Laparoscopic resection of pancreatic neck lesion with Roux-en-Y pancreatico-jejunostomy

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ABSTRACT

Background: Congenital hyperinsulinism is a rare disease and patients not responding to medical treatment need near-total or partial pancreatectomy, dependent on whether they have diffuse or focal hyperinsulinism, respectively. While laparoscopic technique for distal and for total pancreatectomy has been developed, minimally invasive resection of the pancreatic neck with pancreatico-jejunostomy has not been reported in children before.

Case summary: A 2-year old boy suffered from congenital hyperinsulinism, which was refractory to high-dose medical treatment. The nuclear-medicine scan revealed a focal lesion of the pancreatic neck, hence partial pancreatectomy was indicated. On laparoscopy, a slightly prominent tissue mass was apparent in the area of the pancreatic neck. We proceeded with laparoscopic mobilisation of the pancreas from the underlying splenic vessels and resected the pancreatic neck and adjacent parts of the body and the head. After macroscopic resection of the mass, the patient's intraoperative blood glucose levels increased to a point where insulin had to be substituted. To drain the pancreatic tail, we formed an end-to-side anastomosis in the proximal Jejunum and brought the open end to the pancreatic tail and performed a laparoscopic pancreatico-jejunostomy. The patient tolerated the procedure well and had no remaining signs or symptoms of hyperinsulinism.

Conclusion: This is the first report of a laparoscopic middle-segmental pancreatic resection with laparoscopic assisted Roux-en-Y pancreatico-jejunostomy in a child. For benign pancreatic lesions proximal to the body and tail, the described minimally invasive technique should be considered.

1. Introduction

Congenital hyperinsulinism (HI) occurs in 1–1.4 neonates of 50’000 live births [1–3]. However, it is more common up to 1 in 2500 in consanguineous populations. Patients who do not respond to medical treatment require partial or near-total pancreatectomy for focal or diffuse HI, respectively [4]. While open surgical technique is still the most commonly chosen approach for subtotal pancreatectomy in cases of diffuse HI, minimally invasive surgery (MIS) is an alternate approach for focal lesions, especially when they are located in the pancreatic tail [5]. Imaging studies combining data from computed tomography and nuclear medical scans can be particularly helpful in preoperative planning in focal disease [6,7]. Intraoperative frozen sections are indispensable for confirming the diagnosis and determining the extent of resection for both, diffuse and focal forms of HI. Herein, we present a case of focal congenital HI, with challenging intraoperative decision making and the first description of a paediatric minimally invasive resection of the pancreatic neck and body with laparoscopic pancreatico-jejunostomy.

2. Case report

A 2-year old boy with congenital HI with paternal ABCC8 mutation had intermittent hypoglycaemic episodes despite being on intensive feeding regime (3-hourly bolus feeds and overnight continuous feeds via gastrostomy), high-dose treatment with Octreotide at 39 μg/kg/day and Sirolimus 0.8 mg twice daily (3.2 mg/m²/day). The child had maximum fasting tolerance of 3 h. A focal lesion of the pancreatic neck was confirmed on a 18F-DOPA PET scan done 4 weeks prior to the planned operation (Fig. 1). A peripherally inserted central catheter (PICC) was placed 3 days preoperatively.

After induction of anaesthesia a single dose of Co-Amoxicillin was administered, and an epidural catheter was placed. We placed a 10 mm Hasson port supra umbilically and working ports in both flanks. After entering the lesser sac through the gastrocolic ligament, we placed a Nathanson liver retractor to elevate the stomach, which provided access to the pancreas. We identified a tissue mass in the neck area (Fig. 1). Freening up the cranial border of the pancreas using hook cautery followed by separating the pancreas from the splenic vessels starting at the lower border of the pancreatic body allowed complete transection of the pancreatic body distal to the perceived nodular mass (Fig. 2). We
A PET contrast enhanced CT scan at the monic transection of the pancreas was carried out using a laparoscopic Har-towards the neck until the mass with the adjacent normal appearing then continued the separation of the pancreas from the splenic vessels changes of a focal lesion responsible for HI (Fig. 3). Therefore, we macroscopically, the transected mass had a fibrous appearance and measured 6 mm by 7 mm (Fig. 3). On Hematoxylin-Eosin (HE)-stained frozen sections, there were sporadic islet cell hypertrophy without the clear presence of enlarged islets which made it difficult to confirm the lesion was completely removed at frozen section; only the im-munohistochemical stains done the following days showed the typical changes of a focal lesion responsible for HI (Fig. 3). Therefore, we carried out the dissection further first towards the pancreatic tail and then towards the head to remove two additional specimens (Fig. 4), which both showed normal macroscopic appearance as well as normal microscopic structure on HE-stained frozen sections. Following removal of the mass, the patient's blood glucose levels started to increase in-traoperatively and reached a peak of 17.4 mmol/L on a glucose infusion rate of 5 mg/kg/min, requiring insulin infusion. Despite the lack of histologic confirmation of removal of the lesion, we considered it substantive resected based on the macroscopic appearance, the prelimi-nary finding of the frozen sections, and on the hyperglycaemic re-sponse. As the preserved pancreatic tail was more than 5 cm long, we substantially resected based on the macroscopic appearance, the pre-standing immunosuppressive treatment. A recent ultrasound showed complete resolution of the collection and no pancreatic duct dilatations.

3. Discussion

Congenital HI is arguably the most common disease requiring pancreatic resection in infants and toddlers, other indications such as pancreatic neoplasms or chronic pancreatitis are exceedingly rare in this age group. The type of disease determines the extent of pancreatic resection; in focal disease, only as much tissue is resected as to safely remove the pathologic mass.

