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Case Report

The Outcome of Non-Operative Treatment Following Complex Pancreaticoduodenal Injury: A Case Report

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Abstract Complex pancreaticoduodenal injury is an uncommon event that is often difficult to diagnose at an early stage. After abdominal trauma, the surgeon must always be aware of the possibility of pancreaticoduodenal trauma due to the complications associated with missed pancreaticoduodenal injuries. Due to its retroperitoneal position, associated organ and vascular injuries are almost always present, which, along with frequent extra-abdominal injuries, explain the high morbidity and mortality. A high index of suspicion, mechanism of injury, and early identification are key to the final outcome. This study aimed to present a concise description of the outcome of nonoperative management after a complex pancreaticoduodenal injury and the analysis of pancreaticoduodenal-specific complications and morbidity in these patients.

Keywords: Complex pancreaticoduodenal injury, Pancreatic trauma, Duodenal injury, Blunt abdominal trauma

Introduction

Complex pancreaticoduodenal (PD) injuries after blunt abdominal trauma are rare due to their retroperitoneal location, with rates of 1–5%. In addition, if there are no specific physical signs or indicators, diagnosis can be delayed. Timely diagnosis and treatment are crucial since the mortality associated with this condition is 7.1–12.4% due to the difficulty in management.[1] Several factors contribute to a poor prognosis, such as the presence of coexisting injuries to other abdominal organs and the high risk for postoperative complications, including traumatic pancreatitis, pancreatic and duodenal fistulas, diffuse peritonitis, bile leakage, abdominal abscesses, and pancreatic pseudocysts.[2] To evaluate the diagnosis and management of high-grade PD trauma in more detail, we reported the outcome after conservative treatment in one patient. We emphasized the need for imminent surgery in such an acute setting and described one possible surgical option in view of the wide variability regarding the management of such injuries.

Case presentation

A 57-year-old male patient was brought into the Phrapokklao Hospital Emergency Room with blunt abdominal trauma after being involved in a motor vehicle crash. The patient did not have any contributory family, psycho-social, or drug histories.

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On admission, he was fully conscious but anxious, with saturation at 99% oxygen per face mask. He was tachycardic (pulse = 110 bpm). His abdomen was mildly distended with localized tenderness at the right upper quadrant (Figure 1). No other external injuries were noted. A full blood count showed a white cell count of 3, 65/mm^3, a hemoglobin of 13, 5 g/dl, and a platelet count of 250 × 106. A chest x-ray was unremarkable. Extended Focused Abdominal Sonography (eFAST) for trauma demonstrated the presence of free fluid in the hepato-renal region.

After initial fluid resuscitation, an emergency imaging study was conducted. A contrast-enhanced CT scan of the abdomen showed a massive pancreatic head hematoma, a laceration of the liver segment 4B, gallbladder distension, swelling around the hepatoduodenal ligament, and minimal free fluid in the sub-hepatic area (Figure 2).

This patient was admitted to the trauma service and was initially managed with nonoperative treatment. After being admitted to the hospital for 48 hours following a period of rest, the patient had abnormal liver function test results, indicating Hyperbilirubinemia, which raised suspicion about bile duct and pancreatic duct injury. Further radiological examination was conducted with MRCP, which revealed an abrupt change in the caliber of the mid-part of the common bile duct and pancreatic duct (Figure 3). However, the patient's vital signs were stable, and there was no fever. After the abdominal pain had subsided, the patient had a good appetite. Therefore, the treatment plan was non-surgical, and the patient began a diet on Admission day 3. The patient was able to eat without experiencing abdominal pain and was discharged on Day 7 without any reported morbidity. A follow-up plan was made to assess the bile duct and pancreatic duct injuries using MRCP again in Week 4 after the injury as an outpatient case.

