP	+	+	-	?	?	?	?

Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.



Effects of interventions

See: [Summary of findings for the main comparison Iridotomy compared to no iridotomy for patients with primary angle-closure suspect, primary angle closure, or primary angle-closure glaucoma](#)

Proportion of participants with progressive visual field loss

No trial has reported on proportion of participants with progressive visual field loss.

Mean change in IOP

No trial has reported on change in IOP at one year.

Gonioscopic findings

Data for angle width were reported in an analysis of longitudinal changes in 1550 eyes in the ZAP trial (ZAP; Jiang 2014 report). Eyes randomized to iridotomy had a larger angle width (24.0°, 95% CI 23.5° to 24.5°) than eyes randomized to no iridotomy (11.3°, 95% CI 10.9° to 11.7°) (MD 12.70°, 95% CI 12.06° to 13.34°). Using the GRADE approach, we assessed the certainty of the evidence for this outcome as moderate, downgrading for risk of bias.

Need for additional surgery

No trial has reported need for additional surgery.

Number of medication to control IOP

No trial has reported number of medication needed to control IOP.

Mean Change in BCVA

No trial has reported mean change in BCVA.

Quality of life

No trial has reported on quality of life measures.

Adverse events

Data for IOP spikes were reported for 1468 eyes in the ZAP trial. The trial found that eyes undergoing iridotomy were significantly more likely to experience IOP spikes than untreated eyes (9.8% of treated eyes vs 0.4% of untreated eyes, RR 24.00, 95% CI 7.60 to 75.83) (ZAP; Jiang 2012 report). We assessed the certainty of the evidence for this outcome as low, downgrading for risk of bias and imprecision.

DISCUSSION

Summary of main results

We found two RCTs (2502 eyes of 1251 participants) evaluating iridotomy with Nd:YAG laser compared with no iridotomy

(the ZAP and ANA-LIS trials). We were unable to synthesize data quantitatively in a meta-analysis because full reports of these trials are not yet available, and data were sparse for outcomes specified in this Cochrane Review. We were not able to assess the benefit of iridotomy compared to no iridotomy in eyes of patients with PACS, PAC, or PACG based on available data from RCTs. Evidence from one trial suggests that iridotomy increases angle width up to 18 months after treatment (ZAP; Jiang 2014 report) and may be associated with IOP spikes (ZAP; Jiang 2012 report).

Overall completeness and applicability of evidence

For all but two outcomes specified for this review, no data were available for analysis. Information for one of the two trials was available in a conference abstract (ANA-LIS), which provided limited details on study design and methods, participant characteristics, and outcome measures. For the ZAP trial, there are some 2-week and 18-month follow-up data available, but these data were published before the trial finished enrollment. We were not able to conduct any meta-analyses.

Both studies took place in Asia (Singapore and China), the region with the highest prevalence of angle-closure glaucoma (Quigley 2006; Tham 2014). All participants were adults over 50 years of age who had been diagnosed with bilateral PACS on gonioscopy. The full trial reports, when available, may help in assessing the overall completeness and applicability of the evidence.

Quality of the evidence

Based on currently available information, we assessed the overall certainty of the evidence as low to moderate due to concerns with risk of bias and imprecision. We identified no RCTs reporting on progression of visual field loss at one year.

Potential biases in the review process

We followed the standard Cochrane methods outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* to minimize potential for introducing biases in the review process (Higgins 2011). We worked with a medical informationist to conduct a highly sensitive search to identify trials meeting our pre-specified eligibility criteria. We also searched trial registries, anticipating finding few or no RCTs on this topic. The review team involved two methodologists and a clinical expert. The team members worked in pairs to independently screen, review, and extract data to minimize errors and reduce bias.

Agreements and disagreements with other studies or reviews

We found no other published systematic reviews evaluating the effectiveness of iridotomy versus no iridotomy for angle closure. Determining the effectiveness and safety of iridotomy is important but full trial data are not available. We found one trial randomizing 4725 participants to screening or no screening, which we excluded from this review because the intervention was not iridotomy (Yip 2010). Participants who screened positive with PAC, however, were offered iridotomy. This trial found that screening with iridotomy offered as a prophylactic treatment did not reduce incidence of PACG at six years (Yip 2010). Additionally, there is growing interest in examining other modalities for treating PACG, such as removing pupillary block through extraction of the lens. The EA-GLE trial, which randomized 419 participants to surgical lens extraction or iridotomy favored lens extraction for reducing IOP and improving quality of life (Azura-Blanco 2016). Among patients randomized to iridotomy, the investigators observed that IOP decreased from 30.3 mmHg (standard deviation = 8.1 mmHg) to 18.4 mmHg (standard deviation = 4.3 mmHg) at one year, but required more medical treatment to achieve this. An update of the Cochrane Review of lens extraction for management of angle-closure glaucoma is currently underway. Despite the paucity of evidence from RCTs comparing iridotomy to no iridotomy, this intervention continues to be widely used and recommended for treatment of patients with angle-closure glaucoma (AAO 2015).

AUTHORS' CONCLUSIONS

Implications for practice

The available studies directly comparing iridotomy to no iridotomy have not yet published full results. At present, we cannot draw reliable conclusions as to whether iridotomy prevents progression of visual field loss at one year compared to no iridotomy. Patients, providers, and other decision makers need to take this into account when considering treatment options for angle closure. Full publication of the results from the two studies identified may clarify the benefits of iridotomy.

