



Robot-assisted spleen preserving distal pancreatectomy: case report

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Abstract: A 28-year-old female patient was incidentally diagnosed with a unilocular pancreatic cystic lesion located in the body-tail of the pancreas. Findings at contrast-enhanced computed tomography scan and magnetic resonance were both consistent with the diagnosis of mucinous cystadenoma. The patient was then scheduled for a robot-assisted distal pancreatectomy with preservation of the spleen and the splenic vessels. The procedure was completed safely in 255 minutes with minimal blood loss. The post-operative course was uneventful and the patient was discharged on post-operative day 6. Final pathology confirmed the diagnosis of mucinous cystadenoma. In the video presented herein we show the technique for robot-assisted distal pancreatectomy with preservation of the spleen and the splenic vessels.

Keywords: Robotic; spleen; pancreas; distal pancreatectomy; case report

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Introduction

According to the Miami international evidence-based guidelines on minimally invasive pancreas resection, minimally invasive distal pancreatectomy (MIPD) for benign or low-grade malignant tumors is to be considered over open distal pancreatectomy, since it is associated with a shorter hospital stay, reduced blood loss, and equivalent complication rates (1). Additionally, whenever oncologically indicated, the spleen should be preserved because of hematological and immunological advantages (2). During MIPD the spleen can be spared along with the splenic vessels (3) or despite the sacrifice of the splenic vessels (so called procedure) (4). In the Warshaw procedure, spleen supply is maintained through the left gastro-epiploic arcade and the short gastric vessels. This collateral circulation, however, may not be sufficient to ensure spleen viability in all patients, while sometimes the lack of optimal venous outflow results in sinistral portal hypertension with the development of gastric varices (5). Robotic assistance facilitates spleen preservation during MIPD, possibly

because of the enhanced dexterity offered by the robotic system (6).

We herein describe a case of robot-assisted MIPD with preservation of the spleen and the splenic vessels. The attached video demonstrates the technical details of this procedure as defined in a center with experience with over 380 robotic pancreatic resections.

We present the following case in accordance with the CARE reporting checklist (available at <http://dx.doi.org/10.21037/ales.2020.03.14>).

Case presentation

A 28-year-old female patient was incidentally diagnosed with a cystic lesion located in the body-tail of the pancreas during routine abdominal ultrasonography. She was otherwise completely healthy (American Society of Anesthesiologists score class 1).

The patient was further investigated by assay of tumor markers (Ca19.9, Ca15.3 and Ca125), contrast-enhanced computed tomography (CT) scan and magnetic

resonance imaging (MRI). Tumor markers were negative. CT confirmed the presence of a pancreatic cystic lesion, measuring 40 mm with internal septae (*Figure 1*). MRI demonstrated also the presence of two mural nodules showing restricted diffusion (*Figure 2*). The case was discussed at a multidisciplinary tumor board with the recommendation for robot-assisted distal pancreatectomy with preservation of the spleen and the splenic vessels. Endoscopic ultrasonography, possibly associated with fine needle aspiration of the cystic fluid, was not recommended because the results of this additional test were not deemed to possibly change the indication for surgery. After standard preoperative work-up the patient was then scheduled for surgery.



Figure 1 Preoperative contrast-enhanced CT scan showing the pancreatic cystic lesion with internal septae.

Operative procedure

The patient was placed supine with the legs parted on an operating table equipped with a thermic blanket. She was secured to the table with wide bandings and pneumatic intermittent cuffs were placed around the legs to reduce the risk of venous thrombosis (*Figure 3*). The table was tilted on the patient's right side ($5\text{--}8^\circ$) and adjusted in reverse Trendelenburg position ($15\text{--}20^\circ$).

Using a Verres needle, pneumoperitoneum was created and maintained at 10 mmHg. A total of five ports were used, including four 8 mm robotic ports and one 12 mm assistant port (*Figure 4*). After docking of a da Vinci Xi robotic system (Intuitive Surgical, Inc., Sunnyvale, CA, USA), the liver was suspended by hanging the round ligament to the abdominal wall using a transparietal suture and suturing the anterior margin of liver segment three to the diaphragmatic dome (*Figure 5*).