Figure 1 Showed a mild distended abdomen

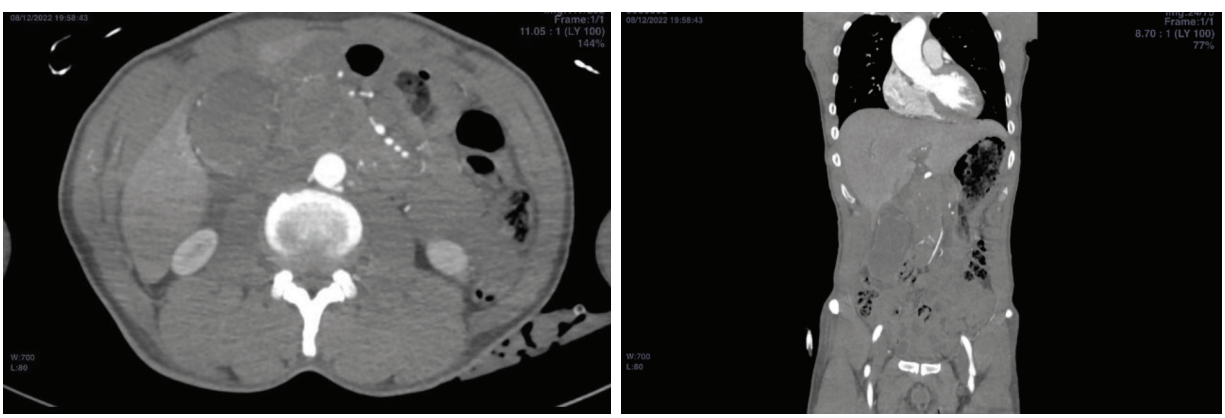

Figure 2 Axial CT abdomen initially

Figure 3 MRCP revealed an abrupt change in the caliber of the common bile duct

On day 28 after the injury, the MRCP results showed a decreased size of the duodenal hematoma and hematoma around the hepatoduodenal ligament, the irregular wall of the gallbladder. In addition, the continuity of the distal common bile duct and proximal pancreatic duct could not be identified (Figure 4). Based on the MRCP findings, it was suspected that there had been bile duct and pancreatic duct injury. Therefore, the treatment plan was to conduct an Endoscopic Retrograde Cholangiopancreatography (ERCP) along with biliary and pancreatic duct stent placement in the urgency or elective era due to normal physiologic patient status.

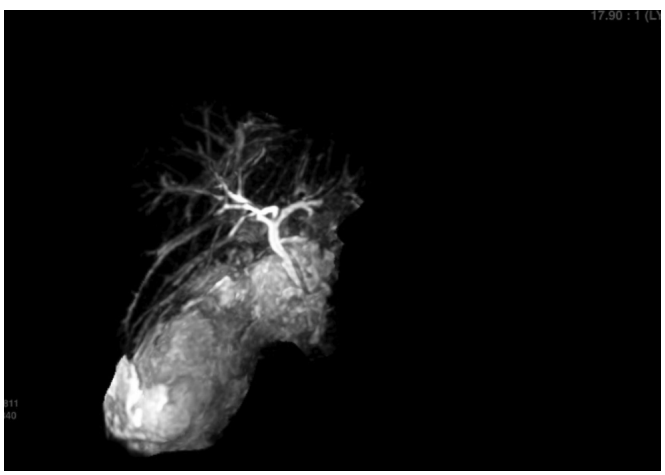

Figure 4 MRCP at day 28 after injury

The patient came to the Emergency Department before their scheduled appointment for ERCP on Day 31 after injury because of symptoms of increased abdominal girth, decreased appetite, and nausea, but with no fever or jaundice. Based on the patient's symptoms, there was suspicion of small bowel obstruction, so a CT scan of the abdomen was performed. The CT scan showed massive intraperitoneal free fluid, but there was no extraluminal free air or signs of gut obstruction (Figure 5). Based on the patient's symptoms and imaging, there was suspicion of biliary or pancreatic ascites, which was confirmed by the patient's latest MRCP on Day 28 after injury and which showed combined bilio-pancreatic duct injuries.

