Case Report

Unity is Strenght: Multidisciplinary Approach to a Severe Liver and Pancreatic Injury

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Abstract

Blunt abdominal trauma is a frequent and potentially fatal condition. The liver is frequently affected, while pancreatic injury is rarer and generally occurs in association with involvement of other abdominal organs. In addition to the high mortality rates in the initial phase after trauma, the occurrence of distant complications is also frequent, such as biliary fistula and pancreatic fistula. Whenever possible, non-operative approach is preferable. However, the management of pancreatic injuries is complex and often requires a multidisciplinary approach. The case of a patient with post-trumatic liver and pancreatic injury is reported. Initially, angioembolization was necessary for liver bleeding; multiple wedge resections of ischemic areas subsequently became necessary. The delayed finding of a pancreatic fistula due to a pancreatic injury not immediately identified, required an integrated medical and endoscopic treatment which finally allowed the patient to heal.

Introduction

Missed intraabdominal injury is one of the most common causes of preventable death for trauma patients who arrive alive at the hospital. In the context of a blunt abdominal trauma, liver injury is relatively frequent (10-15%) and is usually identified with ease by imaging modalities [1]. On the other hand, pancreatic injury is rare (less than 2% of blunt trauma cases) and difficult to diagnose; these injuries are often overlooked in cases with extensive multiorgan trauma [2]. It is well known that symptoms of injury to other intra-abdominal organs commonly mask or supersede that of pancreatic injury, both early and late in the course of trauma. Main factors associated with a worst outcome after pancreatic injury are delayed diagnosis, incorrect classification of the injury, or delays in treatment [3]. Nowadays, the decision whether patients with liver and/or pancreatic injury need to be managed operatively or not is based mainly on the hemodynamic status, associated injuries, and on the anatomical injury grade. However, the hemodynamic status represents the most important factor for the management of a patient after blunt abdominal trauma. Blunt pancreatic injuries without ductal leak usually resolve with conservative management. On the other hand, damage to the ductal system, if inadequately treated or untreated, can result in prolonged morbidity and fistula formation is the most common complication. The association of liver and pancreatic injury represents a very serious condition, both in the early emergency phases and in the late stages due to the high risk of complications. The case we report represents a true example of multidisciplinary management in consideration of its clinical complexity due to the complications of liver and pancreatic injury after a blunt abdominal trauma.

Clinical Case

A 42-year-old patient had a car accident (car driver spilling out of the road) resulting in closed thoraco-abdominal trauma. He was pulled out of the car by the firefighters and transported to our

hospital. Once monitored in the emergency room, the recorded data were blood pressure 90/60 mmHg, heart rate 120/min, respiratory rate 25/min, 95% oxygen saturation in ambient air, TC 34.7°C, Glascow coma scale 13. No skin wounds were present, nor signs of peritoneal irritation, the pelvis was stable. FAST (focused assessment with sonography for trauma) showed perisplenic and periepatic free liquid. Blood tests revealed hemoglobin 135 g/L (normal 140-180), AST 1385 U/L (normal 4-40), ALT 1696 U/l (normal 4-41), amylase 328 U/L (normal 28-100), lipase 1684 U/l (normal 13-60). After initial volemic filling with heated liquids and obtaining hemodynamic stability, the patient was conducted in the radiology department and a total body Computed Tomography (CT) was performed (Figure 1). It showed absence of encephalic and vertebro-medullary lesions; presence of monofocal fracture of V, VI and VII right ribs with moderate ipsilateral pulmonary contusion, no signs of pneumothorax; intrahepatic laceration of the hepatic lobe involving segments 2, 4b, 5 and 6 with achievement of the liver surface at the level of segments 6 and 7, with arterial blush and presence of free effusion having hematic density in the perihepatic, perisplenic and pelvic areas; small superficial splenic contusions; edema of the adipose tissue at the head of the pancreas. About 90 min after the arrival in the emergency room, having the patient reached a condition of hemodynamic stability without significant anemia (hemoglobin 126 g/l), Non-Operative Management (NOM) was adopted. Angioembolization (with Spongostan) of the right hepatic artery and superselective embolization (with Spongostan and microparticles 700-900 mc) of an arterial branch for the left lobe originating from the left gastric artery were performed. Subsequently, a further source of bleeding originating from pseudoaneurysm of the gastroduodenal artery was embolized using multiple spirals from 3 to 7 mm (Figure 2). At the end of the procedure, no more evidence of active bleeding outbreaks. The patient was subsequently admitted to the Intensive Care Unit (ICU) for close monitoring. About 12 h later, the patient developed abdominal hypertension (23 mmHg) and worsening of anemia (hemoglobin 90 g/l); for this reason a new CT scan was performed. It showed extensive hypodensity in the central regions of the liver and hypodensity between the head and body of the pancreas attributable to pancreatitis (Figure 3). In consideration of the clinical and radiological conditions, the patient was taken to the operating room for urgent laparotomy. A deep hepatic parenchymal laceration with a bilobar transverse course was observed; multiple areas of parenchymal ischemia were present at segments 2, 3, 5 and 6 and partially of 1 (Figure 4). No lesions of the biliary tract and portal trunk were observed. Atypical parenchymal resection

