

Single Jejunal Limb Restoration Of Gastrointestinal Continuity Following Pancreaticoduodenectomy

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Citation

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Abstract

A technique to restore gastrointestinal continuity following pylorus-preserving pancreaticoduodenectomy is described. The technique entails the duodenojejunal and choledochojejunal anastomoses on a single jejunal limb, with pancreaticogastrostomy.

INTRODUCTION

Since the first successful pancreaticoduodenectomy reported by Walter Kausch in 1912¹, pancreaticoduodenectomy has undergone several technical modifications, with the goal of lowering the prohibitively pervasive morbidity and mortality associated with this procedure.

The current improvement in hospital mortality to less than 4% is reflective of the emphasis being placed on high-volume pancreatic surgery experience, patient selection, and peri-operative care, as well as on making progress regarding technical issues relating to the restoration of gastrointestinal continuity^{2,3,4}.

Increasingly, the pylorus-preserving pancreaticoduodenectomy (PPPD) is being favored over the classical Whipple pancreaticoduodenectomy^{5,6}. Restoration of pancreaticoenteric continuity, either by pancreaticogastrostomy or pancreaticojejunostomy, remains controversial^{7,8}.

The large number of options available to restore gastrointestinal continuity following pancreaticoduodenectomy attests to the failure to identify a procedure that is universally applicable, safe and widely reproducible⁹. To this end, the use of duodenojejunosomy and pancreaticogastrostomy following PPPD to restore continuity, without the creation of a Roux loop, is presented. This technique has been successfully employed by our surgical unit over the past decade.

SURGICAL TECHNIQUE

A standard PPPD is undertaken with preservation of the right gastric artery. The pancreas is mobilised just beyond

the site of its transection. The common bile duct is transected approximately 1.5cm above the duodenum.

The first step in the reconstruction of gastrointestinal continuity is the anastomosis of the pancreatic remnant to the posterior wall of the recurved stomach. The pancreaticogastrostomy entails first anchoring the far side of the pancreatic stump (serosa and parenchyma) to the posterior gastric wall with 2-0 absorbable suture, followed by a meticulous pancreatic duct-to-gastric mucosa anastomosis with an interrupted 3-0 absorbable suture; the accuracy of this anastomosis is aided by the use of a feeding tube to demonstrate the extent of the pancreatic ductal orifice. The pancreaticogastrostomy anastomosis is concluded with the apposition of the edge of the nearside pancreatic parenchyma and serosa to the gastric serosa. The completed pancreaticogastrostomy anastomosis is not stented.

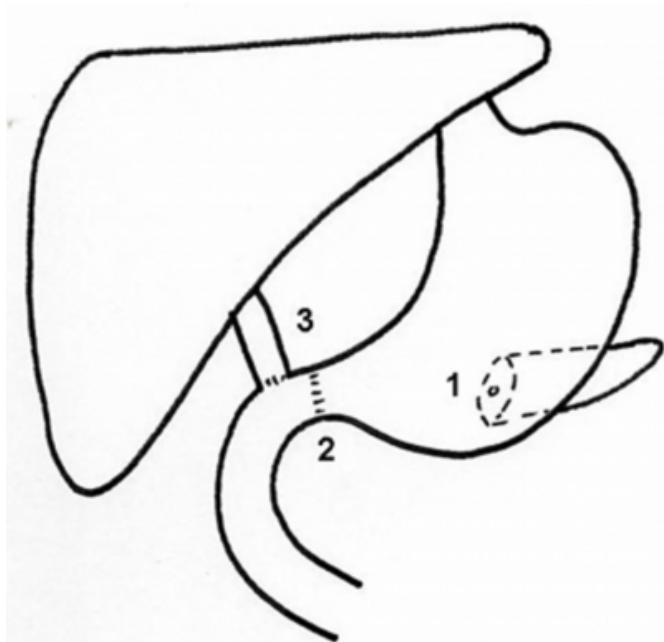
The second step in restoring gastrointestinal continuity entails the division of the ligament of Treitz, which facilitates mobilization and advancement of the proximal jejunum along the space created by the now resected duodenum. The liberal mobilization of the duodenojejunal flexure allows a tension-free end-to-end duodenojejunal anastomosis.

The third step, the end-to-side biliary-enteric anastomosis fashioned distal to the duodenojejunal anastomosis (interrupted 3-0 absorbable suture), completes the restoration of gastrointestinal continuity. (Figure 1)

Abdominal drains are placed adjacent to the sites of the pancreaticogastric and the choledochojejunal anastomoses.