Implications for research

High-quality RCTs are certainly feasible for assessing the effectiveness and safety of iridotomy for slowing the progression of visual field loss in angle-closure glaucoma. This review has identified two trials with results forthcoming. The results of these trials may clarify the remaining evidence gaps in using iridotomy to treat patients with angle closure.

ACKNOWLEDGEMENTS

We thank Kristina Lindsley, Tianjing Li, Barbara Hawkins, Sonal Singh, Andrew Law, Anupa Shah, Xuan Hui, Jennifer Evans and other members of Cochrane Eyes and Vision (CEV) for their comments and suggestions during title registration and writing the review. We thank our peer reviewers for providing comments to the review manuscript. We are also grateful to Amanda Bicket who provided feedback on the background of our review. Our proto-

col was adapted from a previous (withdrawn) protocol by Aravind Reddy and Sandra M Johnson for a Cochrane Review that was could not be completed.

We thank Lori Rosman, Information Specialist for CEV for devising and executing the electronic search strategies. We thank the methodologists and staff at CEV for assistance with full-text screening of non-English articles.

REFERENCES

References to studies included in this review

ANA-LIS {published data only}

- Ang M, Kumar R, Chew PT, Wong HT, Friedman DS, Baskaran M, et al. Effect of prophylactic laser iridotomy on the corneal endothelium in eyes with narrow drainage angles. *Investigative Ophthalmology & Visual Science* 2008;ARVO E- Abstract 1228.
- Baskaran M, Yang E, Trikha S, Kumar RS, Wong HT, He M, et al. Residual angle closure one year after laser peripheral iridotomy in primary angle closure suspects. *American Journal of Ophthalmology* 2017;**183**:111–7.
- How AC, Baskaran M, Kumar RS, He M, Foster PJ, Lavanya R, et al. Changes in anterior segment morphology after laser peripheral iridotomy: an anterior segment optical coherence tomography study. *Ophthalmology* 2012;**119**(7): 1383–7.
- Kumar RS, Baskaran M, Chew PT, Friedman DS, Handa S, Lavanya R, et al. Prevalence of plateau iris in primary angle closure suspects an ultrasound biomicroscopy study. *Ophthalmology* 2008;**115**(3):430–4.
- Kumar RS, Baskaran M, Friedman DS, Xu Y, Wong HT, Lavanya R, et al. Effect of prophylactic laser iridotomy on corneal endothelial cell density over 3 years in primary angle closure suspects. *British Journal of Ophthalmology* 2013;**97**(3):258–61.
- Mani B, Sasikumar R, Wong HT, Chew P, Foster PJ, Friedman DS, Aung T. The Singapore Asymptomatic Narrow Angles Laser Iridotomy Study (ANA-LIS): 5-year results. *Investigative Ophthalmology & Visual Science* 2016; Vol. 57, issue 12. NCT00347178. Asymptomatic narrow angles laser iridotomy study; multicentric RCT. clinicaltrials.gov/ct2/show/NCT00347178 (first received 4 July 2006).
- Sasikumar R, Baskaran M, Chew PT, Wong HT, Friedman D, Foster PJ, et al. Prophylactic laser iridotomy in eyes with narrow drainage angles: a randomized controlled trial. *Investigative Ophthalmology and Visual Science* 2007; Vol. 48:ARVO E-Abstract 3985.

ZAP {published data only}

- Congdon N, Yan X, Friedman DS, Foster PJ, Berg TJ, Peng M, et al. Visual symptoms and retinal straylight after

- laser peripheral iridotomy: the Zhongshan Angle-Closure Prevention Trial. *Ophthalmology* 2012;**119**(7):1375–82. ISRCTN45213099. Zhongshan angle-closure prevention study. www.isrctn.com/ISRCTN45213099 (date assigned 6 May 2008).
- Jiang Y, Chang DS, Foster PJ, He M, Huang S, Aung T, et al. Immediate changes in intraocular pressure after laser peripheral iridotomy in primary angle-closure suspects. *Ophthalmology* 2012;**119**(2):283–8.
- Jiang Y, Chang DS, Zhu H, Khawaja AP, Aung T, Huang S, et al. Longitudinal changes of angle configuration in primary angle-closure suspects: the Zhongshan Angle-Closure Prevention Trial. *Ophthalmology* 2014;**121**(9): 1699–705.
- Jiang Y, Friedman DS, He M, Huang S, Kong X, Foster PJ. Design and methodology of a randomized controlled trial of laser iridotomy for the prevention of angle closure in southern China: the Zhongshan angle Closure Prevention trial. *Ophthalmic Epidemiology* 2010;**17**(5):321–2.

References to studies excluded from this review

Alberti 1988 {published data only}

- Alberti M, Menchini U, Pece A, Vigano C, Brancato R. Effectivity of Nd: Yag Laser iridotomy in narrow angles after mydriatic test. *Annali di Ottalmologia e Clinica Oculistica* 1988;**114**(2):147–50.

