

The use of a pedicalised gallbladder graft to repair a large duodenal defect: a case report and review of the literature.

Authors

Anoja Wijeratne

Jonathon Gani

Correspondence

anojaw@hotmail.com

jongani@mac.com

Abstract

Large or complex duodenal defects are uncommon but can arise in a variety of clinical contexts and present a technical challenge to manage. A case of severe necrotising pancreatitis complicated by necrosis of the distal stomach and proximal duodenum is presented. The resulting large duodenal defect was not amenable to closure with conventional methods but was successfully repaired with a novel technique of cholecystoduodenoplasty. As far as could be determined, successful repair of a large duodenal defect using the gallbladder as a full thickness pedicled graft for acute duodenal necrosis has not been previously described in the literature. The technique is described and illustrated and the literature in this field is reviewed.

Introduction

Duodenal repairs represent a unique surgical challenge because of the duodenum's distinctive physiological properties, fixed retroperitoneal location and intimate relationship with the bile duct, pancreas, pancreatic duct and major surrounding vasculature (1). It is widely accepted that small uncomplicated duodenal defects can be successfully managed with primary or omental patch repair (2, 3, 4). A large or complex duodenal defect is defined as > 3cm or a defect which cannot be successfully repaired using more conventional methods (5, 6, 7). More complex defects require methods including closure of the proximal duodenum with distal gastrectomy and gastroenterostomy, duodenostomy, Roux-en-Y duodenojejunostomy, gastric or jejunal patches and even radical duodenectomy or pancreaticoduodenectomy (4, 8, 9, 10). The choice of procedure depends not only on the nature of the duodenal defect but also the clinical state of the patient may and is often time consuming and technically challenging (11). Large duodenal defects are exceedingly uncommon but can arise from a variety of pathologies including penetrating trauma, benign ulceration, Bouveret's syndrome, duodenal diverticula, resection of duodenal or tumours with duodenal involvement and acute ischaemic necrosis (5, 12, 13). In this report, we describe the technique of cholecystoduodenoplasty for repair of a complex proximal duodenal perforation secondary to ischaemic necrosis from acute severe pancreatitis.

Case report

A previously well 55 year old male presented to the emergency department with sudden onset severe epigastric pain. On initial examination, the patient was afebrile and had localised epigastric peritonism. An elevated lipase level of 20770 U/L (normal < 286) was consistent with a diagnosis of pancreatitis. The patient denied any recent alcohol intake. The patient had a leukocytosis of $21.4 \times 10^9/L$ and a normal C-reactive protein (CRP) level on presentation. A trans-abdominal ultrasound showed a thin walled gallbladder, no evidence of cholelithiasis, a mildly dilated common bile duct with a diameter of 7mm and a prominent pancreatic duct with a diameter of 3.4mm. Two days later, the CRP level rose to 276, liver function tests were moderately deranged and an abdominal CT scan was performed which was consistent with acute necrotizing pancreatitis involving mainly the pancreatic head and uncinate process with a moderate amount of fluid accumulation in paracolic gutters. The patient was managed with supportive measures including analgesia and enteral nutrition. Over the next 2 weeks, the patient became increasingly septic and a repeat CT scan confirmed infected peripancreatic necrosis with gas pockets extending into the transverse mesocolon.

After a 4 week period of non-operative management, the patient underwent a pancreatic necrosectomy through a roof top incision. Debridement of necrotic tissue from the lesser sac, right transverse mesocolon and retroperitoneum was undertaken. A bile leak of unclear aetiology was noted from between the head of the pancreas and the second part of the duodenum. This was controlled by

means of external drainage and packing and a laparostomy was formed. The next day, the patient had massive haemorrhage from an abdominal drain necessitating an urgent return to the operating room for oversew of a ruptured gastroduodenal artery pseudoaneurysm. The gastric antrum and anterior walls of first and second parts of the duodenum were noted to be ischaemic during the procedure. Further peripancreatic necrosectomy was performed. Two days later, the patient developed another bleeding complication arising from a pseudoaneurysm of his middle colic artery that was dealt with by suture ligation. The ischaemic areas noted previously had become necrotic requiring a damage control distal gastrectomy and partial anterior duodenectomy down to the level of the ampulla (figure 1). Duodenectomy also identified the initial bile leak to have been from a deroofed periaampullary duodenal diverticulum. An expected high output biliopancreatic fistula was controlled satisfactorily with packing and dependent external sump drainage.