of the devascularized areas in the aforementioned segments was performed and multiple biliary leaks in the sites of parenchymal lacerations were identified and sutured. After opening of the epiploon cavity, pancreatitis localized to the head was observed, without evidece of parenchymal lacerations. No other lesions were observed and the laparotomy was sutured. Antibiotic therapy with Piperacillin-Tazobactam was established. Overall ICU stay was 8 days. On 4th day post-operative biliary output from drainage occurred. For the persistence of the leak, on 10th postoperative day, an ERCP was performed. At cholangiography a minor spillage from the right intrahepatic hemisystem was observed; a nasobiliary tube was then positioned with progressive cessation of biliary losses in the following days (Figure 5). Twenty days after surgery, a CT was performed and the presence of multiple peripancreatic collections was observed: the largest of them was 8 x 3 cm wide, located near the head of the pancreas. The only not yet removed abdominal drainage was mobilized in order to facilitate the drainage of this collection; in the following days an average whitish liquid output of 150 ml / day was recorded. Lipases dosed by drainage were> 5000 U/l. For this reason a Magnetic Resonance Cholangiopancreatography (MRCP) was performed, with evidence of lesion of the main pancreatic duct (Figure 6). An Endoscopic Retrograde Cholangiopancreatography (ERCP) was subsequently performed: the pancreatogram confirmed the interruption of the main duct, with the spreading of the contrast medium in the retroperitoneum. A transpapillary plastic stent was insertes into the cephalic portion of the pancreatic duct, in order to facilitate pancreatic drainage (Figure 7); a progressive reduction of the tribute of the pancreatic fistula was observed in the following days, but without achieving complete healing. After 32 days, the stent was removed but abdominal drainage was maintained for monitoring purposes, observing an external tribute oscillating in relation to the amount of caloric intake per os. On 132 post-operative day, after several attempts to heal the pancreatic fistula by optimizing the diet, the patient was discharged in good general condition; the average daily tribute of pancreatic fistula was about 70 ml. Two weeks after discharge, another ERCP was performed: it confirmed an interruption of the main duct; access to the pancreatic duct was not successful beyond the interruption; a plastic stent was then positioned in the main duct with the distal end pushed out of the duct, inside the peripancreatic collection that fed the fistula. A few days after stent placement, pancreatic fistula resolution was observed. The stent was removed about 2 months after its placement.
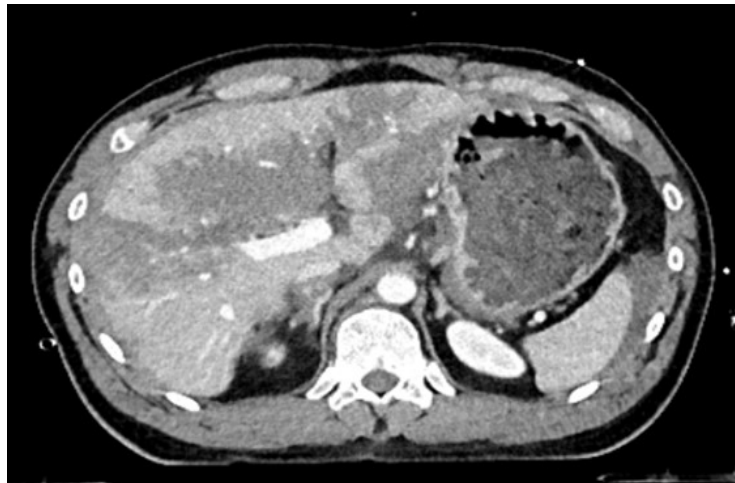
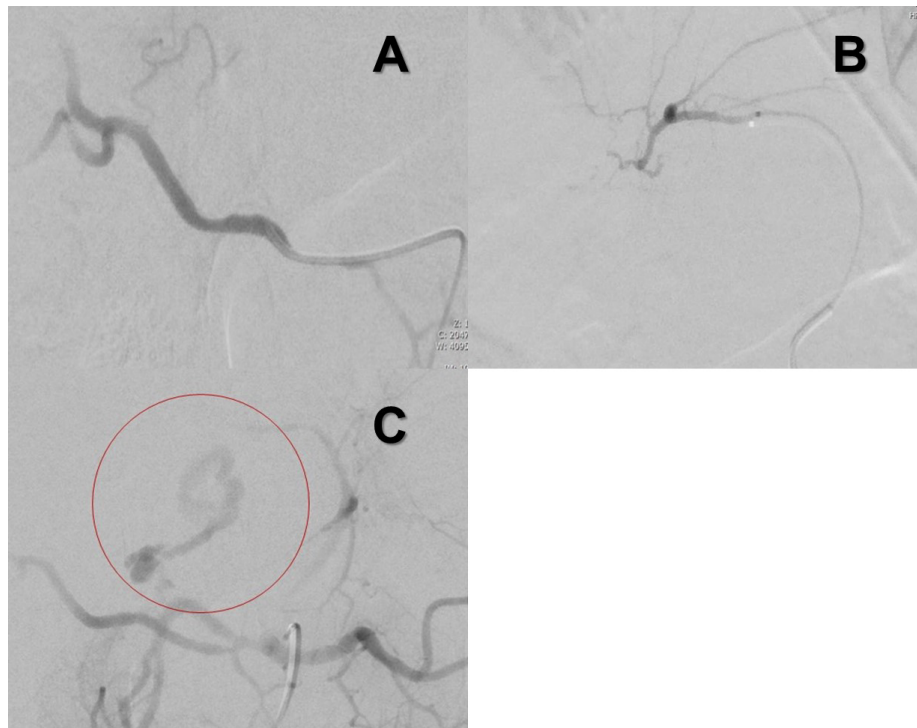**Figure 1:** The first CT scan performed, showing liver injury.