Baeteman 2007 {published data only}

- Baeteman C, Matonti F, Cornand E, Denis D. Clinical-tomographic correlation of the iridocorneal opening following laser iridotomy [Corrélation clinico-tomographique de l'ouverture de l'angle irido-cornéen suite à une iridotomie au laser]. *Journal Francais d'Ophthalmologie* 2007;**30**(3):314–5.

Bass 1979 {published data only}

- Bass MS, Cleary CV, Perkins ES, Wheeler CB. Single treatment laser iridotomy. *British Journal of Ophthalmology* 1979;**63**(1):29–30.

Bourne, 2016 {published data only}

- Bourne RR, Sanchez-Parra L, Zhekov I, Kean J, Buckley R, Parker M, et al. Changes in anterior chamber angle morphology and diurnal intraocular pressure fluctuation following Argon Laser Peripheral Iridoplasty for angle closure, measured with Swept-source Ocular Coherence

Tomography: the IMPACT Study (NIHR ID: CCRN 8955). *Investigative Ophthalmology & Visual Science* 2016; Vol. 57:ARVO E- abstract 5612.

Defranco 1989 {published data only}

Defranco N, Battistini P, Lippera S. Treatment of chronic closed angle glaucoma with Yag laser iridoclasia. *Atti della Fondazione Giorgio Ronchi* 1989;**44**(4):827–30.

Dimopoulos 1974 {published data only}

Dimopoulos H. The use of laser for glaucoma (Greek). *Ofialchron* 1974;**11**(2-3):72–8.

Harada 1989 {published data only}

Harada T, Mizuno K, Awaya S. Yag laser iridotomies pretreated by argon laser. *Journal Francais d'Ophthalmologie* 1989;**12**(8-9):545–8.

Harada 1990 {published data only}

Harada T, Mizuno K, Hogiruchi M, Awaya S. Results of YAG-laser iridotomy in 46 eyes with occluded or occludable angle. *Folia Ophthalmologica Japonica* 1990;**41**(1):210–1.

Haut 1983 {published data only}

Haut J, Van Effenterre G, Flamand M, Camboulives D, M'Rad A. Has laser iridectomy definitely replaced surgical peripheral iridectomy in angle-closure glaucoma?. *Bulletin des Societes d'Ophthalmologie de France* 1983;**83**(10):1093–5.

He 2007 {published data only}

He M, Friedman DS, Ge J, Huang W, Jin C, Lee PS, et al. Laser peripheral iridotomy in primary angle-closure suspects: biometric and gonioscopic outcomes: the Liwan Eye Study. *Ophthalmology* 2007;**114**(3):494–500.

He 2007a {published data only}

He M, Friedman DS, Ge J, Huang W, Jin C, Cai X, et al. Laser peripheral iridotomy in eyes with narrow drainage angles: ultrasound biomicroscopy outcomes. The Liwan Eye Study. *Ophthalmology* 2007;**114**(8):1513–9.

Jin 1986 {published data only}

Jin JC, Hu C, Liu XL. Argon laser treatment for primary angle-closure glaucoma. *Yen Ko Hsueh Pao [Eye Science]* 1986;**2**(1):33–8.

Leroy 1983 {published data only}

Leroy L. Argon laser in acute glaucoma. Prevention and treatment. *Soins - Chirurgie* 1983, (28-29):54–5.

Pollack 1981 {published data only}

Pollack IP. Laser iridotomy in the treatment of angle-closure glaucoma. *Annals of Ophthalmology* 1981;**13**(5):549–50.

Schrems 1987 {published data only}

Schrems W, Hofmann G, Krieglstein GK. Neodymium YAG laser iridotomy in glaucoma with narrow chamber angle and pupillary block glaucoma. *Fortschritte der Ophthalmologie* 1987;**84**(1):72–5.

Zhekov 2016 {published data only}

Zhekov I, Sanchez-Parra L, Kean J, Buckley R, Pardhan S, Parker M, et al. Long term changes in anterior chamber angle morphology and diurnal intraocular pressure fluctuation following Laser Peripheral Iridotomy for angle closure measured with Swept-source Ocular Coherence

Tomography: the IMPACT Study (NIHR ID: CCRN 8955). *Investigative Ophthalmology and Visual Science* 2016; Vol. 57:ARVO E-Abstract 5611.

Additional references

AAO 2015

American Academy of Ophthalmology. *Primary Angle Closure (Preferred Practice Pattern)*. San Francisco: AAO, 2015.

Ang 2000

Ang LP, Aung T, Chew PT. Acute primary angle closure in an Asian population: long-term outcome of the fellow eye after prophylactic laser peripheral iridotomy. *Ophthalmology* 2000;**107**(11):2092–6.

Aung 2001

Aung T, Ang LP, Chan SP, Chew PT. Acute primary angle-closure: long-term intraocular pressure outcome in Asian eyes. *American Journal of Ophthalmology* 2001;**131**(1): 7–12.

Azuara-Blanco 2016

Azuara-Blanco A, Burr J, Ramsay C, Cooper D, Foster PJ, Friedman DS, et al. Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial. *Lancet* 2016;**388**(10052): 1389–97.

Bonomi 2002

Bonomi L. Epidemiology of angle-closure glaucoma. *Acta Ophthalmologica Scandinavica. Supplement* 2002;**236**:11–3.

