



CASE REPORT

Is the diameter of the main pancreatic duct a limiting factor for duct-to-mucosa pancreaticojejunostomy?

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ABSTRACT

Pancreaticoduodenectomy (PD) remains a technically complex procedure, largely due to the morbidity associated with pancreaticojejunostomy, with postoperative pancreatic fistula (POPF) representing the most significant complication. Despite the numerous reconstruction techniques described in the literature, no single method has been universally accepted as the definitive standard. The Blumgart anastomosis, a reinforced duct-to-mucosa technique, has been shown in several studies and meta-analyses to significantly reduce the incidence of POPF following PD, while remaining reproducible and physiologically sound. However, the management of a small-caliber pancreatic duct continues to pose a technical challenge. We report two cases of PD performed using duct-to-mucosa pancreaticojejunostomy, including one patient with a small main pancreatic duct. Postoperative outcomes were favorable, with no major complications, supporting the feasibility and safety of this technique even in the presence of a small duct diameter, provided that adequate surgical expertise and meticulous technique are ensured. These findings support the Blumgart anastomosis as a reliable reconstruction option after PD, regardless of pancreatic duct size.

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Received: 12 Mar 2026

Accepted: 01 Jun 2026

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Keywords: Pancreaticoduodenectomy, duct-to-mucosa pancreaticojejunostomy, Blumgart anastomosis, Pancreatic fistula, Main pancreatic duct, Postoperative complications.

1. INTRODUCTION

Since the first pancreaticoduodenectomy (PD) reported by Whipple and colleagues in 1935 (1), this procedure has been considered the standard surgical treatment for benign and malignant diseases of the pancreatic head and periampullary region. Due to the complexity of the surrounding anatomical structures and the need for multiorgan resection and reconstruction, PD is recognized as one of the most technically demanding surgical procedures, historically associated with a mortality rate exceeding 5% (2). However, thanks to advances in surgical techniques and perioperative management, mortality has decreased to less than 5% in high-volume centers, although postoperative morbidity remains high, reaching up to 50% (3), mainly due to postoperative pancreatic fistula (POPF) at the pancreatic anastomosis.

Despite numerous technical improvements over the years, surgeons continue to propose various modifications of pancreatic anastomosis techniques in search of the optimal reconstruction method after PD (4). Among these, a relatively recent duct-to-mucosa technique known as the “Blumgart anastomosis” (5) has gained increasing interest. Several studies (3) have demonstrated its effectiveness in reducing the incidence of postoperative pancreatic fistula.

In this article, we present two cases managed in the Department of Surgery A, University Hospital Ibn Badis of Constantine, in which a Blumgart pancreaticojejunostomy was performed. The aim of this article is to demonstrate that pancreaticojejunostomy is feasible and safe even in cases with a small pancreatic duct.

2. CASE 1

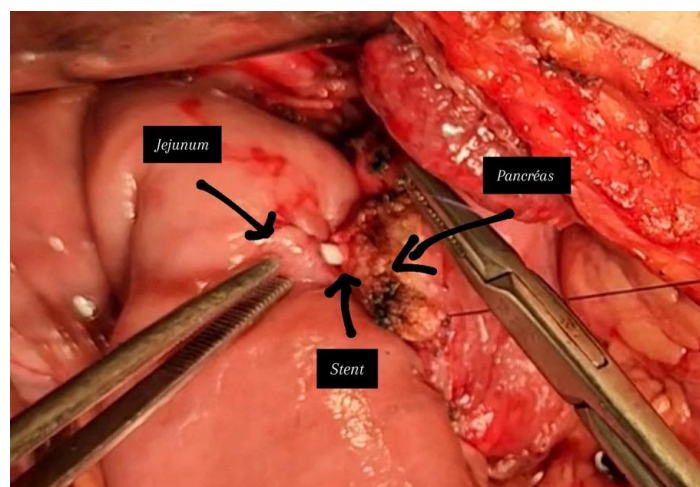
We report the case of a 58-year-old woman from Skikda (Algeria), married, mother of five children, and a retired teacher. Her medical history included well-controlled hypertension under medical treatment, type 2 diabetes mellitus managed with oral hypoglycemic agents, and a total thyroidectomy. The clinical history began six months prior with progressive onset of cutaneous and mucosal subicterus, associated with anorexia and significant weight loss (approximately 15 kg), without abdominal pain or infectious signs. These symptoms prompted outpatient consultation.