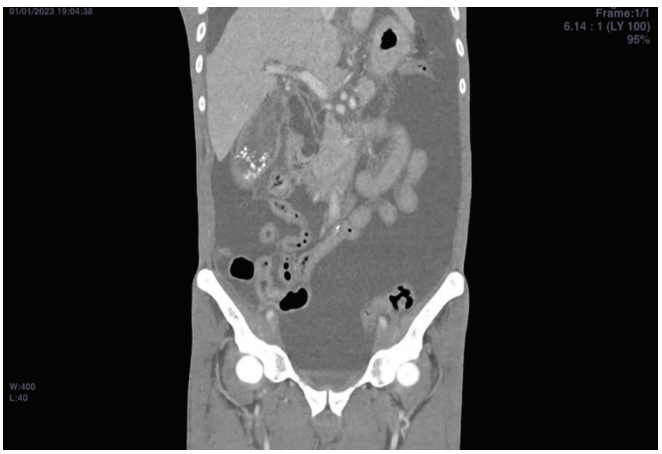

Figure 5 CT scan showed massive intraperitoneal free fluid

The treatment plan was a combined endoscopic and interventional approach under general anesthesia. After the procedure, percutaneous abdominal fluid drainage (PCD) was accessed using ultrasound guidance, and the fluid was found to be bile fluid. There were no immediate complications, and an ERCP was subsequently performed. Intraoperative findings showed no duodenal hematoma or perforation, but an abrupt caliber of the mid-common bile duct was found. It was, therefore, not possible to cannulate the pancreatic duct. A standard endoscopic sphincterotomy was performed, and a cholangiogram showed free contrast leakage from the lateral part of the mid-common bile duct, which was impeded by inserting a 10-F transpapillary biliary stent (Figure 6).

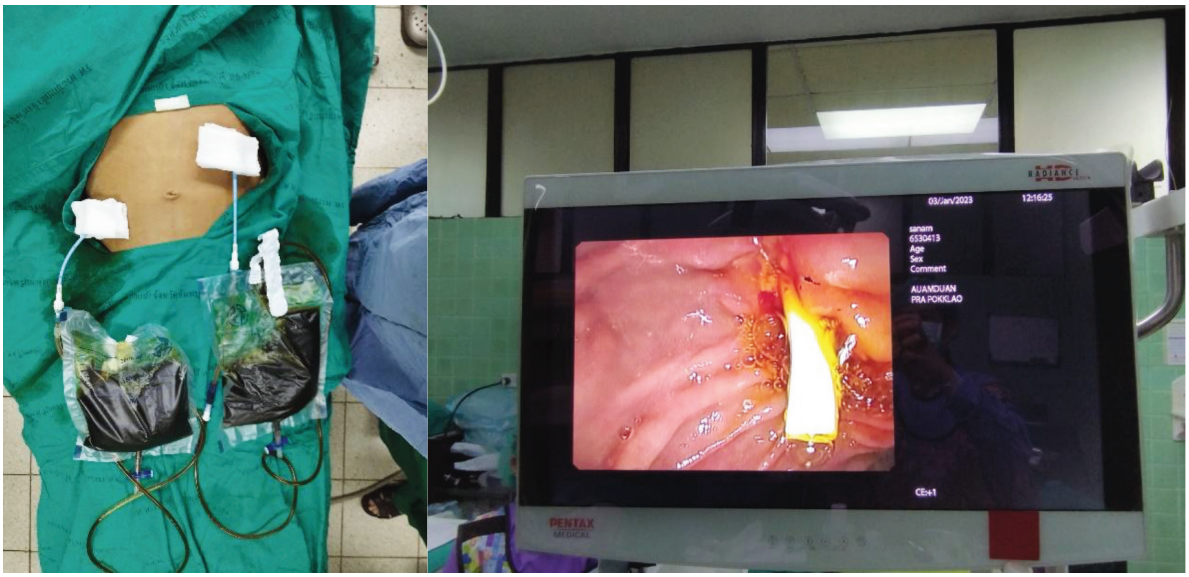

Figure 6 Showed external drainage and ERC with stent insertion

The patient was extubated and able to start a diet without abdominal pain or fever 36 hours post-operation. However, the patient later developed generalized abdominal pain and a high fever, and upon physical examination, generalized peritonitis was found. Suspecting complications or adverse events, an emergency CT scan of the abdomen was performed, which revealed a new onset right retroperitoneal fluid collection with an internal air bubble, but there was no intraperitoneal free air. Based on the symptoms and imaging, it was suspected that there may be continuous leakage from the extrahepatic biliary tree, and therefore, the patient had to undergo open abdominal surgery.

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Figure 7 Abdominal closure with vicryl mesh

On Post-operative day 3, there was a problem with the vacuum-assisted control (VAC) dressing and Penrose drain because they contained small bowel contents. Blood chemistry fluid amylase revealed a small bowel leakage with the development of an entero-atmospheric fistula. However, since the contents leaked out at only 800-1000 ml/day and the patient's vital signs were stable without fever or abdominal pain, enteral nutrition was administered at full capacity, and conservative treatment was planned for the entero-atmospheric fistula (Figure 8).

Figure 8 Entero-atmospheric fistula

On postoperative day 48, all drains and catheters were removed, and the VAC dressing on the abdominal wound was healing well, showing granulation tissue formation. There was no further content leak from the abdominal wound, and the patient could eat normally and gain weight. The patient was discharged from the hospital with plans for long-term follow-up and delayed abdominal wall reconstruction (Figure 9).

