

## CASE REPORT

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# Pancreaticoureteral Fistula Following Penetrating Abdominal Trauma

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### ABSTRACT

**Context** The main pancreatic duct can form a fistulous communication with another epithelium in the setting of prolonged inflammation, operative manipulation, or direct trauma. We present a rare complication of a pancreaticoureteral fistula following a trauma nephrectomy.

**Case report** A 17-year-old male who sustained a gunshot wound to the back arrived to our Emergency Room hypotensive, tachycardic, and with free intraperitoneal fluid on focused assessment sonography for trauma (FAST) exam. He was taken to the operating room for an exploratory laparotomy where a left nephrectomy was performed to control active bleeding from the left renal hilum. Significant bleeding was also encountered at the portal venous confluence. After packing and damage control laparotomy, the periportal/pancreatic bleeding was controlled during a second procedure 6 hours later. After one month in the Intensive Care Unit with an open abdomen, a computed tomography (CT) scan revealed a fluid collection in the splenic fossa which was drained by catheter. Persistent drainage revealed a high amylase concentration (greater than 50,000 U/L). A fistulogram revealed interruption of the main pancreatic duct, and a fluid collection by the tail of the pancreas that was in communication with the

left ureter. The patient's urine amylase was also elevated. The patient was treated non-operatively given the healing open abdomen and controlled fistula. He had an otherwise uncomplicated recovery.

**Conclusions** This is the second report of a pancreaticoureteral fistula in the literature. Treatment of this communication should be similar to that of other pancreatic fistulae.

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### INTRODUCTION

Pancreatic fistulae result when the main pancreatic duct communicates with another epithelialized surface. These fistulae may evolve in the setting of inflammatory pancreatic disease or as a result of injury following surgical resection or trauma. While a variety of pancreatic fistulae have been described in the literature, including communication with peritoneal, pleural, epidermal, and pericardial epithelium, to our knowledge, there is only one prior report of a pancreaticoureteral fistula [1, 2, 3, 4, 5].

### CASE REPORT

A 17-year-old man who had sustained a gunshot wound to the back was brought into the emergency room where he was found to be hypotensive and tachycardic. Secondary survey revealed a bullet wound at the level of T3/T4 on the left back. A focused assessment sonography for trauma (FAST)

exam revealed intraperitoneal free fluid. The patient was emergently intubated and taken to the operating room for an exploratory laparotomy.

Intra-operative findings included a large, expanding, left-sided retroperitoneal hematoma. Further investigation revealed active arterial and venous bleeding from the left renal hilum and a left nephrectomy was performed as a damage control intervention. The left ureter was oversewn using an absorbable suture. No other injuries involving the ureter were found. Gross hematuria had been noted prior to the operation. Difficult bleeding was also encountered at the portal venous confluence behind the pancreas without obvious parenchymal pancreatic injury. Secondary blast effects were noted in the wall of the duodenum and proximal jejunum. The patient was acidotic (lactate 8 mmol/L; reference range: 1.0-2.5 mmol/L), hypothermic (33.8°C) and coagulopathic (INR 2.8) and therefore damage control measures were initiated and a temporary abdominal closure was performed. After six hours of unsuccessful intensive care unit resuscitation, the patient was returned to the operating room for presumed ongoing surgical bleeding. Bleeding from the portal venous confluence was identified and

definitively controlled by suture ligation. The proximal duodenum and jejunum were noted to be of questionable viability and were protected with stapled pyloric exclusion. Closed suction drains were left along the head and tail of the pancreas. The patient was further resuscitated and re-explored on post-operative day 4. His bowel appeared viable and gastrointestinal continuity was restored with a gastrojejunostomy. A feeding jejunostomy was also placed. The abdominal wall fascia could not be approximated and temporary abdominal closure was performed. One of the closed suction drains inadvertently fell out. On post trauma day 11, the abdominal fascia was approximated with cadaveric dermis and vacuum suction. The remaining drain was taken out 18 days post trauma for minimal output.

The patient's post-operative course was complicated by fevers. A computed tomography (CT) scan one month post-injury showed fluid collections in the splenic fossa adjacent to the pancreas. Interventional radiology catheter drainage of the collection yielded 500-700 mL/day of fluid with an amylase concentration of 50,000 U/L. The patient was maintained on bowel rest, sandostatin, and parenteral nutrition. Over the next few weeks, output from the pancreaticocutaneous fistula fluctuated but at times was greater than 500 mL/day and not altered by sandostatin therapy. Endoscopic retrograde cholangiopancreatography (ERCP) was attempted by our most experienced endoscopist in order to stent the pancreatic duct. Despite multiple attempts the ampulla could not be accessed as a result of the surgically altered anatomy. MRCP was considered but it was felt that management would not be altered. A fistulogram was performed which showed a discontinuity of the main pancreatic duct in the head of the pancreas, a fluid collection adjacent to the tail of the pancreas, and a communication between the left fluid collection and the left ureter (Figure 1). The patient's urine amylase concentration (815 U/L) was elevated. The decision was made not to explore the abdomen via laparotomy given the frozen