Figure 2: Angiography with angioembolization. **A:** right hepatic artery, **B:** left hepatic artery, **C:** pseudoaneurism of the gastroduodenal artery.

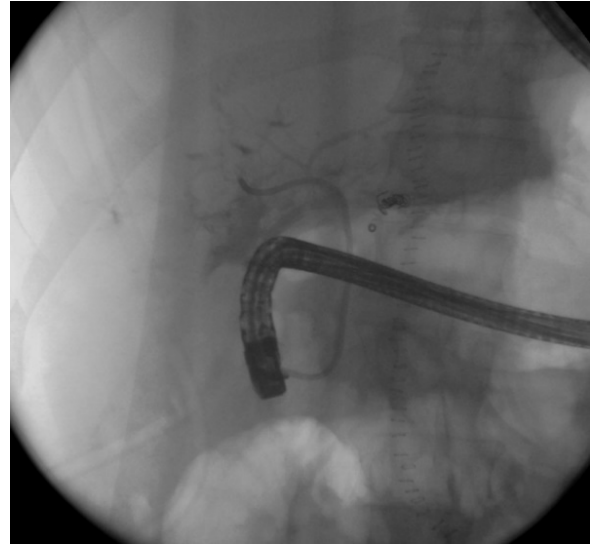**Figure 3:** CT scan performed one day after angioembolization.