The operation began by opening the lesser sac dividing the reflection of colon and omentum. Next the inferior margin of the pancreas was identified and dissection proceeded to the left until the left colonic flexure was fully mobilized. Further mobilization of the pancreatic body-tail allowed visualization of landmark structures, such as the inferior mesenteric vein, the left renal vein and the left adrenal gland. The posteriorly located cystic tumor could also be visualized. After identification of the left gastric artery at the superior margin of the pancreatic body,

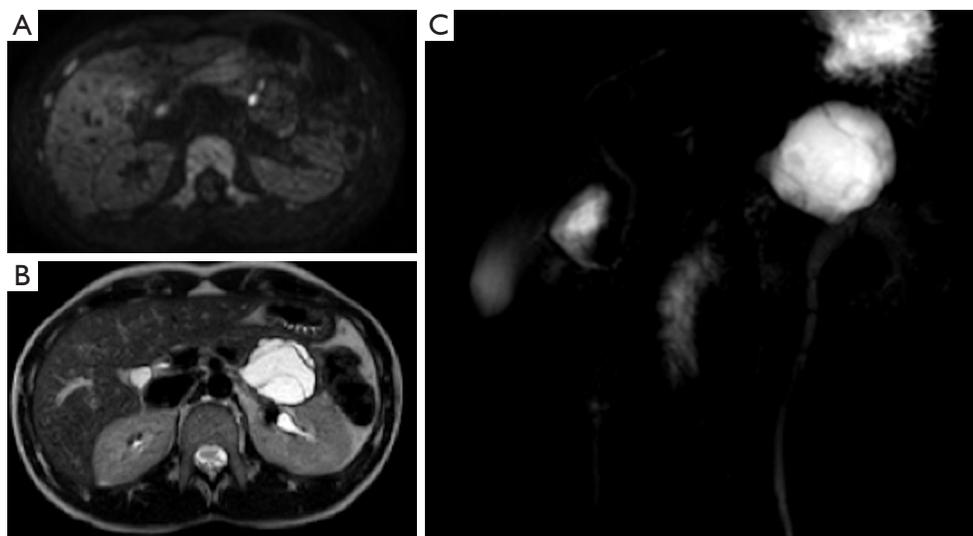


Figure 2 Magnetic resonance imaging. (A) The cyst demonstrates two nodules with restricted diffusion. In the T2 (B) and the cholangiographic (C) sequences the lesion appears dishomogeneous with septae and nodules.

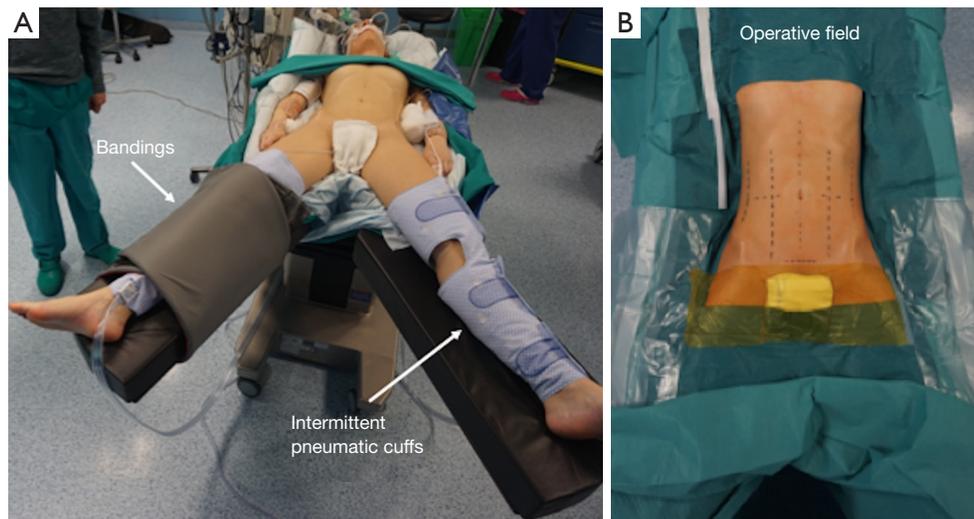


Figure 3 Patient's position. (A) The patient is placed on the operative table in a French position and secured using wide bandings; (B) the patient is widely prepped.

