

Complete major pancreatic duct disruption complicated by pancreatico-atmospheric fistula following blunt upper abdominal trauma

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ABSTRACT

Pancreatic injury post blunt abdominal trauma is exceedingly rare. When complete major pancreatic duct (MPD) disruption occurs, a disconnection between the pancreas and the duodenum can take place, ultimately leading to fistula formation. We describe a case of MPD disruption following blunt abdominal trauma, complicated by a fistula between the pancreas and an open abdomen (pancreatico-atmospheric fistula). Although the fistula was managed using standard methods for treating pancreatic fistulas, wound care was a significant challenge in this case where the fistula exteriorized into an open abdomen.

KEYWORDS: blunt abdominal trauma; pancreatico-cutaneous fistula; pancreatic injury; pancreatico-atmospheric fistula; distal pancreatectomy; wound care

INTRODUCTION

Disruption of the main pancreatic duct (MPD) can result from pancreatitis, pancreatic malignancy, or surgery (iatrogenic injuries during pancreatic necrosectomy, during surgical repair of the abdominal aorta, etc.) [1]. However, pancreatic injury following blunt abdominal trauma is rare, with an incidence of 2-5% [2].

A complete disruption of the MPD can lead to a disconnect between the distal pancreas or body and the duodenum [3]. The subsequent leakage of pancreatic secretions caused by disruption of the MPD will either resolve spontaneously or lead to complications, such as fistula formation, which can cause further complications including intraabdominal sepsis, electrolyte loss, skin irritation, and erosion of surrounding structures such as vessel walls with consequent hemorrhage, bile ducts, and intestines [4].

These pancreatic fistulas can be divided into internal (communicating to a hollow organ) or external (communicating to the skin) fistulas. However, a pancreatico-atmospheric fistula (fistula exteriorizing to the open abdomen) can also result when the abdomen is left open in the context of blunt upper abdominal injury repair [5].

The standard of care for pancreatic duct disruption following blunt abdominal injury is surgical and often includes a distal pancreatectomy to decrease the incidence of complications (such as fistula formation, anastomotic leakage, and intraabdominal abscess formation) [6]. The case

presented is that of a pancreatic duct disruption following blunt abdominal trauma resulting in a pancreatico-atmospheric fistula.

CASE PRESENTATION

A 36-year-old man was admitted to a hospital abroad after a crush injury from a tree falling on his abdomen while he was resting in a hammock. He underwent an urgent laparotomy. Intraoperatively, there was a grade 4 liver laceration and a left gastric artery injury. Both sets of injuries were controlled, and a temporary abdominal closure was placed. On subsequent operations, the patient also underwent a right hemicolectomy with ileostomy and debridement of necrotic pancreatic tissue, and splenic artery repair.

The patient also underwent endoscopic retrograde cholangiopancreatography (ERCP) due to a high bilirubin count, and a pancreatic stent was placed. His postoperative course was complicated by sepsis, which was treated with antibiotics.

One month after his injury, the patient was transferred to our level-1 trauma hospital located in Montreal (Quebec, Canada).

Upon admission, the patient was septic with fever and a high leukocyte count. Further physical examination showed a laparotomy incision with a copious amount of purulent, milky white discharge between suture gaps. There were also multiple abdominal drains and an ileostomy draining soft stool.

Identifying the pancreatic injury was done by analyzing the fluid discharge which confirmed that it was of pancreatic origin with an amylase level of 118,300 U/L.

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A baseline CT (Computerized Tomography) scan was performed, revealing a stent in the pancreatic head (extending to the second part of the duodenum) and a significant gap between the distal pancreas and the head of the pancreas. The CT scan also showed fractured ribs and signs of lacerations in the kidneys, liver, and spleen.

Shortly after arrival, the patient was taken to the operating room for exploratory laparotomy for a proper washout and drainage and to try evaluating accessibility of the pancreas, knowing that this would be challenging given the number of operations the patient has had and the time since injury. During the laparotomy, the wound was mostly already opened, and the fascia was clearly dehiscid. The abdominal wall was fused to the intraabdominal viscera, and there was absolutely no way of dissecting to the lateral aspects of the abdomen to reach the distal pancreas and spleen. In the upper central portion of the abdomen, there was significant necrosis over the body of the pancreas as it was draining into the midline wound and an abdominal abscess. A necrosectomy and abscess drainage were performed. The abdomen was completely socked in with an inability to differentiate anatomic planes.