At 1 week after the initial laparotomy and necrosectomy, much of the peritoneal surfaces were replaced by granulation tissue and structures such as the transverse colon and mesocolon, small bowel loops and the mesentery had become extremely oedematous and firm (figure 2). This created challenges for the subsequent reconstruction of the stomach and duodenum. The reach of the small bowel into the supracolic compartment was limited by its shortened and thickened mesentery and a bulky mound formed by the transverse colon and mesocolon. Thus, a single loop of small

bowel, either in continuity or as a roux-en-Y loop could not reach both the stomach and the duodenum. A retrocolic route was also made difficult by the gross thickening of the transverse mesocolon. An unconventional but viable option was to use the gallbladder as a pedicalised patch to repair the duodenum and perform a standard antecolic gastrojejunostomy.

Operative technique

First, an operative cholangiogram was performed. To avoid an inadvertent injury to the cystic artery, a cholangiogram was performed via needle puncture of the common bile duct. The cholangiogram did reveal a filling defect consistent with a bile duct stone, which was removed via the cystic duct using a flexible choledochoscope.

The gallbladder was then mobilized off the liver bed with particular care to preserve its vascular supply and venous drainage (cystic artery and vein). A longitudinal cholecystotomy made on its inferior surface for a full thickness anastomosis with the edges of the large duodenal defect using interrupted 3-0 polypropylene suture. The cystic duct was not ligated. Upon completion of the gastrojejunostomy, the gallbladder patch appeared deeply congested and cyanosed. A decision was made to perform a re-look laparotomy in 48 hours. A feeding jejunostomy tube was placed using a Witzel tunnel and laparostomy dressing re-applied. At re-look laparotomy, the gallbladder and duodenum looked well perfused with no residual venous congestion (figure 3).

During the patient's recovery, a minor bile leak was noted which spontaneously resolved after one week. Multiple abscesses in the left lobe of the liver and between the liver and the stomach remnant were treated with percutaneous drainage and antibiotics. Gradually, oral intake was well tolerated and his bowel function returned to normal. His open abdomen continued to be managed with vacuum-assisted dressing for another 4 weeks after which it was covered with a skin graft. The patient was discharged from hospital.

Discussion

The surgical repair of duodenal injuries is dependant on the aetiology, site and size of the defect as well as associated patient factors and of course, the surgeon's technical experience (10, 14). While the majority of duodenal injuries can be managed with more widely practiced methods, larger duodenal defects require less commonly utilised methods of repair. Several novel methods are described in case reports and experimental models in the literature for repair of large duodenal defects. No single method is appropriate for all large duodenal defects and this reflects the challenging nature of duodenal repairs particularly in complex patients. Novel options described in the literature include a mucosal patch using a pedicled jejunal or ileal graft, gastric island patch as well as use of synthetic mesh (15, 16, 17). In this case report, we describe a successful pedicalised full thickness gallbladder patch repair (cholecystoduodenoplasty) of a large proximal duodenal

defect in a patient with a large duodenal defect where other techniques were not available (Figure 4). The gallbladder mucosa is quite adequate in this situation where there has been diversion of gastric acid but its durability in an acid environment is unclear.