Figure 1

Figure 1: Schematic diagram by Professor B Singh. The restoration of gastrointestinal continuity, in sequence of undertaking. 1. pancreaticogastrostomy, 2. duodenojejunal anastomosis, 3. choledochojejunal anastomosis



DISCUSSION

Despite the well-recognized complications following the classical Whipple procedure¹⁰, it remains the standard operation for pancreatic, ampullary, duodenal and distal bile duct cancers¹¹, as well as for cases of diagnostic ambiguity such as an inflammatory mass in the pancreatic head. Regardless of experience, this procedure remains a daunting technical challenge particularly in centers without a dedicated pancreatic surgery unit.

A review describing the options available to restore gastrointestinal continuity suggests that these are largely based on a Roux loop⁸. It has been postulated that the siting of three anastomoses on the single Roux loop may predispose the loop to kinking and subsequent pancreatic fistula formation¹². The technique of dividing the ligament of Treitz facilitates the easy advancement of the distal jejunal limb. This affords the restoration of gastrointestinal continuity on an anatomical basis by approximating the proximal (duodenal) and distal (jejunal) end, thereby avoiding the creation of a Roux loop and an additional enteric anastomosis.

The sequence of undertaking restoration of gastrointestinal continuity contributes to the ease of the procedure. The pancreaticogastrostomy, arguably the most challenging of

the 3 anastomoses, is undertaken initially. Attempting this anastomosis following either the duodenojejunal or choledochojejunal anastomoses (or both) will increase the technical challenge of pancreaticogastrostomy. The appropriate positioning and accurate anastomosis of the choledochojejunal anastomosis is best done after the duodenojejunal anastomosis (figure 1).

In this report, the PPPD is described rather than the classic pancreaticoduodenectomy. The PPPD, pioneered by Watson in 1942¹³, and re-introduced by Traverso and Longmire in 1978, is well established in current practice¹⁴. In preserving the gastric reservoir as well as the antro-pyloro-motor complex, this approach may minimize or eradicate jejunal ulceration as well as the other troublesome sequelae of gastric resection¹⁵.

The effect of the PPPD on short-term and long-term gastrointestinal function, however, continues to generate debate. Whilst some investigators have reported that the PPPD may have fewer complications, normalizes the hormonal milieu and provides a better long-term nutritional outcome than the classic pancreaticoduodenectomy^{16,17}, several studies have reported a higher incidence of delayed gastric emptying after preservation of the pylorus^{18,19,20}.

This notwithstanding, it would appear that gastric emptying returns to normal within 2-5 weeks²¹.

It has been postulated that post-operative anastomotic oedema, together with disruption of the neurovascular supply, may be responsible for temporary delayed gastric emptying. Several investigators have confirmed that in the majority normal gastric emptying returns in the long-term.^{22,23}

Concerns about the oncological adequacy of the resection margins have been raised with the use of the PPPD. However the long-term outcome of patients undergoing PPPD is not significantly different from those undergoing standard pancreaticoduodenectomy, suggesting the adequacy of the PPPD^{19,25}.

The development of a pancreatic fistula remains the Achilles heel of the pancreaticoduodenectomy; it is the harbinger of short-term and long-term morbidity and mortality. A variety of techniques have been described to address the pancreatic remnant. In current practice, the most favored options are either the pancreaticojejunostomy or pancreaticogastrostomy²⁶.

The immediate proximity of the pancreatic remnant to the posterior gastric wall contributes to the comparative ease of the pancreaticogastrostomy anastomosis. In addition to a meticulous anastomotic technique it is emphasized that the generous mobilization of the pancreatic remnant is not necessary to undertake a safe pancreaticogastric anastomosis. Furthermore, with the reduction of the number of anastomoses on the jejunal loop, the potential for anastomotic leaks is decreased¹².

Whilst the original clinical description of the pancreaticogastrostomy by Waugh and Clagett in 1946²⁷ entailed invaginating the pancreatic remnant into the posterior gastric wall, we favour the pancreatic duct mucosa to gastric mucosa anastomosis, as described by Telford^{28,29}.

The choice of the appropriate pancreaticoenteric anastomosis remains controversial; in a recent review, the meta-analysis of the 3 randomised controlled trials comparing pancreaticojejunostomy with pancreaticogastrostomy revealed no significant difference with respect to the development of pancreatic fistula, intra-abdominal collections or mortality. However, non-randomized evidence suggests that the pancreaticogastrostomy is associated with a reduction in the development of pancreatic fistula and mortality⁷.

SUMMARY

The restoration of gastrointestinal continuity following PPPD using a single jejunal limb to facilitate the duodenojejunal and choledochojejunal anastomoses, together with pancreaticogastrostomy, has the appeal of technical ease and effectiveness. In our practice, a general surgical unit, this technique has been found to be safe and reproducible; it merits wider application.

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