Figure 9 Patient during follow-up

Discussion

The treatment of pancreaticoduodenal injuries remains a great challenge for trauma surgeons due to the following: the relative rarity of the cases, the lack of reliable and accurate diagnostic methods, and the diagnostic methods being broadly time-dependent; the possibility to consider non-operative management; the variability of the lesions; and the frequent association with other lesions that can immediately be lethal, making it difficult to achieve good management skills and to increase suitable experiences in this field, as well as to achieve standardization of appropriate guidelines. They reportedly constitute about 2% of all blunt abdominal trauma.[3] The morbidity and mortality associated with pancreatic and duodenal trauma is high. There are reported mortalities of up to 30% in patients with blunt pancreatic trauma and up to 25% in patients with duodenal injuries. Early mortality is usually due to severe hemorrhaging from associated vascular injuries and multiple coexisting injuries. Severe anterior-posterior trauma, such as handlebar compressions, deceleration traumas, and seatbelt injuries, compresses these organs against the spine. Early diagnosis is crucial because a delay of even 24 hours can increase the risk of death by 4-fold. Common complications of duodenal and pancreatic injuries include pancreatitis, pseudocysts, fistulas, intra-abdominal abscesses, and bowel anastomosis breakdown, which can lead to sepsis and multi-organ failure.

Our report also described a significant number of IV injuries. This suggests that even higher-grade pancreaticoduodenal injuries may be clinically silent (pancreatic lucid interval) in the initial month after trauma and may present themselves later with growing biliary ascites. Also, since patients remained clinically and hemodynamically stable, further investigations were planned. CT is the most commonly used diagnostic modality for suspected pancreaticoduodenal trauma and its complications. CT reportedly has variable sensitivity (65%-80%) and specificity for detecting pancreatic trauma. CT is not a very sensitive test for pancreatic ductal injury. Specific signs of pancreatic injury included laceration, transection, focal pancreatic enlargement, and inhomogeneous enhancement. Fluid collections, like hematomas and

pseudocysts, were seen communicating with the pancreas at the site of laceration or transection. Nonspecific signs included peripancreatic fat stranding, peripancreatic fluid collections, fluid between the pancreas and splenic vein, hemorrhage, thickened left anterior pararenal fascia, and associated injuries to adjacent structures (15). The pancreas may appear normal in 20% to 40% of the patients when CT is performed within 12 hours after trauma because pancreatic injuries may produce little change in the density, which may not be detectable. This is likely due to obscuration of the laceration plane, hemorrhage, and close apposition of the pancreatic fragments. On repeat scanning at 12 to 24 h, an abnormality, which was initially ambiguous or subtle, becomes more evident. Findings become more radiologically apparent over time with the development of post-traumatic pancreatitis, edema, leakage of pancreatic enzymes, and the subsequent autodigestion of the surrounding parenchyma. The inability to detect early pancreatic trauma with CT may not be a limitation of CT technology but, instead, reflects the evolving nature of pancreatic trauma. An initial pancreatic contusion can progress to subsequent pancreatic transection with progressive autodigestion of the pancreatic gland. Serum Amylase Raised serum amylase can be useful in diagnosis. Still, there is a poor correlation between raised amylase and pancreatic trauma because amylase may be elevated in injuries to the salivary gland, in duodenal trauma, in hepatic trauma, and in injuries to the head and face, as well as in intoxicated patients. Almost one-third of patients may have a normal serum amylase at initial presentation despite pancreatic transection. A raised amylase level after blunt pancreatic trauma is time-dependent. Meanwhile, a persistently elevated or rising amylase level is a more reliable indicator of pancreatic trauma, but it does not indicate the severity of the injury. All our patients had elevated amylase levels, which probably reflects the late presentation and the evolved pancreatic injury.

The management and outcome of delayed pancreaticoduodenal injury patients were presented to us at an average of 4 weeks after the blunt trauma. Patients were initially managed with fluid resuscitation, antibiotics, and hyperalimentation when required. None of the patients had been hemodynamically critical on presentation to us. Patients complained of abdominal discomfort, nausea, and obstipation, which could be attributed to either fluid collections (sterile/infected) or gut obstruction.