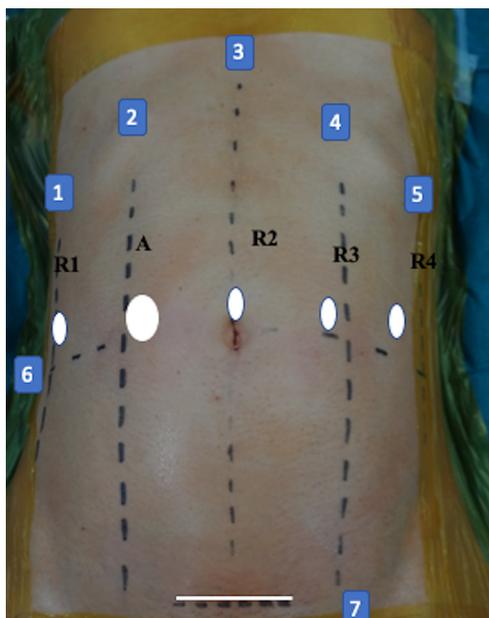


Figure 4 Port position with respect to anatomical lines (1 right anterior axillary line; 2 right pararectal line; 3 mid line; 4 left pararectal line; 5 left anterior axillary line; 6 transverse umbilical line; 7 suprapubic extraction site). All ports are placed along the transverse umbilical line. The optic port is placed at the umbilicus (R2). The remaining ports are placed to the right and to the left along the right (R1) and left (R4) axillary lines and the left pararectal line (R3).

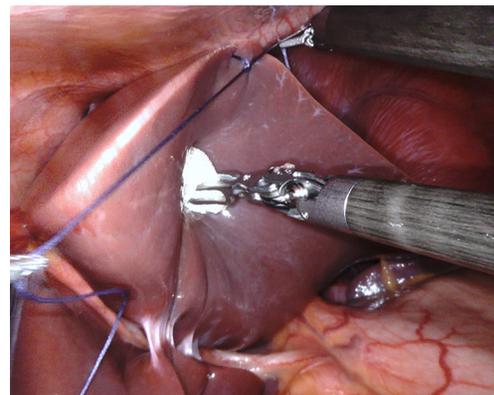


Figure 5 Liver segment number 3 being anchored to the diaphragmatic dome.

dissection was further carried out posteriorly by detaching the splenic vein from the pancreas. Dissection employed bipolar Maryland forceps and electrified scissors. The splenic artery was then identified at the superior border of the pancreas and dissected off likewise with selective ligatures of pancreatic arteries using linen sutures (*Figure 6*). Both splenic vessels were encircled with vessel loops (*Figure 7*). Once a tunnel was developed behind the pancreatic neck, the gland was looped and a robotized stapler, using a reinforced stapler armed with a purple cartridge. After

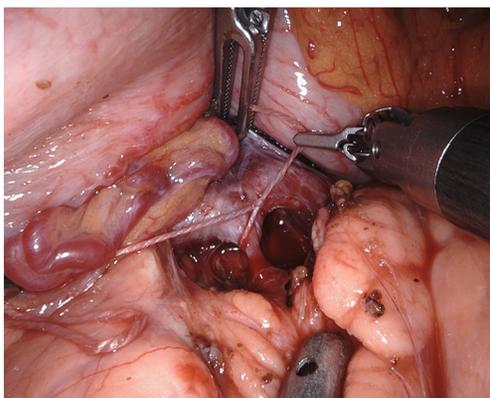


Figure 6 Selective ligation of a pancreatic artery using linen sutures.