Bourne 2013

Bourne RR, Stevens GA, White RA, Smith JL, Flaxman SR, Price H, et al. Causes of vision loss worldwide, 1990–2010: a systematic analysis. *Lancet Global Health* 2013;**1**(6):e339–49.

Caronia 1996

Caronia RM, Liebmann JM, Stegman Z, Sokol J, Ritch R. Increase in iris-lens contact after laser iridotomy for pupillary block angle closure. *American Journal of Ophthalmology* 1996;**122**(1):53–7.

Covidence [Computer program]

Veritas Health Innovation. Covidence. Version accessed 29 November 2017. Melbourne, Australia: Veritas Health Innovation.

Day 2012

Day AC, Baio G, Gazzard G, Bunce C, Azuara-Blanco A, Munoz B, et al. The prevalence of primary angle closure glaucoma in European derived populations: a systematic review. *British Journal of Ophthalmology* 2012;**96**(9): 1162–7.

Deeks 2011

Deeks JJ, Higgins JP, Altman DG editor(s). Chapter 9: Analysing data and undertaking meta-analyses. In: Higgins JP, Green S, editor(s). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from handbook.cochrane.org.

- Edwards 1982**
Edwards RS. Behaviour of the fellow eye in acute angle-closure glaucoma. *British Journal of Ophthalmology* 1982;**66**(9):576–9.
- EGS 2014**
European Glaucoma Society. Terminology and guidelines for glaucoma. www.eugs.org/eng/EGS-guidelines.asp (accessed 11 March 2016).
- Emanuel 2014**
Emanuel ME, Parrish RK 2nd, Gedde SJ. Evidence-based management of primary angle closure glaucoma. *Current Opinion in Ophthalmology* 2014;**25**(2):89–92.
- Fleck 1997**
Fleck BW, Wright E, Fairley EA. A randomised prospective comparison of operative peripheral iridectomy and Nd:YAG laser iridotomy treatment of acute angle closure glaucoma: 3 year visual acuity and intraocular pressure control outcome. *British Journal of Ophthalmology* 1997;**81**(10):884–8.
- Foster 2000**
Foster PJ, Johnson GJ. Primary angle closure: classification and clinical features. In: Hitchings RA editor(s). *Fundamentals of Clinical Ophthalmology*. BMJ Books, 2000: 142–52.
- Foster 2001**
Foster PJ, Johnson GJ. Glaucoma in China: how big is the problem?. *British Journal of Ophthalmology* 2001;**85**(11): 1277–82.
- Foster 2002**
Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys. *British Journal of Ophthalmology* 2002;**86**(2): 238–42.
- Friedman 2001**
Friedman DS. Who needs an iridotomy?. *British Journal of Ophthalmology* 2001; Vol. 85, issue 9:1019–21.
- Friedman 2006**
Friedman DS, Vedula SS. Lens extraction for chronic angle-closure glaucoma. *Cochrane Database of Systematic Reviews* 2006, Issue 3. DOI: 10.1002/14651858.CD005555.pub2
- GRADEpro 2015 [Computer program]**
McMaster University (developed by Evidence Prime). GRADEpro GDT. Version accessed 23 January 2018. Hamilton (ON): McMaster University (developed by Evidence Prime), 2015.
- Higgins 2003**
Higgins JB, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003;**327**(7414):557–60.
- Higgins 2011**
Higgins JB, Altman DG, Sterne JA (editors). Chapter 8: Assessing risk of bias in included studies. In: Higgins JP, Green S editor(s). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from handbook.cochrane.org.
- Kingman 2004**
Kingman S. Glaucoma is second leading cause of blindness globally. *Bulletin of the World Health Organization* 2004; Vol. 82, issue 11:887–8.
- Lim 2005**
Lim LS, Husain R, Gazzard G, Seah SK, Aung T. Cataract progression after prophylactic laser peripheral iridotomy: potential implications for the prevention of glaucoma blindness. *Ophthalmology* 2005;**112**(8):1355–9.
- Mapstone 1968**
Mapstone R. Mechanics of pupil block. *British Journal of Ophthalmology* 1968;**52**(1):19–25.
- Ng 2012**
Ng WS, Ang GS, Azuara-Blanco A. Laser peripheral iridoplasty for angle-closure. *Cochrane Database of Systematic Reviews* 2012, Issue 2. DOI: 10.1002/14651858.CD006746.pub3
- Nolan 2000**
Nolan WP, Foster PJ, Devereux JG, Uranchimeg D, Johnson GJ, Baasanh J. YAG laser iridotomy treatment for primary angle closure in east Asian eyes. *British Journal of Ophthalmology* 2000;**84**(11):1255–9.
- Osborne 2003**
Osborne NN, Chidlow G, Wood J, Casson R. Some current ideas on the pathogenesis and the role of neuroprotection in glaucomatous optic neuropathy. *European Journal of Ophthalmology* 2003;**13** Suppl 3:S19–26.
- Quigley 1981**
Quigley HA. Long-term follow-up of laser iridotomy. *Ophthalmology* 1981;**88**(3):218–24.
- Quigley 2006**
Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. *British Journal of Ophthalmology* 2006;**90**(3):262–7.
- Ramulu 2007**
Ramulu PY, Corcoran KJ, Corcoran SL, Robin AL. Utilization of various glaucoma surgeries and procedures in Medicare beneficiaries from 1995 to 2004. *Ophthalmology* 2007;**114**(12):2265–70.
- Resnikoff 2004**
Resnikoff S, Pascolini D, Etya'ale D, Kocur I, Pararajasegaram R, Pokharel GP, et al. Global data on visual impairment in the year 2002. *Bulletin of the World Health Organization* 2004;**82**(11):844–51.
- Review Manager 2014 [Computer program]**
Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager (RevMan). Version 5.3. Copenhagen: Nordic Cochrane Centre, The Cochrane Collaboration, 2014.
- Robin 1984**
Robin AL, Pollack IP. A comparison of neodymium: YAG and argon laser iridotomies. *Ophthalmology* 1984;**91**(9): 1011–6.

