

## Perioperative management of distal pancreatectomy

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### Abstract

Recent advances in surgical techniques and perioperative management have markedly reduced operative morbidity after distal pancreatectomy (DP). However, some questions remain regarding the protocol for the perioperative management of DP, in particular, with regard to the development of pancreatic fistula (PF). A review of DP was therefore conducted in order to standardize the management of patients for a favorable outcome. Overall, operative technique and perioperative management emerged as two critical factors contributing to favorable outcome in DP patients. As for the operative method, surgical and closure techniques exhibited differences in outcome. Laparoscopic DP generally yields more favorable perioperative outcomes compared to

open DP, and is applicable for benign tumors and some ductal carcinomas of the pancreas. Robotic DP is also available for safe pancreatic surgery. *En bloc* celiac axis resection offers a high R0 resection rate and potentially allows for some local control in the case of advanced pancreatic cancer. Following resection, staple closure was not found to reduce the rate of PF when compared to hand-sewn closure. In addition, ultrasonic dissection devices, fibrin glue sealing, and staple closure with mesh reinforcement were shown to significantly reduce PF, although there was some bias in these studies. In perioperative management, both preoperative and postoperative treatment affected outcome. First, preoperative endoscopic pancreatic stenting may be an effective prophylactic measure against fistula development following DP in selected patients. Second, in postoperative management, a multifactorial approach including prophylactic antibiotics improved high surgical site infection rates following complex hepato-pancreato-biliary surgery. Furthermore, although conflicting results have been reported, somatostatin analogues should be administered selectively to patients considered to have a high risk for PF. Finally, careful drain management also facilitates a favorable outcome in patients with PF after DP. The results of the review indicate that laparoscopic DP coupled with perioperative management influences outcome in DP patients.

**Key words:** Distal pancreatectomy; Pancreatic fistula; Perioperative management

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**Core tip:** Perioperative management of distal pancreatectomy has been reviewed in order to standardize management for a favorable outcome in these patients.

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## INTRODUCTION

Distal pancreatectomy (DP) is generally performed on patients with benign and malignant neoplasms of the distal pancreas and chronic pancreatitis. Recent advances in surgical techniques and perioperative management have markedly reduced the rates of operative morbidity and mortality after DP<sup>[1,2]</sup>. However, pancreatic fistula (PF) still remains a major cause of morbidity<sup>[3]</sup>. The overall incidence of PF in patients undergoing DP is as high as 10%-30%<sup>[1,2]</sup>. In addition, PF is associated with additional complications such as intra-abdominal abscess or hemorrhage, and leads to a prolonged hospital stay<sup>[2]</sup>. Some factors have been reported to predispose patients to the development of PF, including the surgical technique, a soft or normal pancreas, pancreatic thickness, age, obesity, and extended lymphadenectomy<sup>[1-6]</sup>. A review of published results for DP in PubMed Central from January 1998 to October 2014 was conducted using the following terms: "distal pancreatectomy", "pancreas", and "randomized study". Twenty-one articles and the references therein were reviewed. Favorable outcome associated with laparoscopic DP along with clear parameters for perioperative management are discussed.

## OPERATIVE METHOD

### **Resection of the pancreas, closure of the remnant pancreas, and other techniques**

Conventional resection of the pancreas was performed with scissors or electric scissors, bleeding points were ligated, and the main pancreatic duct was ligated. The remnant pancreas was closed with hand-sewn sutures<sup>[1,2]</sup>. In this approach, ligation of the main pancreatic duct was found to be important in preventing PF<sup>[7]</sup>.

Recently, more varied techniques and surgical devices have been introduced into pancreatic surgery for both resection and closure. Resection of the pancreas has been performed with ultrasonic dissection devices<sup>[8]</sup>, saline-coupled bipolar electrocautery<sup>[9]</sup>, and a vessel-sealing system<sup>[10]</sup>. Ultrasonic dissection devices in particular are easily available and also significantly reduce the occurrence of PF in DP<sup>[8]</sup>. Seromuscular patches<sup>[11]</sup>, fibrin glue sealing<sup>[12]</sup>, the application of surface-active meshes, and combinations of these techniques<sup>[13]</sup> were used for closure of the pancreas. Seromuscular patch closure of the pancreatic remnant has been described using either an isolated Roux-Y loop<sup>[11]</sup> or gastric serosa<sup>[14]</sup>. Hassenpflug *et al*<sup>[15]</sup> reported that coverage of the pancreatic remnant after DP decreased the occurrence of clinically relevant PF. Suzuki *et al*<sup>[12]</sup> reported that sealing with fibrin

glue also prevented PF. In addition, PF was reduced when the remnant pancreas was tightly patched and sutured vertically with the hepatic ligament<sup>[16,17]</sup> or an absorbable fibrin sealant patch<sup>[18]</sup>.