Other uses for gallbladder flaps have already been described in the literature, particularly in relation to type II and III Mirizzi syndrome (18, 19, 20). In these cases, the use of a pedicled gallbladder flap was used to reconstruct the bile duct (21). Choledochoplasty can be successfully performed with a well-vascularised gallbladder flap which is known to be bile-tolerant. The use of the gallbladder for this purpose is also advocated due to its convenient location and negates the need for more complex reconstruction methods (22). Its location lends a pedicalised gallbladder flap to variety of clinical scenarios from an alternative to biliary reconstruction in liver transplant (23) to biliary diversion secondary to benign or malignant obstruction via a cholecystoenterostomy (24, 25).

Conclusion

Cholecystoduodenoplasty is an efficient and viable method for repair of selected large duodenal defects. Important factors for the success of this repair include minimising mobilisation of the gallbladder to preserve its vascularity while allowing a tension-free repair as well as excluding distal biliary obstruction.

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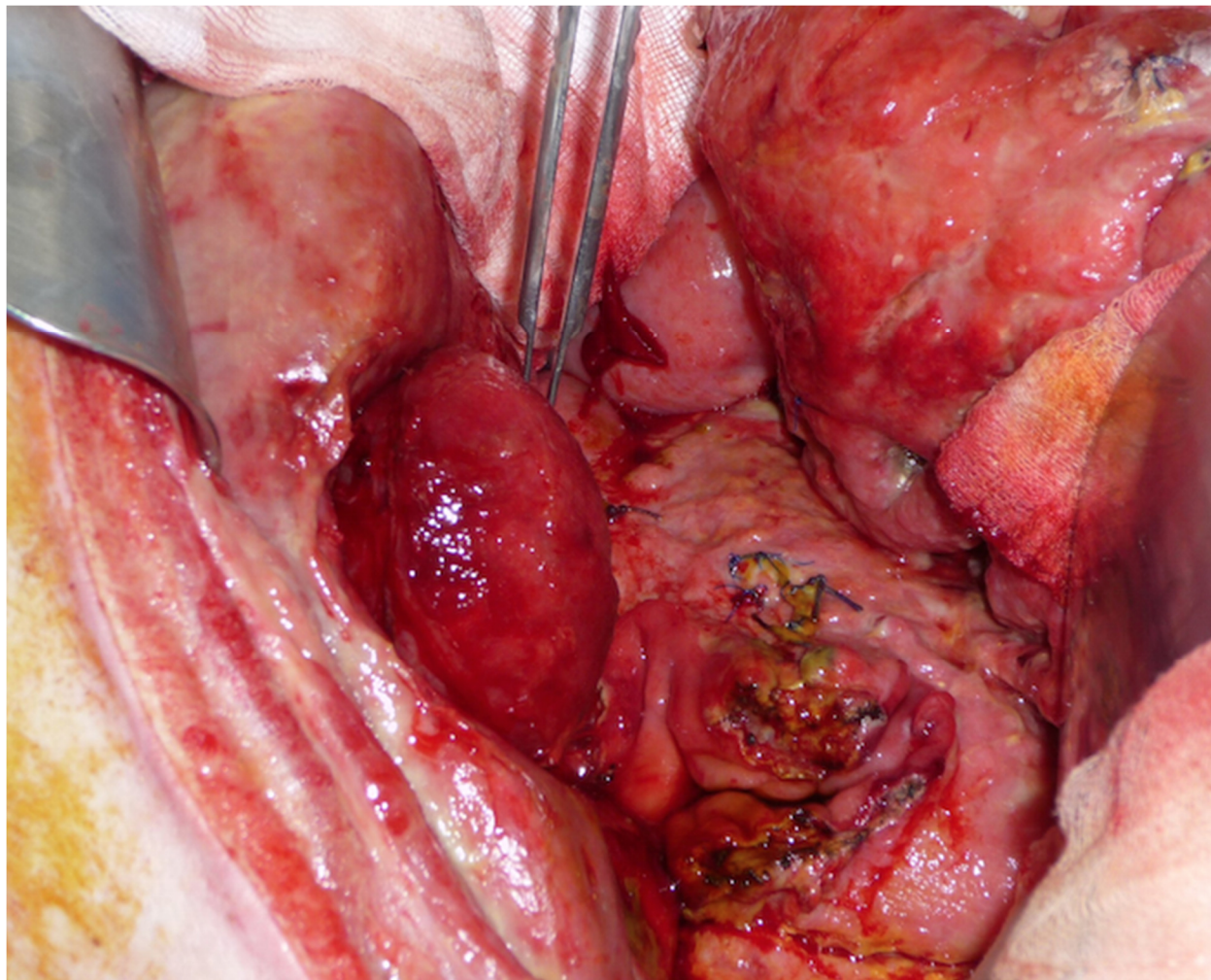