See 2011

See JL, Aquino MC, Aduan J, Chew PT. Management of angle closure glaucoma. *Indian Journal of Ophthalmology* 2011;**59** Suppl:S82–7.

Snow 1977

Snow JT. Value of prophylactic peripheral iridectomy on the second eye in angle-closure glaucoma. *Transactions of the Ophthalmological Societies of the United Kingdom* 1977;**97** (1):189–91.

Sterne 2001

Sterne JA, Egger M, Smith GD. Systematic reviews in health care: Investigating and dealing with publication and other biases in meta-analysis. *BMJ* 2001;**323**(7304):101–5.

Tham 2014

Tham YC, Li X, Wong TY, Quigley HA, Aung T, Cheng CY. Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. *Ophthalmology* 2014;**121**(11):2081–90.

Thomas 2003a

Thomas R, Parikh R, George R, Kumar RS, Muliylil J. Five-year risk of progression of ocular hypertension to primary open angle glaucoma. A population-based study. *Indian Journal of Ophthalmology* 2003;**51**(4):329–33.

Thomas 2003b

Thomas R, Parikh R, Muliylil J, Kumar RS. Five-year risk of progression of primary angle closure to primary

angle closure glaucoma: a population-based study. *Acta Ophthalmologica Scandinavica* 2003;**81**(5):480–5.

Yip 2010

Yip JL, Foster PJ, Uranchimeg D, Javzandulam B, Javzansuren D, Munhzaya T, et al. Randomised controlled trial of screening and prophylactic treatment to prevent primary angle closure glaucoma. *British Journal of Ophthalmology* 2010;**94**(11):1472–7.

Yu 2015

Yu T, Li T, Lee KJ, Friedman DS, Dickersin K, Puhan MA. Setting priorities for comparative effectiveness research on management of primary angle closure: a survey of Asia-Pacific clinicians. *Journal of Glaucoma* 2015;**24**(5):348–55.

Zhang 2015

Zhang ML, Hirunyachote P, Jampel H. Combined surgery versus cataract surgery alone for eyes with cataract and glaucoma. *Cochrane Database of Systematic Reviews* 2015, Issue 7. DOI: 10.1002/14651858.CD008671.pub3

References to other published versions of this review**Li 2016**

Le JT, Rouse B, Gazzard G. Iridotomy to slow progression of angle-closure glaucoma. *Cochrane Database of Systematic Reviews* 2016, Issue 6. DOI: 10.1002/14651858.CD012270

* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

ANA-LIS

Methods	<p>Study design: randomized controlled trial</p> <p>Study grouping: parallel group</p> <p>Sample size calculation: not reported</p>
Participants	<p>Enrollment: 476 participants with bilateral narrow angles from Singapore</p> <p>Baseline Characteristics:</p> <p>Overall</p> <ul style="list-style-type: none"> • Age (year) (mean, SD): 62.8 (6.9) • Female sex (n, (%)): 363 (76.3) <p>Inclusion criteria: participants with bilateral narrow angle, age 50 years and older who provide informed consent obtained prior to or at the baseline visit</p> <p>Exclusion criteria: presence of PAS, IOP > 21 mm Hg; glaucomatous optic neuropathy and/or cup-to-disc ratio > 0.7; secondary angle closure such as uveitis; neovascularization etc.; prior intraocular surgery or penetrating eye injury; corneal disorders such as corneal endothelial dystrophy except mild corneal guttae; evidence of prior acute angle closure event; high risk of acute angle closure; significant cataract and visual acuity less than 20/40; constant use of contact lens for refractive correction; chronic use of topical or systemic steroids; established retinopathies on ocular treatments (e.g. Diabetic); any other disease which is likely to cause field loss in next 3 years; severe health problems decreasing life expectancy to less than 1 year</p>
Interventions	<p>Intervention 1: iridotomy using sequential argon-neodymium-yttrium-aluminum-garnet laser with argon settings of 500 mW to 1000 mW power with a spot size of 50 mA for a duration of 0.05 seconds and a yttrium-aluminum-garnet setting of 2 mJ to 5 mJ and pretreatment with 2% pilocarpine instilled into the eye</p> <ul style="list-style-type: none"> • Use of IOP-lowering medications: none <p>Intervention 2: no treatment</p>
Outcomes	<p>Primary outcomes, per trial registration</p> <ul style="list-style-type: none"> • Peripheral anterior synechiae formation • IOP elevation > 21 mmHg • Development of acute angle-closure event <p>Secondary outcomes, per trial registration</p> <ul style="list-style-type: none"> • Changes in grading of Modified Schaffer Grading • Development of glaucomatous optic neuropathy • Development of corresponding visual field loss by automated perimetry • Change in Heidelberg Retina Tomography (HRT) optic disc parameters • Change in ultrasound biomicroscopy (UBM) angle parameters • Formation of disc pallor <p>Intervals at which outcomes assessed: 1 year, 2 years, 3 years, 4 years, and 5 years.</p>
Notes	<p>Start date: January 2005</p> <p>Funding source(s): National Medical Research Council (NMRC), Singapore</p> <p>Conflicts of interest: none</p>