**Figure 1.** Injection of non-ionic contrast through the external Jackson-Pratt drain pacifies the pancreatic duct with immediate filling of the left ureter.

open abdomen. Repeat ERCP was not attempted. Over the next 1-2 weeks, the patient's fistula output dramatically decreased to less than 20 mL/day. The patient's urine amylase measured 300 U/L and serum amylase measured 250 U/L (reference range: 25-125 U/L). The patient's drainage catheter was removed, oral feeds were restored, and the remainder of his post operative course was unremarkable.

Subsequent follow-up four months after injury revealed no voiding dysfunction. The ureter was not re-evaluated. The urinary amylase normalized. Urinalysis revealed no hematuria.

## DISCUSSION

The precise etiology of the pancreaticoureteral fistula in this case is uncertain. The fistula most likely resulted either from unrecognized trauma to the main pancreatic duct or from an iatrogenic intraoperative injury. The pancreatic fistula and collection most likely had eroded into the area of the left nephrectomy and recently oversewn ureter. It is conceivable that the use of non-absorbable suture in ligating the ureter may reduce the risk of fistula development. In addition, the presence of a long ureteral stump possibly contributed to fistula formation. However, in the context of an unstable trauma patient, further distal dissection of the ureter would have been ill-advised.

Only one prior report describes a patient with a traumatic pancreaticoureteral fistula and in this case, unlike in the present report, the kidney and ureter were both intact [5]. The fistula developed one week after distal pancreatic transection and ureteral contusion secondary to a gunshot wound. After discovery of the fistula, the patient's ureter was endoscopically stented and he was managed with TPN and a somatostatin analogue. Follow-up ureterograms revealed closure of the fistula at twelve weeks post-injury [5].

Pancreatic fistulae may be successfully managed conservatively, endoscopically, or with operative repair. Conservative

management results in spontaneous resolution in 50-90% of all pancreatic fistulae [6]. This treatment typically entails catheter drainage, fluid management, and nutritional support. A recent retrospective study found that 85% of patients with post-operative pancreatic fistulae resolved with expectant management [7]. In a prospective study, 90% of post-traumatic pancreatic fistulae that were managed conservatively closed spontaneously within 24 days [8].

Intervention becomes necessary when a high output fistula persists beyond several months or when it becomes complicated with infection or bleeding [9]. Endoscopic therapy with sphincterotomy and pancreatic stent placement may be attempted to redirect pancreatic secretions away from a fistula tract. In a retrospective study, endoscopic therapy was successful in 82% of cases [10]. In another study, pancreaticocutaneous fistulae treated with endoscopic stent placement resolved in 100% of patients (n=15) within a median time of 10 days [11]. In cases of failed endoscopic therapy, surgery is indicated. Surgical interventions include either distal pancreatic resection or Roux-en-Y pancreaticojejunostomy.

Of additional concern in cases of pancreaticoureteral fistula is the potential pathologic effects of pancreatic secretions on uroepithelium. Exocrine pancreatic secretions are known to damage uroepithelial tissue in patients with bladder-drained pancreatic allografts. Activated proteolytic enzymes and alkaline pH may impair local mucosal defenses thereby predisposing patients to urinary tract infections, urethritis, ulcerations, and strictures [12]. Pancreatic secretions have also been reported to cause metaplastic changes, ranging from cystitis cystica to transitional cell papilloma [13]. Duodenal enterokinase is required to activate pancreatic proteolytic enzymes and patients who receive segmental pancreatic transplants without duodenocystostomy have lower rates of complications related to pancreatic secretions [14]. Because our patient's uroepithelium was only transiently exposed to pancreatic secretions, and these did not contain activated

proteolytic enzymes, future adverse urological sequelae are unlikely.

In summary, pancreaticoureteral fistulas are extremely rare after penetrating trauma and should be managed similarly to other types of pancreatic fistulae. Conservative management with catheter drainage, electrolyte repletion and nutritional support can result in very high closure rates. Endoscopic stenting is another option in cases where gastrointestinal continuity is preserved. Surgical treatment in the form of distal pancreatic resection or Roux-en-Y pancreaticojejunostomy should be reserved for failed conservative and endoscopic management.

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**Keywords** Pancreatic Fistula; Ureter; Wounds, Gunshot; Wounds, Penetrating

**Abbreviation** FAST focused assessment sonography for trauma

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