

Distal pancreatic resection via laparo-endoscopic single site surgery – development of the technique

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Abstract

Aim: To present a novel technique of a laparo-endoscopic single site (LESS) distal pancreatic resection via the umbilicus with use of the QuadPort™ Access System.

Material and methods: The technique of distal pancreatic resection through a 30 mm longitudinal incision in the umbilicus is described. Medial to lateral approach of pancreas preparation using a harmonic scalpel and regular laparoscopic instruments is applied. The described technique was successfully applied in a 26-year-old female patient with tumour of the pancreatic body and tail (90/41/27 mm). Pancreatectomy was followed by splenectomy due to infiltration of the splenic vessels.

Results: Total operative time was 160 min. Blood loss was 800 ml. Initial wound size was 30 mm. Splenic vein and artery infiltration forced augmentation of the wound to 80 mm. The patient required only per request medication. Peristalsis returned spontaneously on the first postoperative day. Hospital stay was 4 days. There were no early peri-operative complications. The patient required readmission due to electrolyte imbalance 7 weeks after the operation.

Conclusions: The proposed operative technique of single incision laparoscopic distal pancreatectomy is difficult and challenging. Nonetheless, the authors proved that it is safe and feasible when performed by an experienced laparoscopic team.

Key words: distal pancreatic resection, single incision laparoscopic surgery, laparo-endoscopic single site surgery, LESS, minimally invasive surgery

Introduction

In the last two decades, minimally invasive surgery has been implemented in multiple surgical subspecialties. Pancreatic surgery remained on the sidelines of this process for a long time. Nevertheless, due to the unquestionable benefits of laparoscopic surgery, frequently it is seen as a method of choice in early tumours of the pancreatic body and tail [1]. Simultaneously, permanent progress in minimally invasive surgery led to development of the conception of laparo-endoscopic single site (LESS) surgery.

At present, LESS surgery is widely accepted in operations of the gallbladder, appendix and abdominal hernias [2]. Simultaneously, multiple reports have appeared on safe and successful LESS application in benign and malignant colorectal lesions, in obesity treatment and splenic resections [2, 3].

Aim

The aim of the study was to present a novel technique of minimally invasive laparoscopic distal pancreatic resection with single access surgery via one small umbilical incision. To the authors' knowledge

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this is the first report on LESS distal pancreatic resection via the QuadPort™ Access System.

Methods

Preoperative period

Standard preoperative antibiotic prophylaxis and antithrombotic prophylaxis as for laparoscopic pancreatectomy are administered.

Patient's positioning

The patient lies flat on the back in the anti-Trendelenburg position with legs separated. The operator stands between the legs of the patient. The assistant surgeon as well as the scrub nurse is situated on the left side of the patient.

Operative procedure

A 30 mm longitudinal incision via the umbilicus is made and open insertion of the QuadPort™, Olympus (Advanced Surgical Concepts, Wicklow, Ireland) is performed (Figure 1).

Pneumoperitoneum of 12 mmHg is achieved. A 10-mm, straight 0° laparoscopic camera is introduced and inspection of the abdominal cavity is done. One curved laparoscopic clinching grasping forceps (Olympus) is used to provide traction and avoid instruments clashing. Then using a laparoscopic grasper and 5-mm Harmonic Ace® Scalpel (Ethicon Endo-Surgery, Johnson & Johnson) the greater omental sac is accessed. The pancreatic body and tail towards the splenic hilus are visualized. Preparation of the lower edge of the pancreatic body is performed starting from the pancreatic neck at the level of the mesenteric vein towards the pancreatic tail (medial to lateral approach) using a Harmonic Ace Scalpel, laparoscopic straight grasper and one laparoscopic curved grasper.

Retrieval of the specimen

The pneumoperitoneum is reduced and the QuadPort's booth is removed leaving the port's sleeve protecting the wound from possible port metastases during the pancreatic tumour removal.

Drain and wound closure

Haemostasis is assured and thorough inspection of the abdominal cavity is done. A Redon drain is

inserted into the pancreatic bed and exenterated via a separate skin incision. Standard suturing material is used for wound closure.

Splenectomy

In the first case performed with the described technique, infiltration of the splenic vein and artery was discovered intraoperatively. The splenic artery was freed from the tumour tissue, but freeing of the splenic vein despite meticulous and lengthy efforts was unsuccessful. Therefore, a decision to perform splenectomy was made. The QuadPort was completely removed. The incision was augmented to 8 cm to facilitate exteriorization of resected tissues, especially the spleen.

The splenic artery and vein were clipped with size M Hem-o-lok® Ligation System (Teleflex Medical) and dissected with a harmonic scalpel. Splenic ligaments were freed and splenectomy completed.

Further operative steps followed the protocol presented above.