Initial abdominal ultrasound revealed a pancreatic head mass associated with intrahepatic bile duct dilatation. For further evaluation, magnetic resonance cholangiopancreatography (MRCP) demonstrated a common bile duct dilated to 16 mm, a non-lithiasic hydropic gallbladder, and a dilated main pancreatic duct measuring 8 mm. Contrast-enhanced computed tomography showed an irregular, infiltrative pancreatic head mass without vascular invasion. It caused double duct dilatation (common bile duct and Wirsung duct) with gallbladder distension, suggesting a malignant primary tumor. Suspicious lymph nodes were identified at the hepatic pedicle, pancreatoduodenal, and celiac regions. Additional findings included homogeneous splenomegaly, mild liver contour irregularity, and moderate portal vein dilatation, suggestive of underlying hepatopathy. Endoscopic ultrasound confirmed cholangiopancreatitis with corpo-caudal pancreatic atrophy and distal bile duct wall thickening. Fine-needle aspiration was paucicellular without evidence of malignancy. A second biopsy revealed chronic pancreatitis without cellular atypia. MRCP confirmed patency of major vascular structures. Staging chest imaging revealed two subpleural pulmonary nodules (9 mm), requiring follow-up, and several nonspecific micronodules in the left upper lobe.

Given the obstructive biliopancreatic syndrome, suspicious pancreatic head mass, and absence of definitive histological diagnosis, a multidisciplinary decision was made to proceed with pancreaticoduodenectomy for both diagnostic and therapeutic purposes. At admission, the patient was in good general condition (WHO performance status 0). Laboratory tests showed WBC 5,700/ μ L, hemoglobin 11.3 g/dL, and platelets 195,000/ μ L. Intraoperative findings confirmed a 3 cm pancreatic head mass, a dilated Wirsung duct (7 mm), and a common bile duct measuring 1.5 cm, without major vascular invasion. The liver was dysmorphic, with no peritoneal carcinomatosis. A standard pancreaticoduodenectomy was performed.

Reconstruction was performed in three sequential steps. An end-to-side pancreaticojejunostomy was fashioned, which represents the critical step and the Achilles' heel of the procedure. Following pancreaticojejunal approximation using three interrupted 5-0 PDS sutures between the pancreatic parenchyma and the jejunal wall, the second stage consisted of constructing the posterior layer of the anastomosis between the main pancreatic duct (duct of Wirsung) and the jejunal mucosa using three interrupted 5-0 PDS sutures.

The third stage involved placement of a transanastomotic stent through the duct of Wirsung into the jejunal lumen, followed by completion of the anterior layer of the anastomosis. The sutures were placed from the anterior pancreatic surface and passed through the pancreatic duct (Figure 1). Finally, additional approximation sutures were placed between the pancreatic parenchyma and the jejunal serosa to reinforce the anastomosis. An end-to-side hepaticojejunostomy was subsequently performed 25 cm distal to the pancreaticojejunostomy. Finally, a gastrojejunostomy was created 40 cm distal to the hepaticojejunostomy in order to restore gastrointestinal continuity and ensure adequate gastric drainage.



Figures 1. Intraoperative image showing a Wirsung–jejunal anastomosis with placement of a stent between the Wirsung duct and the jejunal lumen.

The postoperative course was uneventful, with no reported complications. Oral feeding was initiated on postoperative day 6 following satisfactory clinical and radiological assessment. Surgical drains were maintained for monitoring purposes. The patient was discharged on postoperative day 10 in good general condition, with normal recovery of bowel function and complete resolution of pain. Histopathological examination confirmed a pancreatic ductal adenocarcinoma staged as pT3N0. Lymph node dissection yielded 18 lymph nodes. In addition, all surgical resection margins, including the gastric, biliary, pancreatic, and jejunal margins, as well as the retroportal lamina, were free of tumor infiltration (R0 resection).

