

Laparoscopic Enucleation of Benign Pancreatic Tumours

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Abstract

Benign pancreatic tumour enucleations have been performed since 1996. Endocrine tumours (ET) are rare yet they represent about 2/3 of the laparoscopic enucleations, a topic still in debate. The preoperative imaging routinely comprises a CT scan, but endoscopic ultrasound is mandatory for localizing the tumour and guided biopsy-aspiration. Trocars have to be positioned to avoid "fencing" with the instruments. A Kocher procedure may be necessary for accessing deep or posterior tumours. The bipolar electrocautery and harmonic scalpel ensure better haemostasis than the monopolar cautery hook. The raw surface can be covered with haemostatics or fibrin glue. The mean operating time is about two hours. Forced conversions, due mainly to haemorrhage or insufficient exposure, are uncommon (9%). Pancreatic fistula, the main postoperative complication, affects up to one third of the patients and does not depend on the choice of dissection instruments, management of the remaining cavity or somatostatin use. The main risk factor is the location of the tumour at less than 2 mm from the main pancreatic duct. The necrotic pancreatitis, the pancreatic pseudocyst and the duodenal fistula contribute to a surgical morbidity up to 60%. Although safe and technically feasible, enucleation might be considered as a procedure with high morbidity score.

Keywords: benign tumours, enucleation, laparoscopic, pancreas

Introduction

The laparoscopic approach in major pancreatic surgery dates back to the mid '90, but it still represents an option only in few tertiary specialised centres due to the complexity of the approach (Underwood and Soper, 1999). However, in the light of general tissue preserving surgery, laparoscopic enucleation and atypical resection for benign pancreatic tumours have gained acceptance and have been performed since 1996 (Costi *et al.*, 2013a). Enucleation may be defined as the removal of a mass by dissecting it around its limits, without resecting any healthy tissue.

Endocrine tumours (ET) are rare yet they represent about 2/3 of the laparoscopic enucleations (Brient *et al.*, 2012). Insulinoma and gastrinoma are the most common functional ET's (Kianmanesh *et al.*, 2008). Mucinous and serous cystadenomas and other benign tumours appear in case-reports (Giger *et al.*, 2006). Schwannoma (Wu *et al.*, 2005), fibrous tumour (Miyamoto *et al.*, 2007), pancreatic polypeptide secreting tumours (PPomas) (Kuo *et al.*, 2008) or dermoid cyst (Vermeulen *et al.*, 1990) are limited findings.

Technical feasibility and short term efficacy are proven mostly by case reports and small retrospective multicentric

studies. The largest unicentric data presents 29 consecutive cases of laparoscopic enucleations (Costi *et al.*, 2013 a). The authors' personal experience is limited to a single case of serous cystadenoma.

Case selection and technical details related especially to the management of the raw surface after the removal of the mass are among the topics which raise interest (Zhang *et al.*, 2016).

By reviewing the existing data on this topic, the authors tried to encourage the laparoscopic approach, which could be safely used in more cases than it is nowadays. The reasons for this are the optimised preoperative imaging, widely available intraoperative ultrasound and safe haemostatic devices.

The preoperative assessment

Preoperative imaging routinely includes a CT scan, but endoscopic ultrasound is mandatory for localizing the tumour and allowing, if considered necessary, a guided biopsy/aspiration (Costi *et al.*, 2013 a). EUS-guided (Endoscopic ultrasound) fine needle tattooing is an alternative method of localization in case of lack of laparoscopic ultrasound (Vaidakis *et al.*, 2010). In cases of

cystic tumours ERCP (Endoscopic retrograde cholangiopancreatography) may be useful for showing no contact between the main pancreatic duct and the tumour (Mori *et al.*, 1995).

The surgical technique and procedure steps

The semi-Fowler's supine position, with the legs in abduction, seems to be generally accepted. The disposition of the surgical team can vary considering the location of the tumour, the procedure performed and the individual preference. By changing the surgeon's position and tilting the table laterally access may be improved.

Two monitors, a harmonic scalpel, bipolar electrocautery forceps and routine laparoscopic instruments are necessary. A 0° laparoscope held by a robotic arm guided by vocal control is recommended by experienced surgeons (Costi *et al.*, 2013 a) but a 30° optic may offer better perspective in difficult situations. The flexible laparoscopic ultrasound offers vital information on the position and relations of the tumour with the pancreatic duct and vessels.

A nasopancreatic drainage stent (NPDS) placed endoscopically prior to surgery helps to delineate the main pancreatic duct during ultrasonography (Misawa *et al.*, 2013).

A right sided procedure aiming at the head and uncus necessitates 4-5 trocars in the right upper quadrant with at least one of 12 mm. The appropriate rules concerning angles have to be followed in order to avoid "fencing" with the instruments.

The transection of the gastrocolic ligament allows a wide access for the ultrasound transducer in the omental pouch. An important issue is the relation of the tumour with the main pancreatic duct. The preoperative duct stenting may facilitate a correct assessment and can reduce the risk of pancreatic fistula (PF) (Misawa *et al.*, 2013). A Kocher maneuver may be necessary for accessing deep or posterior tumours. The supplemental dissection of the superior pancreatic margin allows an appropriate enucleation in selected cases (Costi *et al.*, 2013 a).