Results

The described technique was successfully applied in a 26-year-old female patient (BMI about 18 kg/m²) with tumour of the pancreatic body and tail (90/41/27 mm). Despite having three CT-guided fine needle biopsies done, the aetiology of the tumour was unknown at the time of surgery. American Society of Anesthesiology (ASA) Score was II due to comorbid asthma with no previous abdominal surgery. Total operative time was 160 min. The proximal pancreatic resection margin was 15 mm. Blood loss was 800 ml. Initial wound size was 30 mm. Splenic artery

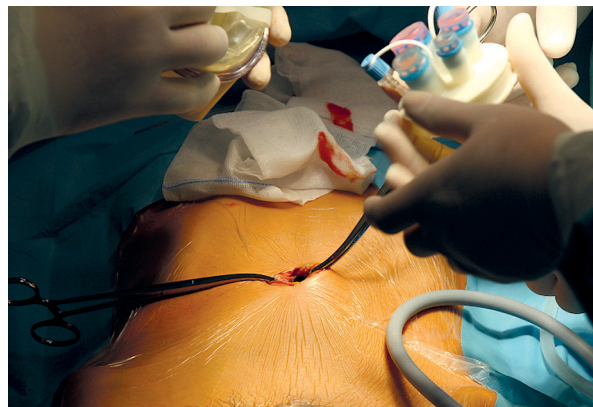


Figure 1. Open insertion of the QuadPort

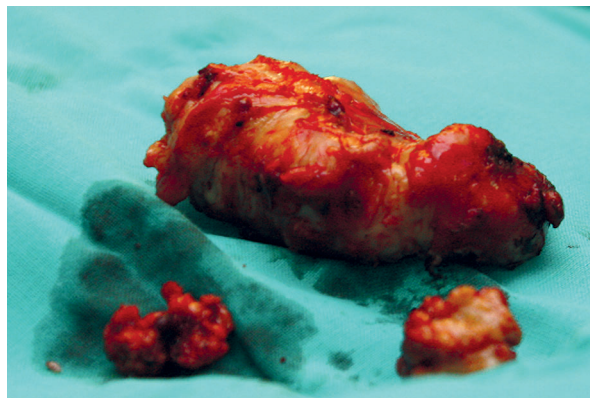


Figure 2. Resected body and tail of the pancreas



Figure 3. Final abdominal incision

and vein infiltration, need to perform splenectomy and need to exteriorize the spleen and indurated, cartilage-like pancreas (Figure 2) forced augmentation of the wound to 80 mm (Figure 3).

Postoperatively, the patient required only per request analgesics. Spontaneous return of peristalsis took place on the first postoperative day, when a liquid diet was started. Hospital stay was 4 days. Histopathological examination of the specimen revealed an inflammatory tumour. There were no early (30 days) perioperative complications. The patient required readmission due to electrolyte imbalance 7 weeks after the operation. In the 3-month follow-up period there were no further adverse events recorded.

Discussion

Until recently, pancreatic resections have remained the domain of open surgery. The scale of technical difficulties followed by the risk of complications required huge technical progress to be made before wide acceptance of minimally invasive laparoscopic

techniques in pancreatic surgery. From the first report on laparoscopic pancreatic resection by Gagner *et al.* in 1996 [4] until 2005 there were only isolated case reports available. Since the multicentre retrospective analysis of 127 cases performed by Mabrut *et al.* [5] further reports on safety and feasibility of laparoscopic pancreatic resections involving larger groups of patients have started to appear. Kim *et al.* in their single institution retrospective analysis demonstrated the advantage of laparoscopic distal pancreatectomy compared to open procedure in terms of earlier resumption of diet and earlier discharge [6]. The authors also found no difference between open and laparoscopic approach with regard to the operative times, frequency of perioperative morbidity and mortality, and treatment costs. Further comparative studies and systematic reviews proved the laparoscopic approach to be superior also in terms of shorter operative times and decreased blood loss [7, 8].

Most of the studies on application of LESS have proved the feasibility and safety of this approach [9-13]. Nonetheless, due to the complexity of single access surgery there have been no successful cases of pancreatic resections in the available literature so far. The authors, before applying LESS in distal pancreatic resection (DPR), performed several laparoscopic DPRs as well as several LESS operations including cholecystectomies, right hemicolectomy [3] and total mesorectal excision as well as some transvaginal and transgastric NOTES operations [14] to achieve technical proficiency in minimal access surgery.

The presented technique requires a QuadPort Access System® that allows use of a 10-mm laparoscopic camera and three operative instruments. The design of the port enables more freedom of movement than other commercially available single access ports. It also allows the use of regular, straight, laparoscopic instruments available in a laparoscopic surgery centre, therefore decreasing costs of the operation. There was only one curved laparoscopic grasper used to provide better triangulation and to avoid instruments' clashing – mainly outside the abdominal cavity (Figure 4). The port was located directly above the pancreatic field for better traction and visualization.

In the presented case, the initial umbilical incision was 30 mm long and would have allowed safe performance of the distal pancreatic resection with splenic preservation if not for the intraoperative diagnosis of splenic vein and artery infiltration. The

splenic artery was freed from the tumour tissue but freeing of the splenic vein despite meticulous and lengthy efforts was unsuccessful. Therefore, the incision was augmented to 80 mm to facilitate safe splenectomy, oncological clearance (at this stage the tumour aetiology was uncertain) and exteriorization of resected tissues. Total operating time of 160 min was partially attributable to the efforts to preserve splenic vessels and was comparable to or shorter than laparoscopic distal pancreatectomies described in the literature [6, 15, 16]. On the other hand, there was greater blood loss than in many series due to the fact of splenic vessels' infiltration and technical difficulties of freeing them. Although, thanks to use of the harmonic scalpel, proximal pancreatic stump reinforcement with sutures was not required, the authors recommend Redon drain placement to avoid collection of any pancreatic secretions.

Conclusions

The proposed operative technique of laparo-endoscopic single site distal pancreatectomy is difficult and challenging. Nonetheless, the authors proved that it is safe and feasible when performed by an experienced laparoscopic team. However, the patients should be carefully diagnosed and selected for the procedure to avoid intraoperative complications.

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Figure 4. Parallel movement of the instruments

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