Figure 1 Intraoperative photo – one week post initial necrosectomy. Large anterior duodenotomy D1/D2 with oedematous and non-pliable wall. Forceps = gallbladder

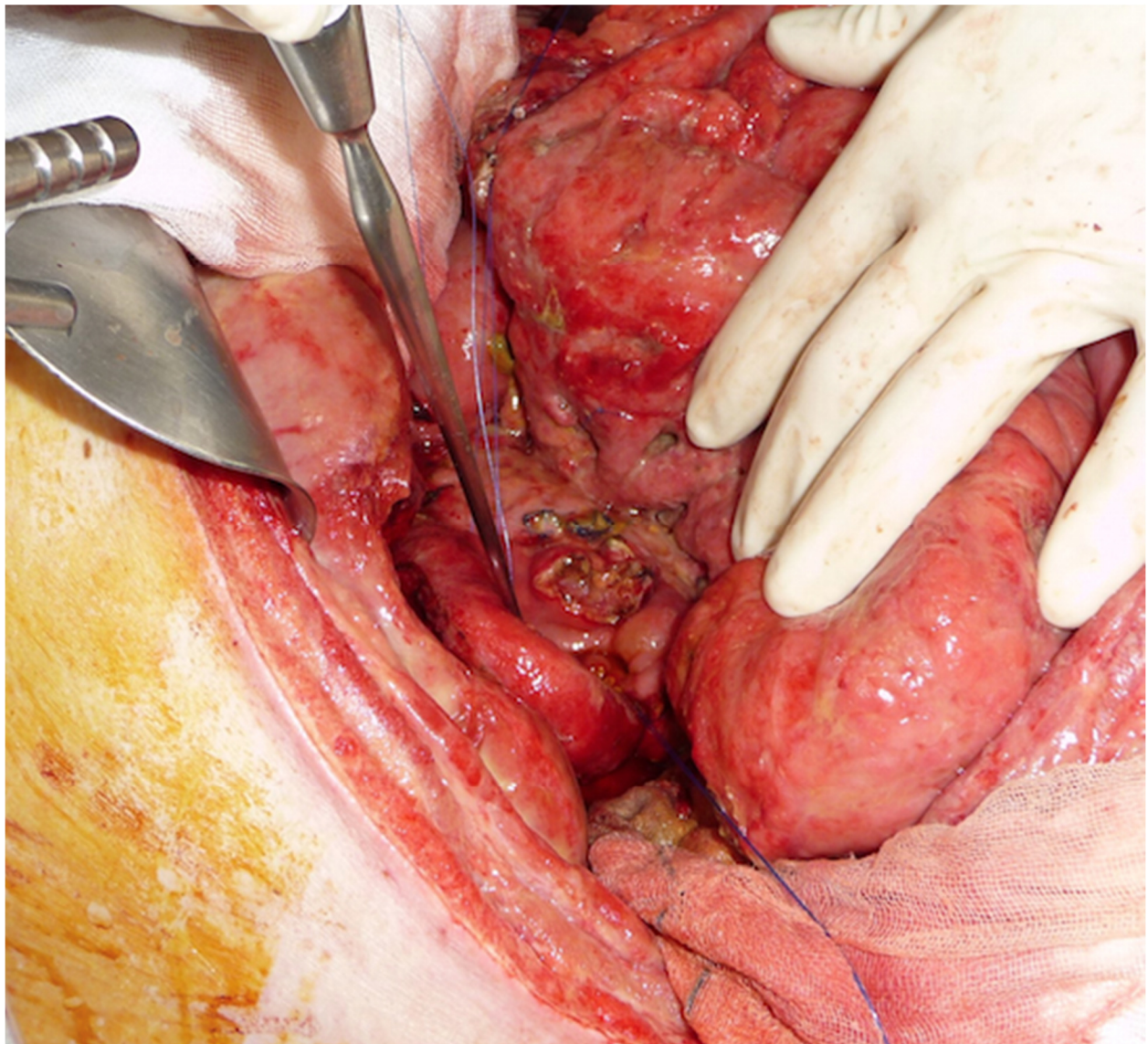