Our results indicated that most patients could be managed non-surgically by drain placement into the fluid collections. An endoscopic or surgical drainage procedure could manage those who presented with biliary ascites. The morbidity rate was 35.4 % in the non-operative group and included pancreatitis, pancreatic abscesses, and recurrent pancreatic fistulas. ERCP with biliary stenting was needed in three patients who had persistent/recurrent pancreatic fistulas that were non-respondent to conservative measures. Trans-papillary stents can reduce the leaking of pancreatic fluid and bile leakage by bridging the disruption, or they can reduce the pressure of the pancreatic duct by allowing preferential flow through the stent into the pancreatic sphincter. A trial of Octreotide is generally given to control a high output (> 500 ml/day) pancreaticoduodenal fistula. There was an enteroatmospheric fistula in the surgically managed patients. No mortality was reported. There is a consensus that stable patients with low-grade pancreaticoduodenal injuries without pancreatic ductal injury (Grade I and Grade II) can be successfully and conservatively managed with low morbidity (< 20%) and mortality. Surgical treatments are mostly recommended for high-grade injuries with main pancreatic duct disruption (Grades III, IV, and V). For Grade III injuries, distal pancreatectomy with splenectomy is the standard surgery of choice. If the injury occurs at the neck, a pancreatico-jejunostomy may be done as an alternative. For Grade IV injuries, pancreatic drainage is recommended for damage control surgery. For pancreatic injury Grade V, treatment options vary from drainage to a single or two-stage pancreaticoduodenectomy.

Diagnostic delays and main pancreatic duct leaks are associated with increased morbidity and mortality. Early surgical management is associated with decreased morbidity and length of hospital stay, particularly for those injuries to the body and tail of the pancreas. In a study of 39 high-grade pancreatic injuries (Grades III and IV), patients who had received conservative treatments were observed to require longer hospitalizations and more days of total parenteral nutrition, as well as a greater incidence of complications. Conservative management of high-grade injuries is a topic of controversy. In recent years, there have been increasing numbers of publications describing the conservative management of high-grade pancreatic injuries with successful outcomes.

Hamidian et al. compared 39 patients with major ductal injuries undergoing surgical management with 12 patients who were undergoing conservative management. They concluded that both operative and non-operative management of major-grade blunt pancreatic injuries was acceptable, depending on the clinical condition, with similar complication rates. Morbidity remained high with non-operative management. However, the majority of the complications could be managed non-operatively. In hemodynamically stable patients, a controlled leak walled off as a pseudocyst, absent of associated organ injuries and absent of pancreatic necrosis, predicts a higher success rate for the non-operative strategy of high-grade pancreatic injuries. Koganti et al. have studied 34 patients with Grade III/IV trauma, of which 26 were initially under conservative management. Ten of them could be successfully managed without an operation, and based on multivariate logistic regression, the presence of necrosis and associated organ injury predicted the failure of conservative management. The development of a pseudocyst was associated with the success of non-operative treatment. They concluded that non-operative measures should be attempted in a select group of Grade III and Grade IV blunt pancreatic trauma patients, who were hemodynamically stable with a controlled leak that had been walled off as a pseudocyst and were without any associated organ injuries and pancreatic necrosis.

Our study also supported the feasibility of conservative management in patients with high-grade (III and IV) pancreaticoduodenal injuries who remained hemodynamically stable. In our patients, late complications were managed either with radiological drainage or surgical drainage. There was significant morbidity but no mortality. Morbidity was significantly less in those patients who had developed a pseudocyst. The interpretation of this report was limited due to its case report and the limited sample size. Our study of patients did not represent the complete spectrum of pancreaticoduodenal injuries, especially the more severe injuries involving hemodynamically unstable patients.

Conclusions

The overall mortality was comparable with the figures found in the literature worldwide. Adequate exploration of the pancreas and duodenum and conservative operative management are recommended when possible.

REFERENCES

1. Coccolini F, Kobayashi L, Kluger Y, et al. Duodeno-pancreatic and extrahepatic biliary tree trauma: WSES-AAST guidelines. World J Emerg Surg. 2019;14:56. doi: 10.1186/s13017-019-0278-6.
2. Feng XF, Fan W, Shi CX, et al. Simplified pancreatoduodenectomy for complex blunt pancreaticoduodenal injury. Chin J Traumatol. 2013;16(5):311-3.
3. Rickard MJ, Brohi K, Bautz PC. Pancreatic and duodenal injuries: keep it simple. ANZ J Surg. 2005;75(7):581-6. doi: 10.1111/j.1445-2197.2005.03351.x.