

Robotic Double Purse-String Telescoped Pancreaticogastrostomy: How I Do It

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Published online: 25 September 2018
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Abstract

Introduction Some articles have recently shown that robotic pancreaticoduodenectomy (PD) is feasible and can be a safe method. On the other hand, pancreatic fistulas (PF) remain the most dreaded complication after PD, and a secured pancreaticoenteric reconstruction may be essential in this regard. Previous articles have highlighted the usefulness of telescoped pancreaticogastrostomy (PG) in open PD to reduce the risk of postoperative PF. Additionally, in 2016, Addeo et al. described a double purse-string telescoped PG (DPS-PG), simplified from previous techniques, with favorable short-term results.

Materials and methods The attached video reports our standardized technique for robotic DPS-PG, which is based on Addeo's approach. The main characteristic of this technique is an easy placement of two seromuscular purse-string sutures without the need for gastric wall dissection or deep pancreatic parenchymal sutures. We modified and developed Addeo's technique to suit the robotic PD. In our robotic DPS-PG, there is no need to perform the opening of the distal gastric stump, the anterior gastrostomy, or the suture fixation of the pancreatic parenchyma to the stomach, as it could lead to a rupture of the pancreas, particularly when the parenchyma is soft.

Results We consider that our technique of robotic DPS-PG might be feasible and can be safely performed, just as a previously described technique in open surgery.

Conclusions Further evaluation with clinical trials is required to validate its real benefits.

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s00268-018-4808-2>) contains supplementary material, which is available to authorized users.

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Introduction

With the development of minimally invasive surgical approaches, the robotic approach has been considered as an option in pancreaticoduodenectomy (PD). The review by Kornaropoulos et al. [1] concluded that robotic PD is safe and feasible in a high-volume institution where surgeons are experienced and the medical staff is appropriately trained, although randomized controlled trials, cost analysis, and data on long-term oncologic outcomes are needed to further investigate outcomes. On the other hand, robotic PD seems to offer an unequivocal advantage in complex procedures such as restoration of digestive continuity as compared to laparoscopy, due to the tridimensional view along with an extended range of motion.

However, the failure of pancreaticoenteric reconstruction may lead to pancreatic fistula (PF), which remains the most dreaded complication after PD. Pancreaticoenteric reconstruction after PD is usually achieved via pancreaticojejunostomy (PJ) or pancreaticogastrostomy (PG) performed according to the surgeon's preference. The review by Cheng et al. [2] concluded that there was little or no difference between PJ and PG in the overall postoperative PF rate (PJ 24.3%; PG 21.4%).

In 2016, Addeo et al. [3] described a double purse-string telescoped PG (DPS-PG), modified from an original telescoped PG technique with favorable short-term results of 50 consecutive patients. They reported 8% (4 patients) of the overall PF rate with no grade C PF and no pancreatic duct occlusion. However, to our knowledge, no article focused on the DPS-PG in robotic pancreatectomy. As a result, we will now describe our DPS-PG in robotic PD.

Materials and methods

The patient is placed on the operating table in a supine position, with legs spread apart and arms alongside the body. The robot is placed at the head of the patient. The surgeon is seated at the da VinciTM surgical robotic system (Intuitive Surgical, Inc., California, USA). The first assistant stands between the patient's legs, and the second assistant stands on the left side of the patient, close to the scrub technician. One screen is placed on the right side of the patient's head. The second screen will be placed on the right side too in order to provide an adequate view for the second assistant and the scrub technician. Regarding port positioning, a 3D robotic camera (30° scope) port is introduced after open laparoscopy through a supraumbilical or infraumbilical incision. Three other 8 mm robotic ports will be placed on a semicircular line around the target in the left (robotic arm No. 1) and right midclavicular line (robotic arm No. 2) and the left anterior axillary line (robotic arm No. 3). A 12–15 mm assisting port is inserted into the right midclavicular line. Other 5 mm ports can be used if necessary. Robotic PD is performed according to our institutional standardized technique as described elsewhere [4], and we will focus on PG as follows (video).