Figure 2 – Cholecystotomy and preparation for cholecystoduodenoplasty

Forceps = gallbladder

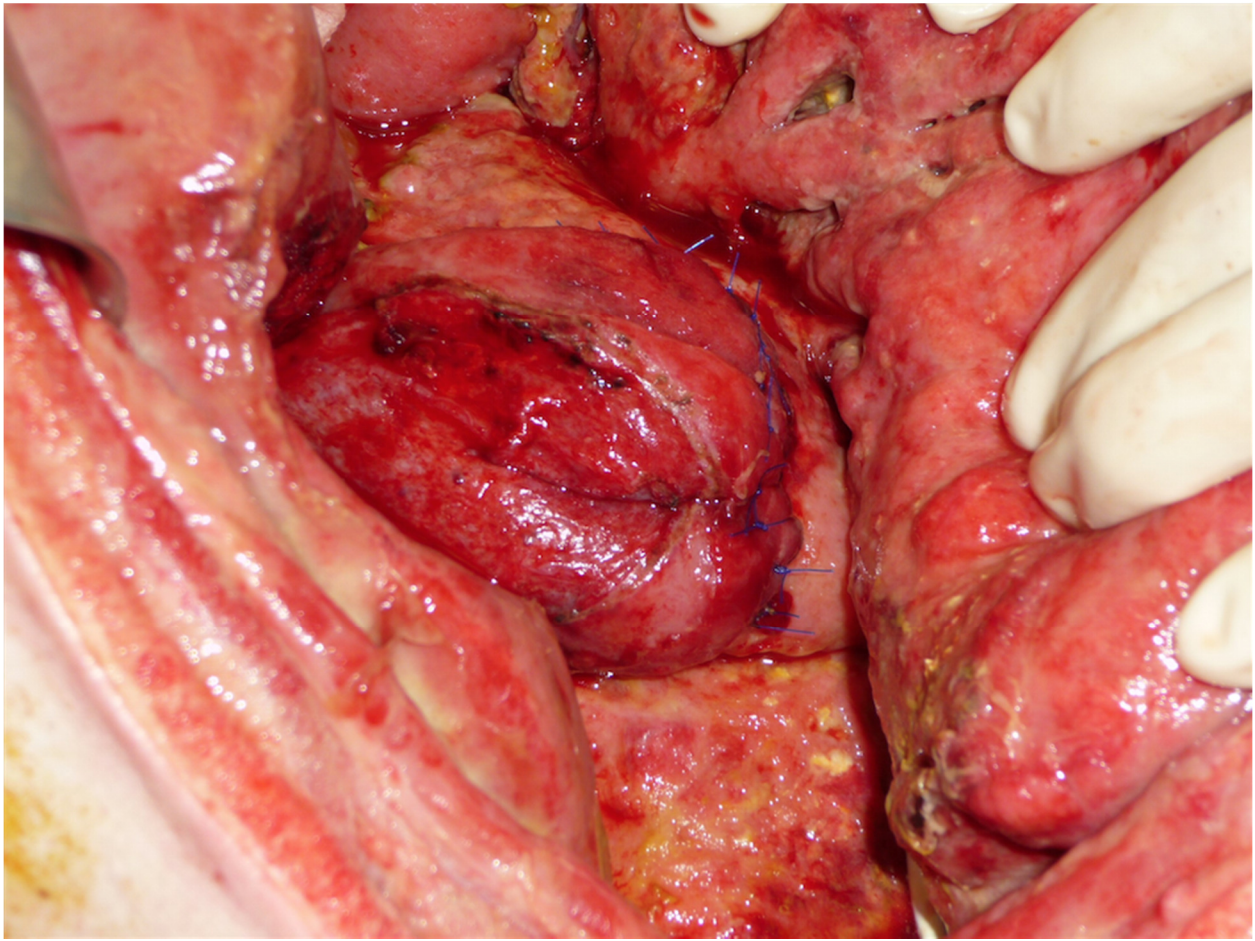


Figure 3 - Cholecystoduodenoplasty

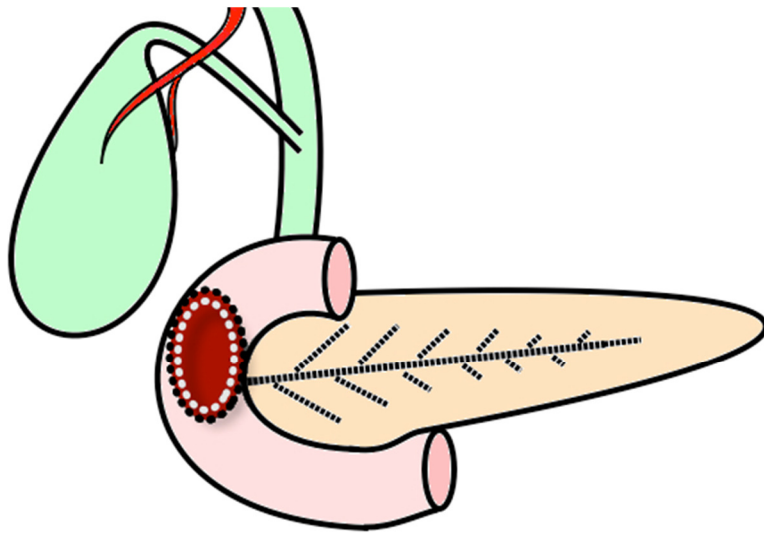


Figure 4A