Open operation is still the most common approach for near-total pancreatectomy in cases of diffuse HI [10,11], although the technique of laparoscopic near-total pancreatectomy has been developed and described [5,12]. The open approach in general has several advantages, it does not only allow for palpation of the pancreas for masses or nodules, it also permits easier access for intraoperative ultrasound than laparoscopy. Intraoperative ultrasound is often essential to locate an insulinoma and to avoid injury to the pancreatic duct [13-16]. On the other hand, there are several reports of laparoscopic pancreatic resec-tions, especially with focal lesions within the pancreatic tail [5,12,17,18]. Surgeons may choose a laparoscopic approach for its reduced morbidity and pain and avoidance of the undesirable cosmetic result of an upper transverse laparotomy; some also report much earlier oral feeding and shorter hospitalization after laparoscopic resection compared to open [18-20]. The use of intraoperative ultrasound is also recommended for laparoscopic resections [15,19]. However, laparo-scopic ultrasound may not be available in a paediatric hospital. Fur-thermore, some reports raise the concern of an increased likelihood of incomplete resection and the subsequent need for re-operation after laparoscopic pancreatectomy [21]. Leakage of pancreatic fluid and fistula formation is an additional concern with minimally invasive pancreatectomy and pancreatecto-jejunostomy [22]. In our case, output from the drain placed in the lesser sac decreased over time and subsided spontaneously on postoperative day 10. Overall, minimally invasive pancreatectomy has important limitations; yet, successful laparoscopic operations also offers distinct benefits to the patient.

In case of focal HI – such as in our patient – the mass can frequently be enucleated resulting in a less than 5% loss of pancreatic tissue [16]. However, some patients with head or neck lesions of the pancreas still require a proximal pancreatectomy and thus a pancreatico-jejunostomy; additionally, enucleation can lead to injury of the pancreatic duct [14,16]. In our case, at the point where we were confident that we had removed the lesion, we had three options. First, to remove the remaining tail, leaving less than 50% of pancreatic tissue having removed already some of the head of the pancreas with the long-term risk
of diabetes. Second, to do an open pancreatico-jejunostomy to collect and drain the secretions produced by the pancreatic tail. Third, to perform the latter procedure laparoscopically, which we decided to do to avoid a laparotomy with all its consequences. A drainage technique for middle segmental pancreatic resections has been described after resection of benign pancreatic body lesions operated in an open fashion [23,24]. An earlier case report of laparoscopic resection of a pancreatic cystadenoma in a 55 year old woman described an end-to-side anastomosis to assure drainage of the remaining distal pancreas [25].

The fact that frozen sections of a macroscopically identified mass had a normal appearance after HE-staining led to an intraoperative decision-making dilemma. We considered cautery artefact as a potential reason why sections of the mass did not display HI typical features; however, no heat-induced changes were detected in the sections through the mass. To reduce cautery artefacts, some recommend sharp dissection for enucleation and transection of the distal pancreas in case of a proximal pancreatectomy [10]. Also, focal lesions might feature tentacles extending into otherwise healthy surrounding pancreatic tissue. Therefore, confirmation of complete excision on frozen sections is generally our standard [5]. However, since not even the macroscopic mass displayed the HI-typical changes on frozen sections, we were unable to assess eventual outgrowths from the mass until we had confirmation of complete removal using immunohistochemical staining.
We are currently investigating whether long-standing Sirolimus treatment affects microscopic appearance of hyper productive pancreatic islet cells.

To the best of our knowledge, we are herein reporting the first paediatric case of a laparoscopically performed middle segmental pancreatic resection with laparoscopic Roux-en-Y pancreatico-jejunostomy. We suggest considering this approach for similar cases, since it combines superior intraoperative visualisation with reduced surgical trauma and thus diminished postoperative pain and favourable cosmesis.

Acknowledgement

Consent

The patient's family agreed to the anonymised publication of the case.

Author's contributions

MS: Drafting of manuscript, critical revision of manuscript, creating of figures.
PS: Critical revision of manuscript.

Fig. 4. A) Laparoscopic separation of pancreatic body from the underlying splenic vessels to resect a short segment of pancreas distal to the already resected neck.
B) Schematic illustration of the intraoperative situ.
C) View of the jejunal limb brought out through the slightly extended umbilical incision, prepared for the pancreatico-jejunal anastomosis after forming the foot-point anastomosis.
D) Laparoscopic view of the jejunal limb juxtaposed to the pancreatic tail after bringing the jejunum through the transverse mesocolon and fashioning the posterior part of the anastomosis.
E) Schematic representation of intraoperative situs after completion of the dorsal part of the anastomosis.

Fig. 5. A) Picture of the laparoscopically completed pancreatico-jejunal anastomosis before drain placement.
B) Schematic drawing of the pancreatico-jejunal anastomosis.
C) Photograph of the immediate postoperative appearance of the patient's abdomen with the drain and the previously placed percutaneous endoscopic gastrostomy (PEG) in situ.
D) Photograph of the patient's abdomen 3 months after the operation, showing the well healed short wounds of the trocar sites.
MA: Critical revision of manuscript.
PDC: Conception and critical revision of manuscript.

Disclosure statement

No competing financial interests exist.

Patient consent

The patient’s parents agreed to the publication of the case and the included pictures.

Funding

P.D.C. is supported by National Institute for Health Research (NIHR-RP-2014-04-046). All research at Great Ormond Street Hospital NHS Foundation Trust and UCL Great Ormond Street Institute of Child Health is made possible by the NIHR Great Ormond Street Hospital Biomedical Research Centre. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Conflict of interest

The following authors have no financial disclosures: MS, PS, MA, PDC.

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