The left-sided procedures (pancreatic neck-body-tail) necessitate 6 trocars placed on the midline and sideways on the left and right mid-axillary line. The access is gained through the gastrocolic, or rarely, through the hepatogastric ligament (Kang *et al.*, 2008). After performing the ultrasound, if the distance to the duct is safe, the superior and inferior margins of the pancreas are dissected in order to allow the enucleation (Costi *et al.*, 2013 a).

The enucleation is performed by blunt and sharp dissection. Bipolar electrocautery and harmonic scalpel ensure better hemostasis than the monopolar cautery hook. A holding suture may allow a progressive "extraction" of the mass as circumferential dissection progresses in depth (Kang *et al.*, 2008). The dimensions of the tumour do not represent a challenge by itself, the largest reaching up to 60 mm (Costi *et al.*, 2013 a). Suturing or not the remaining cavity, or covering the raw surface with hemostatic products, relies on the judgment of the surgeon who has to consider several factors: the quality of the parenchyma, the size of the cavity and bleeding risk. The raw surface can be covered with Tachosil, Surgicel, Floseal (Costi *et al.*, 2013 a) or fibrin glue (Singh *et al.*, 2006). A Roux-en-Y limb to drain the enucleation bed is seldom used, even in open enucleation (Inchauste *et al.*, 2012).

After enucleation pancreatography through the NPDS may detect injury to the main pancreatic duct. If branches of pancreatic duct are identified, ligation is recommended (Misawa *et al.*, 2013).

The selective or even routine drainage is also endorsed.

Discussion

Although the laparoscopy has gained wide acceptance in most areas, enucleation in pancreatic surgery is still a topic currently in debate (Zhang *et al.*, 2016).

Regarding the case selection, preoperative process that confirms malignant tumours have to be excluded, whereas those of uncertain nature may benefit of enucleation pancreatic surgery. In this situation, the biopsy of a small, deep lying, tumour, is usually difficult, so surgery may bring diagnose and treatment. If malignancy is found especially with positive margins, conversion or reoperation is mandatory (Costi *et al.*, 2013 a). Non-invasive intraductal papillary and mucinous neoplasm may be approached, but the rate of PF is as high as 54% (Blanc *et al.*, 2008).

The operative set-up may vary regarding the optimal position of the surgeon and the number and placement of trocars. The general idea is to adapt to the specific conditions of a certain case, without clinging to a standard position or number of trocars.

Intraoperative ultrasound is mandatory for localizing the tumour and to detect multiple neoplasia (Singh *et al.*, 2006). Experienced teams are seldom unable to localize intraoperatively the tumour (Costi *et al.*, 2013 a).

If learning curve and malignant cases are excluded, forced conversions, due mainly to haemorrhage or insufficient exposure, are rare (9%) (Costi *et al.*, 2013a). Conversions, if malignancy is confirmed on frozen section, have to be regarded as a proof of sound judgment.

The pancreatic fistula is the main postoperative complication. Due to various definitions of PF data are heterogeneous. Papers reporting PF according to the conference of the International Study Group of Pancreatic Fistula (ISGPF) have up to one third of the patients affected by this complication. PF incidence does not depend on the choice of dissection instruments, management of the remaining cavity (suture, omentoplasty, local haemostats) or somatostatin analogue use (Costi *et al.*, 2013 a). A risk factor for PF is the location of the tumour at less than 2 mm from the main pancreatic duct (Brient *et al.*, 2012). The best laparoscopy procedure does not reduce the PF rate of enucleations, as open series report a similar PF rate (Brient *et al.*, 2012; Inchauste *et al.*, 2012).

Other specific complications may include necrotic pancreatitis, pancreatic pseudocyst and duodenal fistula (Costi *et al.*, 2013 a). The overall surgical morbidity of open enucleations seems to be lower (28.3% vs. 60%) (Hackert *et al.*, 2011).

The mean operating time of enucleations is about 2 hours. The blood loss is usually minimal. However, losses of up to 1,500 ml have been communicated by experienced teams (Costi *et al.*, 2013 a).

Considering right vs. left-sided laparoscopic enucleations the results are different. A longer duration (178 vs. 132 minutes), but more important a higher morbidity (64% vs.

45%) and longer hospital stay (26 vs. 9 days) demonstrate that head-uncus locations should be approached with caution even by experienced teams (Costi *et al.*, 2013 b).

The mean postoperative days does not reflect the immediate outcome, as patients may be discharged with a patent PF (Sweet *et al.*, 2007).

Conclusions

Considering the recent literature data, the optimal way of sectioning and managing the raw pancreas procedure, in order to reduce the risk of PF, remains the main goal of enucleation. Although safe and technically feasible, enucleation represents a procedure with high morbidity. Controlled randomized studies would be useful to assess the method.

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