Intraoperative gastroscopy was unremarkable. A drain was left in the pancreatic bed, and another drain was left lateral to the duodenum.

Finally, a temporary abdominal closure was applied. The patient returned to the OR several times for further washouts and drainages.

Following operative exploration (details to follow), a Magnetic Resonance Pancreatography subsequently revealed that the MPD was unrecognizable for a length of 2-3 cm in the body of the pancreas (a clear discontinuity between the distal pancreas and the head of the pancreas) (Figure 1) and

that the pancreatic fluid had come from the pancreatic tail extending to the open abdomen. This confirmed the diagnosis of MPD disruption complicated by a pancreatico-atmospheric fistula.

Initially, the patient was started on a 2-week dose of meropenem (1000 mg IV). To address the fistula output, the patient was put *nil per os* (NPO) and was started on total parenteral nutrition (TPN) and Octreotide (100 mcg/mL IV). Electrolytes were monitored regularly and corrected as needed.

The patient was taken to the operation room 4 times for laparotomies, washout, wound debridement, and Vacuum-assisted closure (VAC) changes. All that, coupled with bedside dressing changes, resulted in the development of granulation tissue over the open abdomen.

To accelerate the healing process, a split-thickness skin graft applied to the granulation tissue developing in the abdominal wound converted the pancreatico-atmospheric fistula to a pancreatico-cutaneous fistula.

ERCP was repeated at our institution and showed no leak, and the previous stent placed abroad was replaced by a new stent.

After 40 days on TPN, the patient started tolerating an oral diet (low fat, high protein). The fistula output and amylase levels started decreasing subsequently. The skin graft was successful with >90% take. Finally, the patient was discharged after a total of 60 days of admission to the Montreal General Hospital.

On further follow-up in the clinic 3 weeks after discharge, a CT of the abdomen with a fistulogram showed that the contrast did not reach the pancreas; thus, there was no evidence of a fistula from the pancreas to the skin surface, indicating that the pancreatico-atmospheric fistula had