Pancreas mobilization

After extraction of the resected specimen through a Pfannenstiel's incision, the surgical incision is closed in layers and the pneumoperitoneum is re-established. First, with regard to the pancreaticogastric anastomosis, the splenic vein and artery are separated from the pancreatic body over a 3–4 cm length to facilitate the construction of the PG anastomosis. Small branches of the splenic artery and vein

are selectively divided between metal clips. The robotic arm No. 3 grasper is used to pull up the stomach in order to expose its posterior surface.

Gastric incision and purse-string suture

Robotic arm No. 1 hook cautery is positioned appropriately opposite the pancreatic stump and allows to perform a seromuscular incision on the posterior wall of the stomach. The diameter of the gastric incision is calibrated to 1 cm less than the diameter of the pancreatic stump. It is achieved to ensure a tight approximation of the gastric wall to the pancreatic stump. Two large needle drivers are mounted onto robotic arms 1 and 2 to fashion two seromuscular purse-string sutures of V-LocTM (Medtronic, plc., Minnesota, USA) (Fig. 1a). The suture is applied in a concentric fashion around the posterior gastric incision (inner and outer purse-string sutures). The distance between the purse-string sutures is about 1 cm. The needle is pushed through the loop to allow for a mere traction.

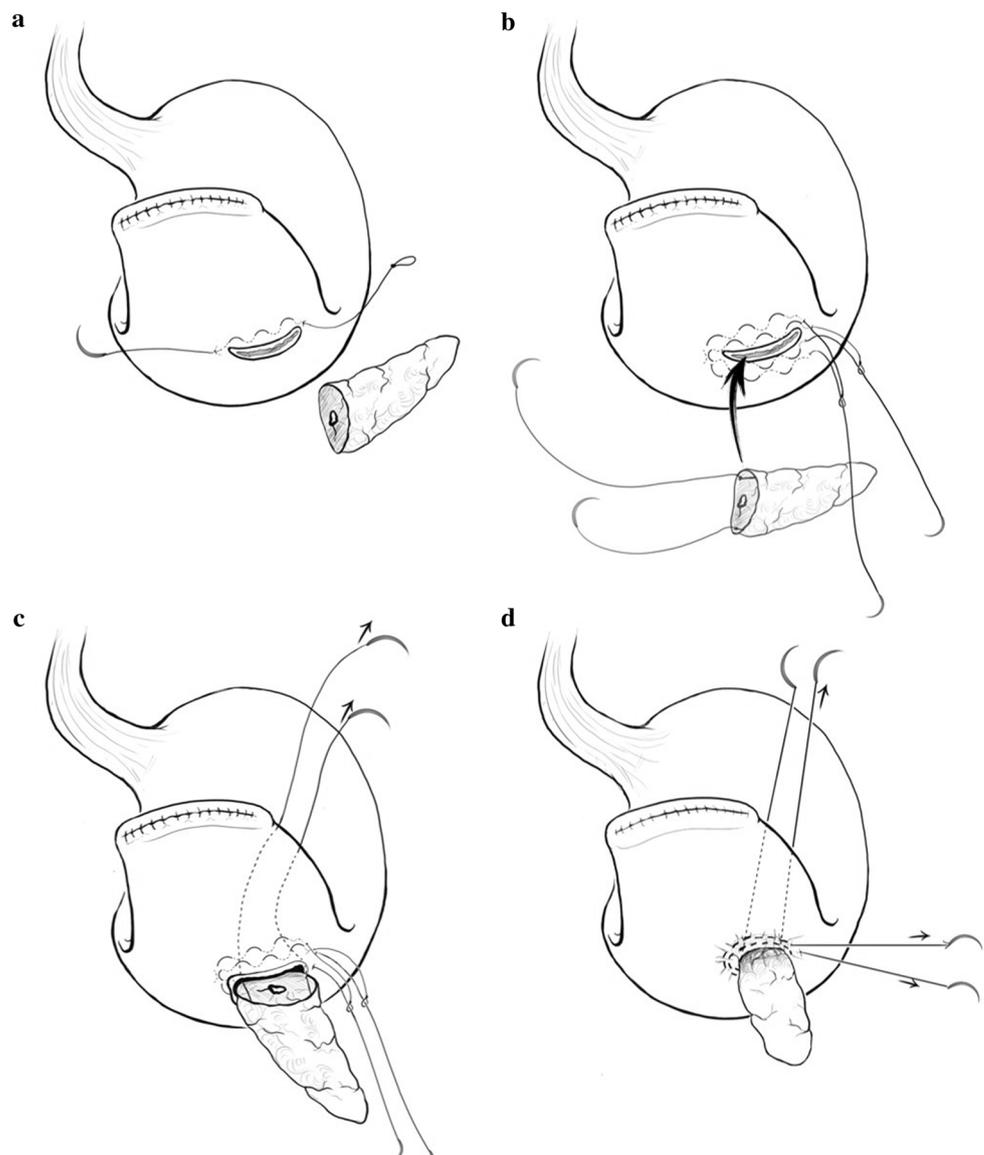
Anchoring suture and gastrotomy

The distal pancreatic stump is transfixed at its cranial and caudal edge with two corner 3/0 VicrylTM stay sutures (Ethicon, Inc., Ohio, USA) (Fig. 1b). The gastric mucosa is opened with robotic arm No. 1 hook cautery on the posterior wall of the stomach. The two cornered stay sutures are positioned into the gastric lumen and exit at the anterior wall of the stomach (Fig. 1c). These two sutures will allow for a progressive traction of the pancreatic stump in order to achieve its invagination into the stomach.

Completion of pancreaticogastrostomy

The robotic arm No. 3 is used to maintain upward tension on the stay sutures above the anterior aspect of the stomach. The pancreatic remnant has to be gently pulled into the gastric lumen using both No. 1 and No. 2 graspers. Ideally, the pancreatic remnant should protrude over 2 cm into the opening created on the posterior gastric wall. Subsequently, the two V-LocTM purse-string sutures are tightened with minimal tension to prevent any pancreatic duct occlusion and postoperative pancreatitis. It is achieved by gently pulling the sutures toward the pancreatic body to approximate the gastric wall to the pancreatic parenchyma (Fig. 1d). The V-LocTM sutures are divided, and the needles are withdrawn.