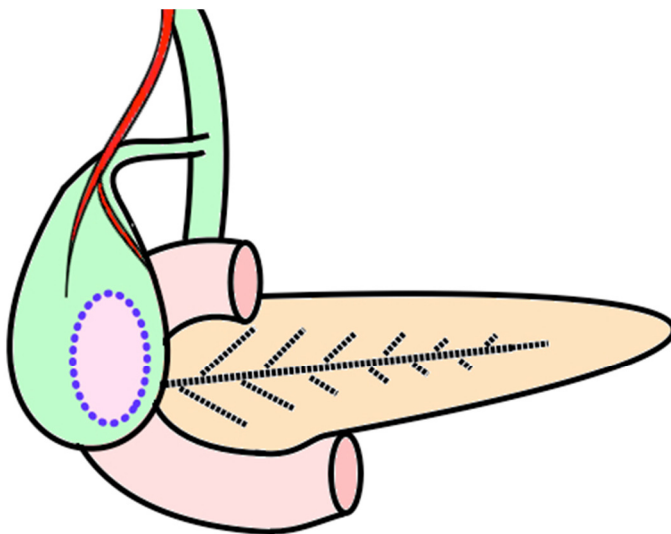


Figure 4B

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Figure 4 – Schematic diagram of cholecystoduodenoplasty A. – Complex duodenal perforation
B. Repaired using a pedicled gallbladder flap