Stapling devices can be used at the same time to resect the pancreas<sup>[19]</sup>. This technique is applied mainly in laparoscopic DP<sup>[20]</sup>. However, a randomized trial demonstrated that staple closure did not reduce the occurrence of PF compared to hand-sewn closure<sup>[21]</sup>. Oláh *et al*<sup>[22]</sup> also reported that closure with a stapler in combination with a seromuscular patch from the jejunum did not reduce the occurrence of PF compared to the use of a stapler alone.

In a systematic review<sup>[23]</sup>, ultrasonic dissection devices<sup>[8]</sup>, fibrin glue sealing<sup>[12]</sup>, and staple closure with mesh reinforcement<sup>[24]</sup> were shown to significantly reduce the occurrence of PF, although there was some bias in these studies.

### **Open vs laparoscopic and robotic surgeries**

Laparoscopic techniques have been recently applied to hepato-pancreato-biliary surgery<sup>[25]</sup>, so there are many studies reporting on the use of laparoscopic DP. Laparoscopic DP is used for resection of benign tumors and some ductal carcinomas of the pancreas<sup>[25]</sup>. Systematic reviews have demonstrated that laparoscopic DP leads to significantly more favorable perioperative outcomes<sup>[20,25]</sup>. Robotic DP is also available and safe for pancreatic surgery, but the influence of the technique on overall survival of oncology patients is still unknown<sup>[26]</sup>.

### **Extended surgery**

DP was performed with various extents of lymphadenectomy based on the disease and stage of cancer. Although tumors invading the celiac axis had been considered unresectable, Hirano *et al*<sup>[27]</sup> advocated DP with *en bloc* celiac axis resection. This strategy offers a high R0 resection rate and potentially allows for some local control of advanced pancreatic cancer. Although this method is associated with a high frequency of complications, Okada *et al*<sup>[28]</sup> demonstrated that preservation of the left gastric artery in DP with *en bloc* celiac axis resection reduced postoperative morbidity.

## POSTOPERATIVE MANAGEMENT

### **Prophylactic antibiotics**

In general, a prophylactic, intravenous, broad-spectrum antibiotic (cefotiam or cefazolin sodium) was started intraoperatively. Once an infective complication was diagnosed, an appropriate sensitive antibiotic agent was selected and administered<sup>[17]</sup>. A recent study by Ceppa *et al*<sup>[29]</sup> reported that a multifactorial approach improved high surgical site infection rates following complex hepato-pancreato-biliary surgery.

### **Somatostatin analogues**

Somatostatin analogues inhibit pancreatic exocrine

secretion, but various groups reported conflicting results for their use in perioperative management of patients undergoing DP. In some studies, perioperative treatment with these compounds was shown to decrease the rate of clinically significant postoperative PF, leak, or abscess<sup>[30]</sup>. In contrast, other studies failed to demonstrate a benefit in the perioperative use of somatostatin analogues in patients undergoing DP<sup>[31,32]</sup>. Therefore, the use of somatostatin analogues should be administered selectively to patients considered to have a high risk for PF.

### Drain management

Abdominal drains were positioned on the left sub-diaphragm and stump of the remnant pancreas. The drain of the left sub-diaphragm was usually removed on postoperative days 2-3, and the drain of the stump of the remnant pancreas was usually removed within six postoperative days based on clinical symptoms (no sign of infection) and the values of drain amylase and lipase (less than three times the serum amylase and lipase activity)<sup>[1,17]</sup>.

Kawai *et al*<sup>[33]</sup> also showed that early removal of drains was a critical factor in the reduction of morbidity following pancreaticoduodenectomy. These results support the view that drains are not mandatory and that, if placed, should be removed as soon as possible after DP. Thus, careful drain management also facilitates a favorable outcome in patients with PF after DP<sup>[34]</sup>.

### Stent management

Prophylactic transpapillary pancreatic stenting has been proposed as a strategy to prevent PF. However, this technique does not reduce PF when standardized resection of the body and tail of the pancreas is performed<sup>[35]</sup>. However, Abe *et al*<sup>[36]</sup> reported that preoperative endoscopic pancreatic stenting might be an effective prophylactic measure against fistula development following DP in select patients.

## CONCLUSION

Perioperative management is important for an early favorable outcome in patients undergoing DP. Laparoscopic DP facilitates favorable results.

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