Fig. 1 Steps of the double purse-string telescoped pancreaticogastrostomy. **a** Seromuscular purse-string sutures in the posterior wall of the stomach. **b** Intraoperative view after two cornered stay sutures of the pancreas. **c** Two cornered stay sutures passing through the gastric lumen. **d** Final view after the completion of the pancreaticogastrostomy



Discussion

An original telescoped PG technique in open PD has carried technical drawbacks as follows. The use of an external layer of interrupted sutures which include the seromuscular layer of the stomach and full-thickness bites on the pancreatic parenchyma might lead to the rupture of the pancreas, particularly when the parenchyma is soft, and to the development of a PF. In contrast, the technical variant of the DPS-PG described by Addeo et al. [4] eliminates the need to place sutures through the pancreatic parenchyma and reduces the risk of pancreatic tears and subsequent fistula formation.

Recently, Giulianotti et al. [5] further reported their technique of a dunking trans-gastric PG after robot-assisted

PD, which introduced anterior gastrotomy and multiple short internal running sutures to secure the pancreatic capsule to the gastric mucosa. However, in our robotic DPS-PG, there is no need to perform an opening of the distal gastric stump or an anterior gastrotomy, thanks to the following. First, the two cornered stay sutures are positioned into the gastric lumen and exit at the anterior wall of the stomach, which can allow for a progressive traction of the pancreatic stump in order to achieve its appropriate invagination into the stomach without direct vision. Secondly, a sufficient fixation of the pancreatic remnant to the gastric lumen can be achieved using only two concentric purse-string sutures. However, the permeability of the main pancreatic duct cannot be checked after the completion of the anastomosis. One should be careful

not to place excessive tension onto the purse-string sutures in order to avoid obstruction of the pancreatic duct and development of postoperative pancreatitis.

Conclusion

This is a PG anastomosis with two purse-string sutures in robotic PD without any stitches on the pancreas to prevent any tearing, especially when dealing with soft pancreas. The robotic DPS-PG might be considered as feasible and can be safely performed, just as in open surgery. We should accumulate patient numbers to demonstrate short-term outcomes of patient series in a subsequent clinical study.

Acknowledgements The authors are grateful to Iana Shutrova, Christopher Burel and Guy Temporal for their assistance in proof-reading the manuscript, as well as to Catherine Cers for her digital illustrations, which serve as schematics in the present article.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interests.

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