

# PANCREATOGASTROSTOMY WITH ONE CONTINUOUS SEROMUSCULAR CIRCULAR SUTURE

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## ABSTRACT

**Objective.** One of the most feared complications after pancreaticoduodenectomy (PD) remains postoperative pancreatic fistula (POPF). In the current study, we demonstrate a new technique for pancreaticogastrostomy (PG), using one continuous seromuscular circular suture without trans pancreas sutures for PG. **Material and Methods** During the period December 2012 to December 2014, 32 consecutive patients underwent PD (either pylorus-preserving or classical Whipple's) carried out using the above suture-less PG. Indication for PD was pancreatic duct carcinoma. Procedures were carried out by the same surgeon, same approach and anastomotic method in order to avoid technical changes. **Results** Postoperative mortality was zero and morbidity was 21.8 % (n=7). Pancreatic leakage (Grade A/B) occurred in 2 (6.2 %) patients. These pancreatic leaks were managed nonoperative by maintaining the closed drains. The most common postoperative complication delayed gastric emptying (Grade B/C) in 3 (9.3 %) patients. **Conclusion** We conclude that the suture-less PG possesses several advantages over conventional PG and pancreaticojejunostomy (PJ). This technic seems to lessen the risk of a pancreatic leak, probably by diminishing the possibility of suture damage to the pancreas and by embedding the transected stump into the posterior gastric wall. This novel PG is a valid and valuable procedure, especially for soft, nonfibrotic pancreas. .

**KEYWORDS** Pancreaticoduodenectomy; Pancreaticogastrostomy; Suture-less pancreaticogastrostomy; Postoperative pancreatic fistula

## Introduction

Pancreaticoduodenectomy has been the standard operation for resection of periampullary tumors and other various indications. Nevertheless, mortality rates after PD have decreased; morbidity is still as high as 28-58 % [1,2]. The occurrence of POPF in patients undergoing PD is in the range of 5-35 % [3]. Clinically relevant POPF is the principal contributor to postoperative mor-

bidity and most often caused by a leak from the pancreatoenteric anastomosis [4,5]. Risk factors for POPF include a soft pancreas, a small pancreatic duct, underlying pathology, and the surgeon's experience [6]. Many techniques have been proposed to guarantee the continuity of the pancreatic remnant and the digestive tract [7-9]. However, no "gold standard" surgical procedure has been established. The conventional anastomosis described for this operation is PJ [10]. Pancreaticogastrostomy has been described and studied as an alternative to jejunal anastomosis in both observational studies and randomized controlled trials (RCTs) with inconsistent results [11-13]. Three recent RCTs reported lower rates of pancreatic fistula in association with PG than PJ [14-16]. Almost all retrospective studies comparing PG and PJ have suggested that the rate of pancreatic fistula reduced in PG. Several PG anastomotic techniques have reported. They include mattress sutures, the so-called binding PG using two purse-string sutures, or one binding purse-string, two transfixing mattress sutures, two continuous hemstitch sutures, with gastric partition and duct-to-mucosa PG [17-21]. In the current

