



Intraperitoneal Drainage and Pancreatic Resection

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- Pancreaticoduodenectomy • Distal pancreatectomy • Intraperitoneal drain
- Pancreatic fistula • Amylase

Key points

- Evidence regarding routine elimination of prophylactic intraoperative peritoneal drainage in all cases of pancreaticoduodenectomy strongly suggests that this approach will greatly increase mortality.
- Elimination of routine prophylactic intraperitoneal drainage during distal pancreatectomy does not appear to worsen or improve overall complications.
- This risk of increased morbidity and mortality with a selective drainage approach must be balanced against the risk of leaving a prophylactic drain in patients with a low risk of developing a pancreatic fistula.
- Drains in low-risk patients do in fact worsen outcomes if left in place too long, and early removal of drains in these patients improves outcomes.

EVOLUTION OF DRAINS IN PANCREAS SURGERY

The most important complication in pancreatic surgery is a postoperative pancreatic fistula. Numerous modifications in pancreatic surgery have been tried in an effort to prevent pancreatic fistula [1–11]. In pancreaticoduodenectomy, different anastomotic techniques (duct-to-mucosa, invaginated) and the use of pancreatic duct stents (internal and external) have been studied. In distal pancreatectomy, various transection methods (oversewing, stapling, stapling with mesh, transpapillary pancreatic duct stents) have been compared. In both types of resections, sealants, autologous tissue patches, and antisecretory

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agents (octreotide, pasireotide) have been extensively studied. Despite all this effort, pancreatic fistula still occurs in about 10% of patients after pancreas resection and remains the most important unsolved problem in pancreatic surgery.

Abdominal drains have been the key mitigation strategy for pancreatic fistula since the origin of pancreatic resection in the early 1900s. Long before pancreas resection was possible, the writings of Hippocrates document the early use of drains to address infections and empyema [12]. These early drains were constructed of a wide range of materials and passively drained fluid collections. With the availability of rubber manufacturing, a soft rubber tube named after Dr Charles Bingham Penrose, a gynecologist, became popular [13]. In the early twentieth century, suction drainage, originally using devices with glass receptacles, became more widely used. Then, in the 1940s and 1950s, with the availability of plastics and other synthetic materials, surgeons began to use closed-suction drains. Later, modifications of drainage tubes in the 1970s were aimed at reducing collapse and/or clogging of the tube. Two neurosurgeons, Drs Fredrick E. Jackson and Richard A. Pratt, designed what is commonly referred to today as the “JP drain” [14]. The JP drain is a flat, rectangular silicone drain with multiple perforations and internal ridges to provide consistent drainage while preventing collapse when under suction. In addition, the “Blake drain” is a cylindrical silicone catheter with a solid cross-shaped center and 4 open-fluted channels to prevent the plugging of draining perforations. Both the JP and Blake drains accomplish the task of closed-suction negative-pressure drainage, and the terms are frequently used interchangeably by surgeons. They remain patent under forces that can reach multiple atmospheres and are designed to avoid obstruction of drainage by body tissues (Fig. 1).

Two studies have compared Penrose drains to closed-suction drains in pancreas resection [15,16]. However, these studies were retrospectively conducted over a long period of time (17 years and 22 years, respectively); comparison of the drains was not the primary endpoint, and they yielded contradictory results. Still, the use of Penrose drains has almost universally fallen out of favor in pancreatic surgery because of concerns about retrograde infection and difficulties with keeping drainage fluid from coming in contact



Fig. 1. Drains used in pancreas surgery: (A) Penrose, (B) Jackson-Pratt, (C) Blake.

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