Publication language: English		
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not reported in available records.
Allocation concealment (selection bias)	Unclear risk	Not reported in available records.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Trial described as "Open-label" on ClinicalTrials.gov (NCT00347178)
Blinding of outcome assessment (detection bias) All outcomes	High risk	Trial described as "Open-label" on ClinicalTrials.gov (NCT00347178)
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Full trial report not yet published.
Selective reporting (reporting bias)	Unclear risk	Full trial report not yet published.
Other bias	Unclear risk	Full trial report not yet published.

ZAP

Methods	<p>Study design: randomized controlled trial</p> <p>Study grouping: parallel group</p> <p>Sample size calculation: trial was designed to detect a 30% difference in the rate of progression from PACS to PAC; estimated 870 participants needed assuming an attrition rate up to 20%; power not reported</p>
Participants	<p>Enrollment: 775 participants from China (ZAP; Jiang 2014 report)</p> <p>Baseline Characteristics:</p> <p>Overall</p> <ul style="list-style-type: none"> • Age (year) (mean, SD): 59.4 (5.0) • Female sex (n, (%)): 640 (82.6) <p>Inclusion criteria: 'static' gonioscopy identifying 6 or more clock hours of angle circumference in which the posterior (usually pigmented) trabecular meshwork cannot be seen in both eyes</p> <p>Exclusion criteria: evidence of primary angle closure (a narrow angle as defined above, but with PAS and/or IOP > 21 mmHg) or glaucomatous optic neuropathy; age less than 50 years or greater than 70 years of age; plan to move from the area within the next 5 years; severe health problems precluding follow-up such as end-stage heart disease, kidney disease, or lung disease, or terminal cancer; prior intraocular surgery or penetrating eye injury as observed by the clinician examining the subject (i.e. not per patient report);</p>

	media opacity preventing laser iridotomy (e.g. corneal opacity); evidence of a prior acute angle closure attack (the presence of iris whorling, focal iris atrophy, or glaucomflecken with a history of an acute red eye and decreased vision); people who are unable to give their own informed consent; people with an excessively high risk of acute angle closure crisis (i.e. subjects who have a rise in IOP of > 15 mmHg on dilation with phenylephrine 5% and tropicamide 0.5% (in either eye) or a rise in IOP of > 15 mmHg after a 15-minute dark-prone provocative test); best corrected visual acuity worse than 20/40 presumed due to cataract	
Interventions	<p>Intervention 1: iridotomy using neodymium-yttrium-aluminum-garnet (Nd:YAG) laser (Visulas YAG III; Zeiss Meditec, Dublin, CA) starting at 1.5 mJ with 1 drop of pilocarpine 2% (Pharmacy of Zhongshan Ophthalmic Center, Guangzhou, China) instilled in the intervention eye 15 minutes before treatment</p> <ul style="list-style-type: none"> • <i>Use of IOP-lowering medications:</i> 1 drop of brimonidine 0.15% (Allergan, Irvine, CA) was instilled in the intervention eye 15 minutes before treatment. <p>Intervention 2: no treatment</p>	
Outcomes	<p>Primary outcomes, per trial registration</p> <ul style="list-style-type: none"> • Treatment failure, defined as meeting any of the following. <ul style="list-style-type: none"> ○ Intraocular pressure > 24 mmHg ○ Presence of peripheral anterior synechiae ○ Glaucomatous optic neuropathy <p>Secondary outcomes, per trial registration</p> <ul style="list-style-type: none"> • Specular microscopy measures of corneal endothelial cell loss • Formation of lens opacity • Anterior segment optical coherence tomography measures (qualitative and quantitative) of ocular anterior segment anatomy • Digital iris photograph measures of iris • Ultrasound biomicroscopy measurements of ocular anterior segment anatomy <p>Intervals at which outcomes assessed: 6, 18, 30, 42, 54, and 72 months</p>	
Notes	<p>Start date: March 2008</p> <p>Funding source(s): Fight for Sight; Sun Yat-sen University Clinical Research 5010 Project; Fundamental Research Funds of State Key Lab</p> <p>Conflicts of interest: none</p> <p>Publication language: English</p>	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"A computer-generated list of random numbers was used to select the eye to be treated by LPI."
Allocation concealment (selection bias)	Low risk	"The random number was kept in a sealed envelope with the corresponding sequential number written on the cover and was opened by a masked research nurse prior to

ZAP (Continued)