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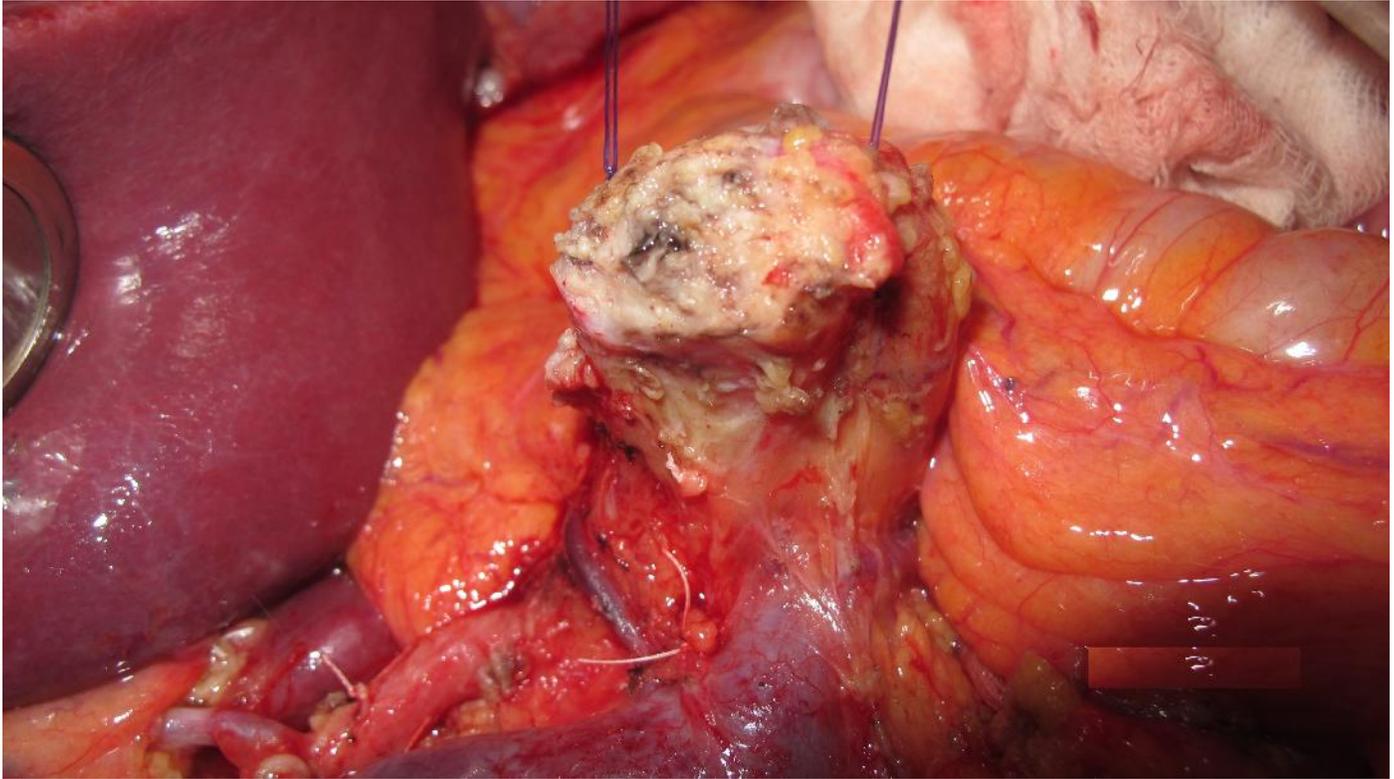
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**Figure 1:** The pancreatic remnant was mobilized 3 cm from the splenic vein and the surrounding tissues.

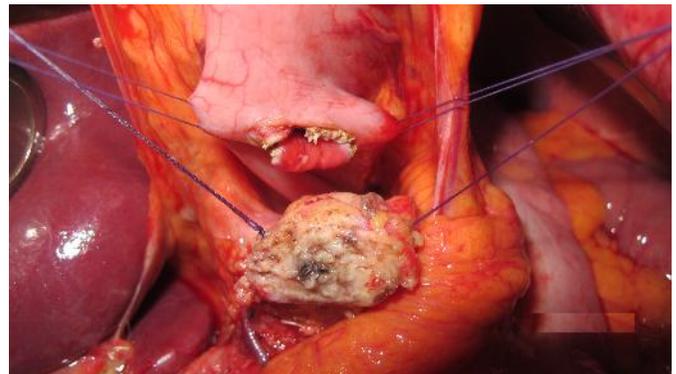
study, we demonstrate a new technique for PG, using one continuous seromuscular circular suture without trans pancreas sutures for PG, which we now use as the standard method for pancreatic reconstruction after PD.

### Material and Methods

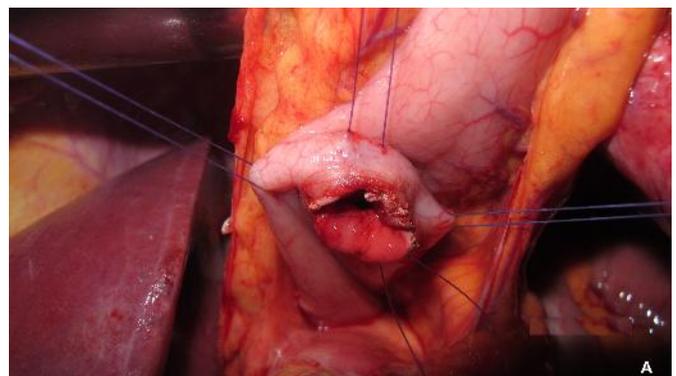
During the period December 2012 to December 2014, 32 consecutive patients underwent PD (either pylorus-preserving or classical Whipple's) carried out using the above suture-less PG. Indication for PD was pancreatic duct carcinoma. All procedures were carried out by the same surgeon, same approach and anastomotic method in order to avoid technical changes.