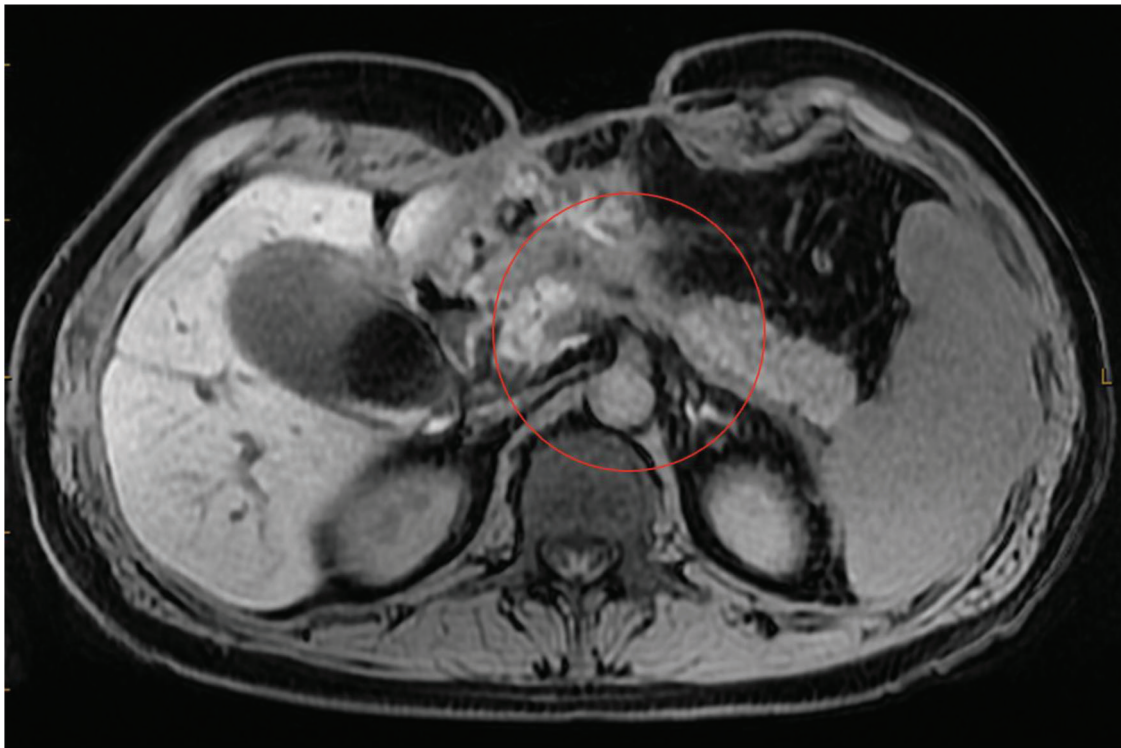


Fig. 1. Magnetic Resonance Pancreatography revealing unrecognizable MPD for a 2-3 cm in the body of the pancreas.

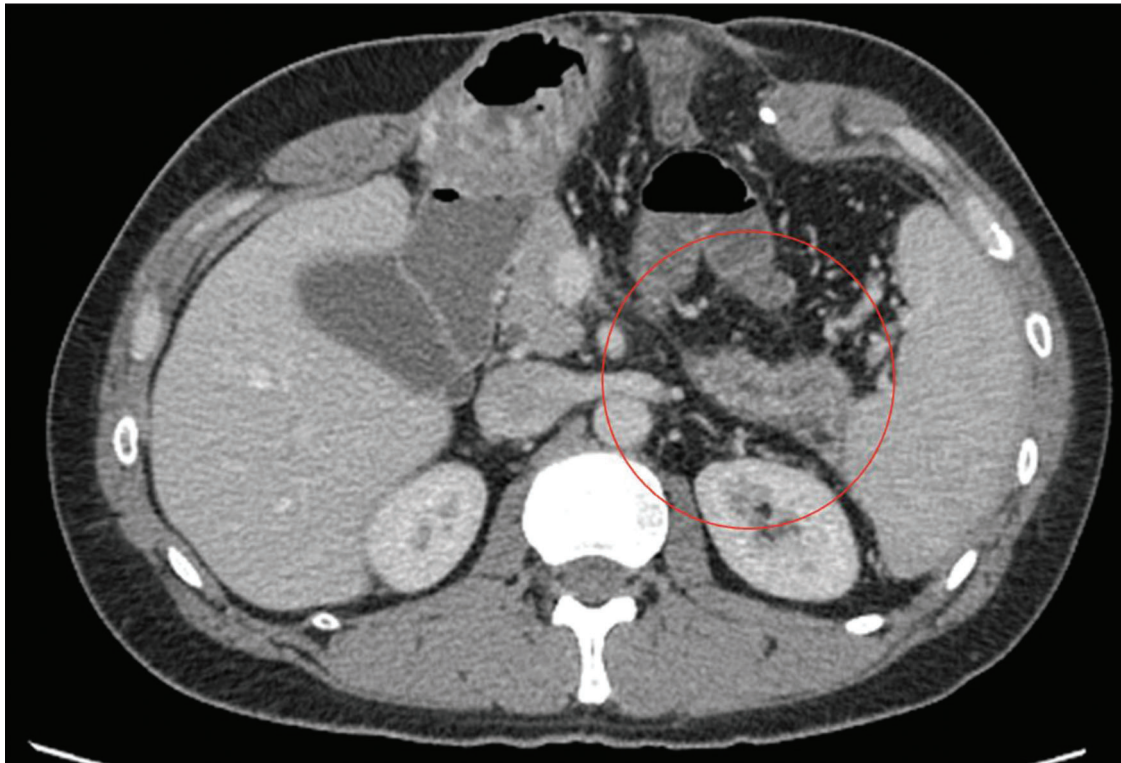


Fig. 2. Abdominal CT one year after the injury showing pancreatic tail atrophy.

closed completely. A repeated abdominal CT one year after the injury showed that the pancreatic tail has atrophied (Figure 2).

In summary, this case of a complete MPD disruption presenting with a pancreatico-atmospheric fistula was managed by endoscopic drainage therapy with stenting, as well as total parenteral nutrition and octreotide followed by the gradual introduction of enteral feed to lower the secretion of pancreatic fluids.

■ DISCUSSION

Although blunt abdominal injuries affecting the pancreas are rare (occurring in 2-5% of cases) [2], they pose a serious challenge, including sepsis, difficult abdominal wall closure and management, electrolyte and fluid disturbances, nutritional deficiencies, hemorrhage, all contributing to significant morbidity and mortality [4,7,8].