		LI treatment.”
Blinding of participants and personnel (performance bias) All outcomes	High risk	“Single centre randomised controlled trial (not masked)”
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Intraocular pressure was measured by a research nurse who was unaware of treatment status of each eye; however, there is insufficient information for all outcomes
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Full trial report not yet published. Only immediate IOP change, risk factors for IOP spikes, and angle width after laser treatment in PACGs treated by prophylactic LPI is reported for this trial. The data on other outcomes from the RCT are not reported though secondary analysis using nested observational designs have been published
Selective reporting (reporting bias)	Unclear risk	Full trial report not yet published.
Other bias	Unclear risk	Full trial report not yet published--limited amount of data has been reported

IOP: intraocular pressure

PI: laser peripheral iridotomy

PACG: primary angle-closure glaucoma

PAS: peripheral anterior synechiae

RCT: randomized controlled trial

SD: standard deviation

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Alberti 1988	Study design did not meet the eligibility criteria
Baeteman 2007	Study design did not meet the eligibility criteria
Bass 1979	Study design did not meet the eligibility criteria
Bourne, 2016	Intervention did not meet the eligibility criteria
Defranco 1989	Study design did not meet the eligibility criteria

(Continued)

Dimopoulos 1974	Study design did not meet the eligibility criteria
Harada 1989	Study design did not meet the eligibility criteria
Harada 1990	Study design did not meet the eligibility criteria
Haut 1983	Study design did not meet the eligibility criteria
He 2007	Study design did not meet the eligibility criteria
He 2007a	Study design did not meet the eligibility criteria
Jin 1986	Study design did not meet the eligibility criteria
Leroy 1983	Study design did not meet the eligibility criteria
Pollack 1981	Study design did not meet the eligibility criteria
Schrems 1987	Study design did not meet the eligibility criteria
Zhekov 2016	Intervention did not meet the eligibility criteria

DATA AND ANALYSES

Comparison 1. Iridotomy vs No treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Angle Width	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Adverse events	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
2.1 IOP spike (rise greater than or equal to 8 mmHg) at 1 hour	1		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 1.1. Comparison 1 Iridotomy vs No treatment, Outcome 1 Angle Width.

Review: Iridotomy to slow progression of visual field loss in angle-closure glaucoma

Comparison: 1 Iridotomy vs No treatment

Outcome: 1 Angle Width

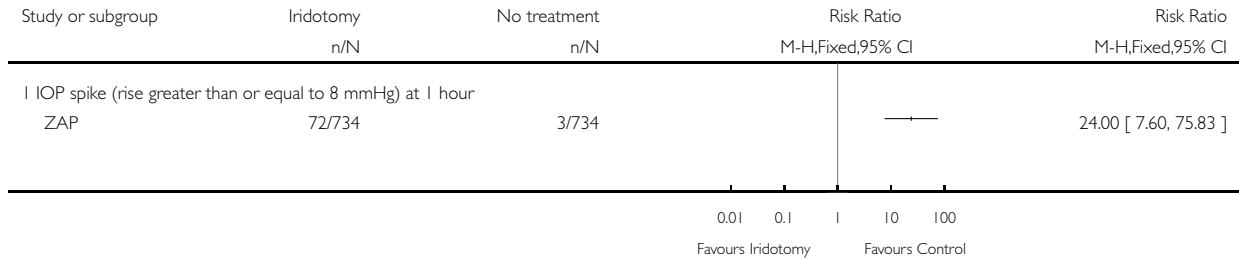


Analysis 1.2. Comparison 1 Iridotomy vs No treatment, Outcome 2 Adverse events.

Review: Iridotomy to slow progression of visual field loss in angle-closure glaucoma

Comparison: 1 Iridotomy vs No treatment

Outcome: 2 Adverse events



ADDITIONAL TABLES

Table 1. AAO summary of clinical findings defining angle-closure diseases

	Primary angle-closure suspect (PACS)	Primary angle closure (PAC)	Primary angle-closure glaucoma (PACG)
Iridotrabecular contact greater than or equal to 180°	X	X	X
Elevated intraocular pressure OR peripheral anterior synechiae		X	X
Optic nerve damage			X

APPENDICES

Appendix 1. CENTRAL search strategy

- #1 MeSH descriptor: [Glaucoma, Angle-Closure] explode all trees
- #2 (angle* near/3 closure*)
- #3 (angle* near/3 close*)
- #4 (Uncompensat* near/2 glaucoma*)
- #5 (Narrow* near/2 angle*)
- #6 (occlude* near/3 angle*)
- #7 Acute glaucoma*
- #8 (APAC or AACG or PACG or PACS)
- #9 pupillary block glaucoma*
- #10 {or #1-#9}
- #11 MeSH descriptor: [Laser Therapy] explode all trees
- #12 MeSH descriptor: [Lasers] explode all trees
- #13 Laser*
- #14 (iridotom* or LPI)
- #15 {or #11-#14}
- #16 #10 AND #15

Appendix 2. MEDLINE (Ovid) search strategy

- 1. exp Glaucoma, Angle-Closure/
- 2. (angle* adj3 closure*).tw.
- 3. (angle* adj3 close*).tw.
- 4. (Uncompensat* adj2 glaucoma*).tw.
- 5. (Narrow* adj2 angle*).tw.
- 6. (occlude* adj3 angle*).tw.
- 7. Acute glaucoma*.tw.
- 8. (APAC or AACG or PACG or PACS).tw.
- 9. pupillary block glaucoma.tw.
- 10. or/1-9
- 11. exp Laser Therapy/
- 12. exp Lasers/
- 13. Laser*.tw.
- 14. (iridotom* or LPI).tw.
- 15. or/11-14
- 16. 10 and 15