### Surgical technique

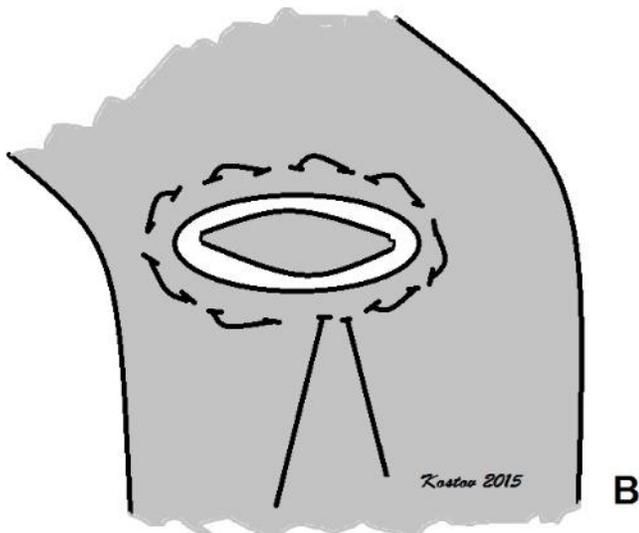
After the PD, any bleedings from the transected surface of the pancreatic remnant is stopped by bipolar electrical coagulation or absorbable sutures. Then the pancreatic remnant was mobilized 3 cm from the splenic vein and the surrounding tissues [Figure 1]. Two transient retention sutures placed at the cranial and caudal proximal end of the pancreatic remnant. Afterward, a transversal full-thickness incision is made on the posterior gastric wall with length 2 cm at the most to ensure tight adherence to the posterior wall of the stomach and the pancreatic stump after completion of the anastomosis [Figure 2]. The relevant place for the incision selected so the pancreatic stump should enter the opening without tension. A 5-cm longitudinal incision made on the anterior gastric wall opposite to the posterior wall incision. A continuous seromuscular circular suture (3-0 PDS) placed around the gastric incision, 1 cm away from the cut edge [Figure 3 A/B]. The pancreatic remnant pulled with slide tension on the holding sutures through the whole in the posterior gastric wall into the stomach [Figure 4 A/B]. This maneuver was



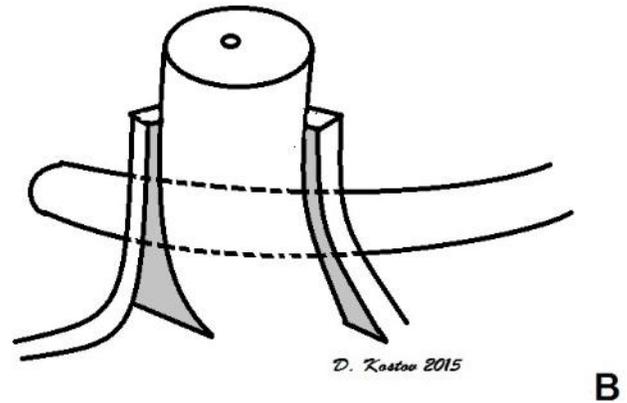
**Figure 2:** A transversal full-thickness incision made on the posterior gastric wall with length 2cm.



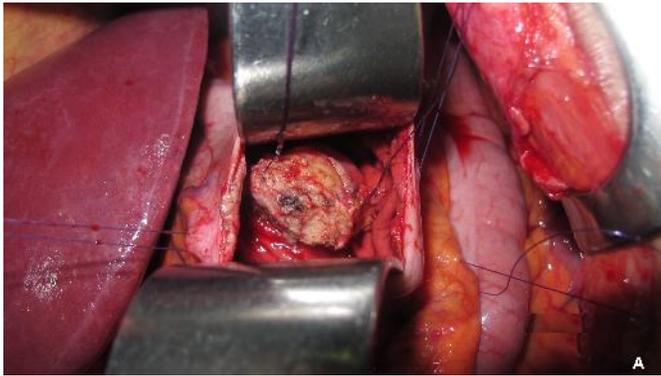
**Figure 3 A:** A seromuscular continuous circular suture (3-0 PDS) was placed around the gastric incision, 1 cm away from the cut edge.