3. CASE 2

We report the case of a 57-year-old woman with type 2 diabetes mellitus and hypertension, presenting with epigastric pain. Laboratory tests were within normal limits.

Abdominal ultrasound revealed a solid mass in the region of the pancreatic head (uncinate process), without common bile duct dilatation. MRI demonstrated a 24 mm suspicious pancreatic nodule with a non-dilated main pancreatic duct.

Pancreaticoduodenectomy was performed, with a Wirsung-to-jejunum anastomosis. The pancreatic duct measured 3 mm. Postoperative outcome was favorable, with resumption of oral intake on postoperative day 3 and discharge on day 7.

Ethical Considerations

Written informed consent was obtained from both patients authorizing the publication of the clinical and operative data related to their cases. Patient confidentiality and anonymity were strictly preserved throughout the study. In accordance with the ethical principles of the Declaration of Helsinki, data collection and reporting were conducted with full respect for patient privacy. According to the institutional guidelines in force at our center, approval from the local ethics committee was not required for the publication of case reports.

4. DISCUSSION

Pancreatic anastomosis after pancreaticoduodenectomy (PD) remains the main challenge for the pancreatic surgeon [7]. Over the past 30 years, pancreatic surgeons have continuously sought “optimal” technical solutions for managing the pancreatic remnant, providing evidence supporting the best approaches [8].

A study confirmed that the Blumgart technique appears to significantly reduce postoperative morbidity and mortality compared with other techniques (risk difference -11%; $P < 0.001$). This means that one major complication can be avoided for every ten patients treated [6]. The relative complexity of the anatomical structures surrounding the pancreas and the need to resect and reconstruct multiple organs make pancreaticoduodenectomy one of the most sophisticated surgical procedures, with a reported mortality rate exceeding 5% [9]. Thanks to advances in surgical techniques and perioperative management, the mortality rate associated with pancreaticoduodenectomy has decreased; however, the morbidity rate remains high, ranging between 20% and 60% [10,11].

Termino-lateral duct-to-mucosa pancreaticojejunostomy ensures both mucosal continuity and anastomotic patency. Moreover, it represents the most physiologically appropriate technique [12,13]. This method may offer specific advantages. First, the direct anastomosis between the two mucosal surfaces may promote tissue healing. In addition, the seromuscular covering of the pancreatic stump by the jejunum may prevent erosion of the remnant pancreas by digestive enzymes, thereby reducing the risk of hemorrhage and residual infection [14,15]. Furthermore, the termino-lateral anastomosis is not limited by the diameter of the pancreatic stump [21]. Thus, this technique may be suitable for patients with a large pancreatic remnant and a wide pancreatic duct [16,17,20]; however, the relative technical complexity of the procedure requires greater surgical experience.

For small pancreatic ducts, a forced anastomosis may lead to ductal rupture and failure of the procedure [18,19,20]. Moreover, edema at the anastomotic site may induce suture disruption and potentially fatal postoperative pancreatic fistula [14]. In our experience, although the small diameter of the Wirsung duct makes the procedure technically more challenging, it yields excellent postoperative results, provided that sufficient time is taken, the technique is refined, magnification loupes are used, and fine sutures (5-0 or 6-0 PDS) are employed to avoid ductal injury.

Several studies in the literature support this technical approach. Yamashita et al. demonstrated that the use of $\times 5$ magnification surgical loupes during pancreaticojejunostomy significantly reduced the rate of postoperative pancreatic fistula (POPF) [22]. Furthermore, Nojiri et al. identified suture caliber as a factor influencing the risk of POPF, reporting improved outcomes with the use of fine 5-0 or 6-0 sutures during duct-to-mucosa pancreaticojejunostomy [23].

5. CONCLUSION

This article once again confirms the satisfactory outcomes of pancreaticojejunostomy. This technique promotes biological healing and simplifies the reconstruction process. The incidence of fistula and associated complications with these techniques was low, thereby improving patient prognosis. In our experience, we observed that a small diameter of the pancreatic duct (Wirsung) is not an absolute contraindication to this technique, provided that substantial surgical expertise is available.

Competing interests: The author declares that he has no competing interest.

Funding: This research received no external funding.

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