While external pancreatic fistulas (EPFs) usually occur after drainage of inflammatory pancreatic pseudocysts or elective pancreatic surgeries, EPFs following nonpenetrating abdominal injuries are uncommon, occurring postoperatively in 4%-6% of patients [9,10].

In the setting of damage control laparotomies, the abdominal wall is left open with a temporary abdominal closure to prevent the occurrence of abdominal compartment syndrome (ACS) and to facilitate subsequent exploratory laparotomies. In these settings, an EPF can exteriorize to the open abdomen, resulting in the so-called pancreatico-atmospheric fistula [5,11].

Although the literature mentions some cases of MPD disruption complicated by an external pancreatic fistula

connected to the skin, which has a mortality of 28.6%, to our knowledge, this case is the first to describe MPD disruption followed by the development of a pancreatico-atmospheric fistula, which likely has a higher mortality than that seen in a pancreatico-cutaneous fistula [5].

The treatment of EPFs in the setting of posttraumatic MPD disruption can be quite challenging and includes the following:

1) Surgical management

Although there is a general consensus that patients with complete MPD should be managed surgically in the form of distal pancreatic resection [6,13], this option was not possible for our patient due to multiple exploratory laparotomies performed previously that resulted in a frozen abdomen, and the only surgical management offered to our patient was necrosectomy and drainage. This operative drainage, coupled with broad-spectrum antibiotics, helped achieve source control.

Frequent take backs to the operating room for washout and VAC changes helped in keeping the abdomen and the wound clean, which resulted in developing and preserving the granulation tissue over the open abdomen. The skin adjacent to the pancreatic fistula was protected to prevent further damage. A split-thickness skin grafting was applied over the granulating tissue, which reversed the catabolic effect of the fistula, converting it from a pancreatico-atmospheric fistula to a pancreatico-cutaneous fistula [5]. This was an essential step as wound care of an atmospheric fistula exteriorizing to an open abdomen is a large challenge, as it is more complicated than managing a fistula draining to the skin of an intact, closed abdominal wall.

2) Conservative management

Some of the supportive measures that help control the pancreatic exocrine secretion is putting the patient NPO and starting TPN. Further control can be achieved medically by using Somatostatin analogues (e.g., Octreotide).

Moreover, patients with pancreatic fistulas are at risk of developing metabolic acidosis from losing bicarbonate-rich secretions; therefore, it is paramount to constantly monitor and correct fluid and electrolyte derangements.

All these conservative measures were applied in our case and helped in decreasing the pancreatic secretions and achieving local wound control. However, conservative management alone of an EPF in the setting of MPD disruption is usually not useful due to the viable upstream pancreatic segment that is no longer draining into the duodenum [12].

3) Endoscopic management

The sphincterotomy and pancreatic stent placement via an ERCP, as in our case, provided access to the MPD and reduced the pancreaticoduodenal pressure gradient, facilitating pancreatic fluid drainage into the duodenum and diverting it away from the open abdomen.

While some articles in the literature mention that endoscopic drainage is usually not effective in cases of complete MPD disruption [14], others argue that even if the disruption site is complete, endoscopic drainage should still be considered for selected patients as an effective, safe, minimally invasive treatment that improves clinical outcome [12,15].

As surgery was not an option, we had to perform endoscopic drainage to manage the pancreatico-atmospheric fistula despite a complete unbridged disruption of the MPD.

The viable pancreatic tissue upstream of the disruption site had undergone slow atrophy (as proven on follow-up imaging), which resulted in the complete cessation of pancreatic fluid drainage through the external fistula [16].

CONCLUSION

We describe a case of major pancreatic duct disruption following blunt abdominal trauma that resulted in a pancreatico-atmospheric fistula, a complex clinical entity that might cause infectious complications, metabolic derangements, and wound healing challenges. The standard methods in managing fistula output like TPN and Octreotide were applied in addition to endoscopic stenting. The wound care was challenging given the pancreatic fluid was passing through an open abdomen. Multidisciplinary approaches to control pancreatic output, preserve the granulation tissue, multiple take backs to the OR for washout, and timely skin grafting were key elements in managing such a complex fistula.

Conflict of Interest

The authors declare that they have no competing interest.

Informed Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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