**Figure 3 B:** A seromuscular continuous circular suture around the gastric incision.



**Figure 4 B:** A seromuscular continuous circular suture around the pancreatic remnant.



**Figure 4 A:** The pancreatic remnant pulled with slide tension on the holding sutures through the whole in the posterior gastric wall into the stomach.

performed very gently to ensure tight wrapping of the posterior gastric wall around the pancreatic remnant and to avoid laceration of the pancreas. Ideally, the pancreatic remnant should protrude from the posterior gastric wall by 2 cm. Then the seromuscular continuous circular suture was tied to the lowest part of the pancreatic stump [Figure 5]. A gastric decompression tube is placed just above the PG before the closure of the anterior gastric wall. The anterior wall of the stomach is closed using an absorbable 4-0 interrupted suture, and the PG is complete.

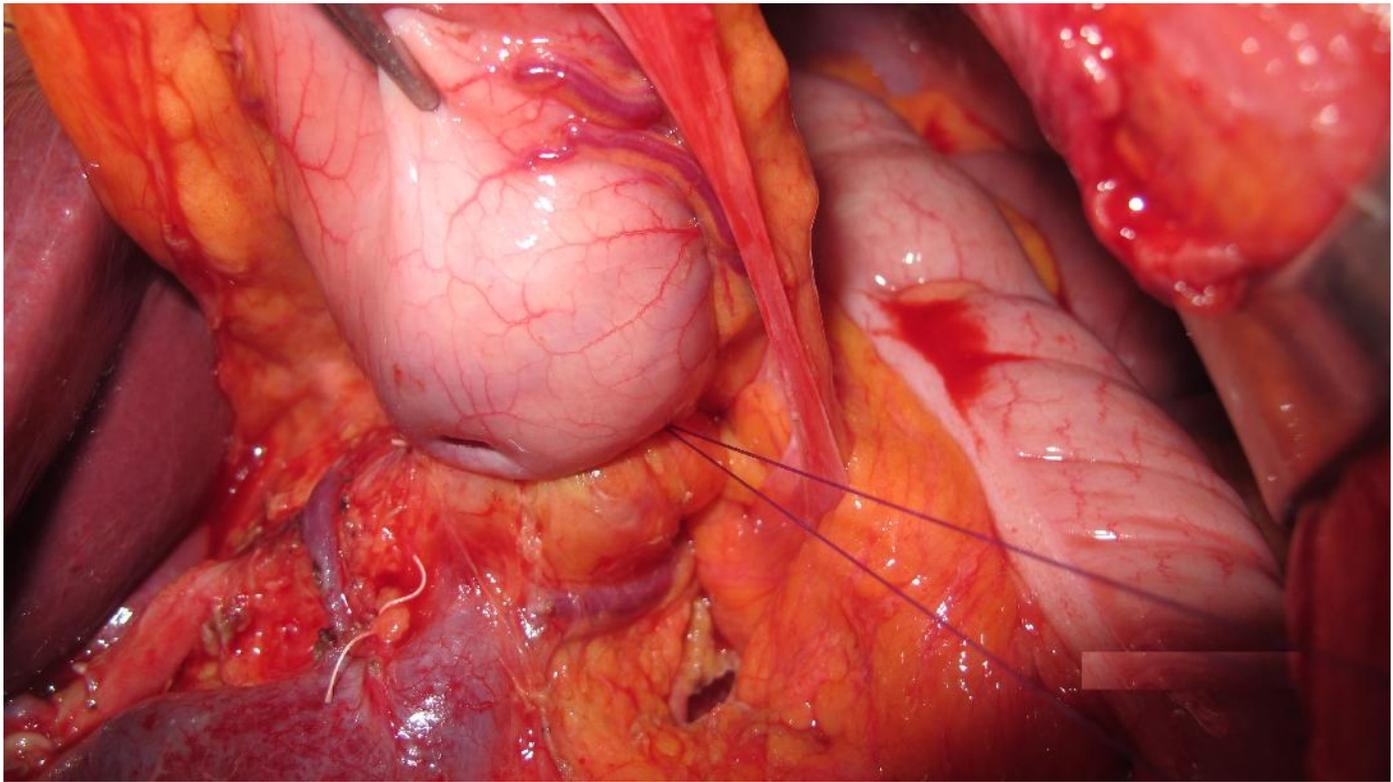
## Results and Discussion

There was no operative or hospital death. Postoperative complications occurred in 7 patients (21.8 %). The most common complication was delayed gastric emptying (Grade B/C) in 3 patients (9.3 %). Pancreatic leak (Grade A/B) occurred in 2 patients (6.2 %). These pancreatic leaks were managed nonoperative by maintaining the closed drains.

Pancreatic reconstruction is particularly demanding; a variety of methods and techniques have been proposed to maintain the continuity of the anastomosis and diminish rates of leak [7,22-24]. However, the issue of which method is optimal to restore pancreatic digestive continuity remains controversial.

Three RCTs [14-16] and four recent meta-analyses [12,25-27] reported lower rates of POPF in association with PG than PJ. In this article, we described a new anastomosis technique using one continuous circular seromuscular suture without trans pancreas sutures for PG. Every suture carries the risk for pancreatic laceration resulting in pancreatic leakage, especially in a fragile and soft pancreatic remnant. This technique minimizes the trauma to the pancreatic parenchyma. Compared with other anastomosis techniques, our method has the several four benefits: it is simple, easy, safe and quick to perform. The median time for the PG anastomosis was 9 minutes. The simplicity of our technique might be an important argument, especially when the anastomosis must show in unfavorable conditions. Our method provides a theoretical risk of ischemic pancreatic tissue injury due to the tightened continuous seromuscular suture. However, we did not yet observe this in our pilot series. The technical and physiological advantages and disadvantages of PG have discussed in several studies reporting the technique [28-32]. PG has recently reintroduced as a useful procedure with several advantages over PJ:

- The PG can be created quickly because of the proximity of the stomach and the pancreas;
- The posterior wall of the stomach is thick and highly vascularized compared with the jejunum;
- The pancreatic juices activated because of the acidic milieu and lack of enterokinase in the stomach. In PG, the pancreatic exocrine secretions enter the potentially acidic gastric environment, precluding digestive damage of the pancreas-enteric anastomosis by proteolytic enzymes;
- PG anastomosis is located at a certain distance away from the major blood vessels, which are skeletonized during the resection phase of the tumor and the lymph nodes. If a PF occurs after PG, the major vessels are less prone to being damaged by activated proteolytic enzymes of the pancreas;
- Postoperative gastric decompression results in removal of gastric and pancreatic secretions and avoids tension on the anastomosis;
- A nasogastric tube can be used as drainage if a fistula occurs after PG, thereby avoiding potentially invasive procedures;



**Figure 5:** The seromuscular continuous circular suture tied to the lowest part of the pancreatic stump.

- PG anastomosis reduces the number of anastomoses in a single loop of retained jejunum, which potentially decreases the likelihood of loop kinking.

However, PG has some theoretical and technical disadvantages. First, PG is burdened with an increased incidence delayed gastric emptying. Second, available data on hormone levels indicate that the exocrine function appears to be worse after PG than after PJ, resulting in severe atrophic changes in the remnant pancreas. Third, the activation of pancreatic exocrine secretions can occur more quickly in the presence of intestinal enterokinase and bile. Another potential disadvantage of PG, compared to PJ is an obstruction of the main pancreatic duct due to overgrowth of the gastric mucosa.

The described modification of PG reduces the risk of pancreatic leakage by removing the danger of suture injury of the pancreas. Our experience with PG showed it to be technically easier, safer and acceptable alternative to the standard PJ procedure for pancreatic stump reconstruction after PD for various indications. The presented suture-less PG has to be evaluated in controlled trials to determine its safety.

### Authors' Statements

#### Competing Interests

The authors declare no conflict of interest.

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