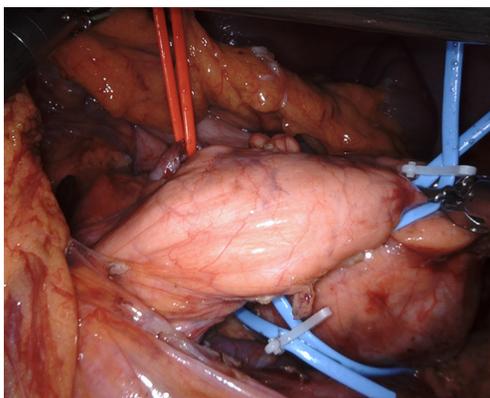


Figure 7 The splenic vessels and the pancreas are encircled with vessel loops.

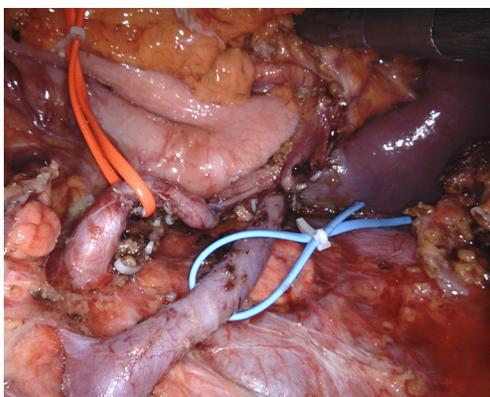


Figure 8 Final intraoperative view of the spared splenic vessels.

division of the pancreas, dissection was carried out along the splenic vessels until the splenic hilum. Lymph nodes around the pancreatic artery were also removed. Spurting bleeders were fixed using 5/0 polypropylene sutures. At the end of the procedure both splenic vessels were completely skeletonized (*Figure 8*). The specimen was placed in an endoscopic bag and retrieved from a small suprapubic transverse incision. The round ligament of the liver was mobilized and placed around the pancreatic stump. A 14 Fr pig-tail drain was placed close to the pancreatic stump and left to drain by gravity.

Post-operative course

The post-operative course was uneventful, and the patient was discharged on postoperative day 6.

Pathology

Histology demonstrated a mucinous cystadenoma with low grade dysplasia measuring 42 mm.

Discussion

The first robotic distal pancreatectomy was reported in 2003 (7). Several studies have shown that robotic distal pancreatectomy is not just feasible but also safe with respect to competing surgical approaches (8). While all types of minimally-invasive pancreatic resections have been performed using laparoscopic technique, the use of robotic assistance is believed to be rewarding when fine dissections and intracorporeal sutures are needed (9). Distal pancreatectomy with preservation of both spleen and splenic vessels is certainly a procedure that requires fine intracorporeal dissections. Indeed the use of robotic assistance, when compared to laparoscopy in the setting of robotic spleen-preserving distal pancreatectomy, was shown to increase the rate of spleen preservation (10-12), to reduce the rate of conversion to open surgery, and to shorten the length of hospital stay (12). Additionally, laparoscopic spleen-preserving distal pancreatectomy has been associated with high rates of post-operative thrombosis of the splenic vessels leading to the formation of gastric varices. Although no direct comparison is available, the robotic technique was associated with high rates of long-term patency of splenic

vessels (13). The main argument against the use of robotic assistance, especially in procedures that can be performed laparoscopically, is costs (14). Current estimates, however, mostly take into account a quite rough evaluation of costs associated to the use of the robot. More sophisticated studies are clearly needed to define the economic sustainability of robotic assistance, as currently known, for procedures that can also be performed by conventional laparoscopic techniques (15).

As specifically regards the technique shown in this video, we have decided to remove the lymph nodes along the splenic artery. This is not standard and may not be required even in the context of mucinous cystadenocarcinoma due to the low rate of lymph node metastasis associated with this tumor type (16). We prefer to remove the lymph nodes along the splenic vessels in case of a different diagnosis at final pathology to have a complete staging of the tumor.

In conclusion in this video, we have demonstrated the technique for robotic spleen-preserving distal pancreatectomy, developed at a center having performed 380 robotic pancreatic resections.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at <http://dx.doi.org/10.21037/ales.2020.03.14>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/ales.2020.03.14>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this study

and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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