Appendix 3. Embase.com search strategy

- #1 'closed angle glaucoma'/exp
- #2 (angle* NEAR/3 closure*):ab,ti
- #3 (angle* NEAR/3 close*):ab,ti
- #4 (uncompensat* NEAR/2 glaucoma*):ab,ti
- #5 (narrow* NEAR/2 angle*):ab,ti
- #6 (occlude* NEAR/3 angle*):ab,ti
- #7 (acute NEAR/1 glaucoma*):ab,ti
- #8 apac:ab,ti OR aacg:ab,ti OR pacg:ab,ti OR pacs:ab,ti
- #9 ('pupillary block' NEAR/2 glaucoma):ab,ti
- #10 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9

#11 'low level laser therapy'/exp
 #12 'laser'/exp
 #13 laser*:ab,ti
 #14 'iridotomy'/exp
 #15 iridotom*:ab,ti OR lpi:ab,ti
 #16 #11 OR #12 OR #13 OR #14 OR #15
 #17 #10 AND #16

Appendix 4. PubMed search strategy

1. (angle*[tw] AND closure*[tw]) NOT Medline[sb]
2. (angle*[tw] AND close*[tw]) NOT Medline[sb]
3. (Uncompensat*[tw] AND glaucoma*[tw]) NOT Medline[sb]
4. (Narrow*[tw] AND angle*[tw]) NOT Medline[sb]
5. (occlude*[tw] AND angle*[tw]) NOT Medline[sb]
6. Acute glaucoma*[tw] NOT Medline[sb]
7. (APAC[tw] or AACG[tw] or PACG[tw] or PACS[tw]) NOT Medline[sb]
8. pupillary block glaucoma[tw] NOT Medline[sb]
9. #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8
10. Laser*[tw] NOT Medline[sb]
11. (iridotom*[tw] OR LPI[tw]) NOT Medline[sb]
12. #10 OR #11
13. #9 AND #12

Appendix 5. LILACS search strategy

("Glaucoma de Ángulo Cerrado" OR "Glaucoma de ngulo Fechado" OR MH:C11.525.381.056\$ OR (angle\$ AND (closure\$ OR close\$ OR narrow\$ OR occlude\$)) OR (Uncompensat\$ glaucoma\$) OR (Acute glaucoma\$) OR (pupillary block glaucoma\$) OR APAC OR AACG OR PACG OR PACS) AND (Laser\$ OR iridotom\$ or LPI OR MH:E02.594\$ OR MH:E04.014.520\$ OR MH:E07.632.490\$ OR MH:E07.710.520\$ OR MH:SP4.011.087.698.384.075.166.027\$ OR MH:VS2.006.002.009\$)

Appendix 6. ClinicalTrials.gov search strategy

Angle closure glaucoma OR Acute glaucoma OR pupillary block glaucoma

Appendix 7. WHO ICTRP search strategy

Angle closure glaucoma OR Acute glaucoma OR pupillary block glaucoma OR narrow-angle glaucoma OR uncompensated glaucoma OR uncompensative glaucoma

CONTRIBUTIONS OF AUTHORS

JL, BR, and GG designed and wrote the protocol.

JL and BR screened studies for inclusion.

JL and BR extracted data from studies.

JL, BR, and GG drafted the final review and will be responsible for updates.

DECLARATIONS OF INTEREST

JL: none known.

BR: none known.

GG has received travel funding and both educational and unrestricted research funding from pharmaceutical and equipment manufacturers that are involved in the treatment of glaucoma; however none of the funding is otherwise related to (or competing with) the subject of this review.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- Cochrane Eyes and Vision US Project, supported by cooperative agreement 1 U01 EY020522, National Eye Institute, National Institutes of Health, USA.
- Epidemiology and Biostatistics of Aging Training Program, T32 AG000247, National Institute on Aging, National Institutes of Health, USA.
- JL is a doctoral candidate supported by the Epidemiology and Biostatistics of Aging Training Program.
National Institute for Health Research (NIHR), UK.
- Richard Wormald, Co-ordinating Editor for Cochrane Eyes and Vision (CEV) acknowledges financial support for his CEV research sessions from the Department of Health through the award made by the NIHR to Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology for a Specialist Biomedical Research Centre for Ophthalmology.
- This review was supported by the NIHR, via Cochrane Infrastructure funding to the CEV UK editorial base.

The views expressed in this publication are those of the authors and not necessarily those of the NIHR, NHS, or the Department of Health.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We added methods for assessing the certainty of the evidence and presenting outcomes in a 'Summary of findings' table in accordance with revised Cochrane standards and GRADE. We revised our background to be more concise and clarified that comparator (observation) refers to no iridotomy. For our secondary outcomes, we also considered data for longer-term follow-up closest to one year if trials did not report outcomes at one year.

Methods not implemented

We did not conduct a meta-analysis as planned because data are not available for all outcomes and the full reports of the trials are still under preparation. Accordingly, we did not perform assessment of reporting biases, subgroup analyses and sensitivity analyses.