Figure 5: Nasobiliary tube insertion.

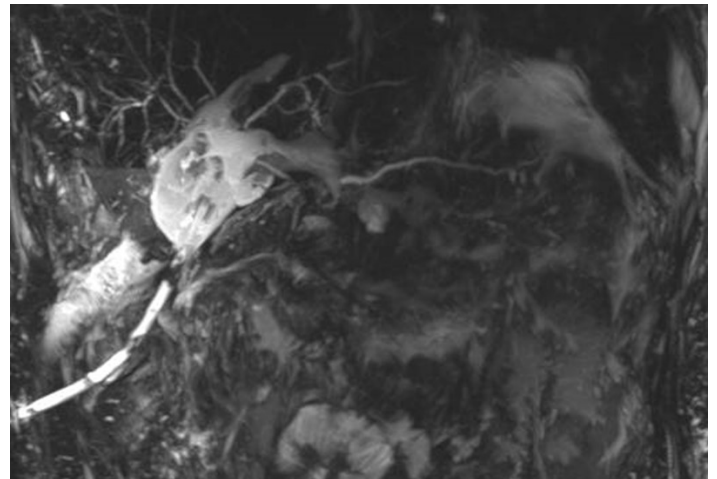**Figure 4:** Liver aspect at laparotomy.

Figure 6: MRCP: identification of pancreatic fitula.

Figure 7: CT scan performed after stent placement in the main pancreatic duct.

The patient, checked clinically every 3 months, is in good general condition and asymptomatic. MRCP performed about a year after surgery showed residual stenosis of the main pancreatic duct about 8 mm long at the isthmic level, with ductal dilation upstream of about 6 mm; no other lesions were reported.

Discussion

The simultaneous presence of liver and pancreatic injury after a blunt abdominal trauma is a very serious condition that puts the patient's life at risk. In fact, the risk is present both in the early stages of emergency, due to the possible state of shock and at a distance in case of development of complications such as biliary fistula and pancreatic fistula. For this reason, the management should be multidisciplinary. Following initial evaluation of the patient, the key decision involves recognizing patients who require prompt laparotomy; the decision is generally based on hemodynamic instability and a positive FAST or diagnostic peritoneal lavage. In case of hemodynamic stability, without the need for prompt laparotomy, accurate diagnostic imaging is mandatory. CT scan with intravenous contrast is the gold standard in hemodynamically stable trauma patients [1]. It allows a morphologycal classification of organ injury according to the American Association for the Surgery of Trauma (AAST) injury scale. Sensitivity and specificity for liver injury are very high, reaching 96-100% [1]. On the other hand, in pancreatic trauma contrast-enhanced CT-scan has high specificity (90–95%) but low sensitivity (52–54%) for ductal involvement [2]. Moreover, up to 40% of pancreatic injury can be missed or misdiagnosed on abdominal CT-scan obtained within 12 h of injury; repeating CT-scan 12-24 h after trauma can help in diagnosing pancreatic ductal injuries [4]. In the case we reported, the early CT scan showed pancreatic edema localized at the head only; after 12 h the pancreatic aspect was almost the same and no lesion of the main duct was identified. On the other hand, the linver injury, staged as grade III according to AAST classification, captured most of the attention. Because of hemodynamic stability of the patient, NOM was initially employed, according to the World Society of Emergency Surgery (WSES) liver trauma management guidelines [1]. He underwent angiographic evaluation and angioembolization was performed. The procedure made it possible to control both the bleeding present in the liver and the one due to the rupture of the pseudoaneurysm of the gastroduodenal artery, which is a possible complication of pancreatic trauma [5-7]. Unfortunately, the following day a laparotomy with liver resection was necessary due to the onset of abdominal hypertension, anemia and the finding of multiple ischemic areas on CT. The outcomes of hepatic angioembolization were generally favorable with a high success rate (77-100%), but it is well known that the treatment modality is not without associated morbidity: the most frequently reported complications following hepatic angioembolization included hepatic necrosis (14.9%), abscess formation (7.5%), and bile leaks (3.7%) [8,9]. Due to the finding of some ischemic areas of the liver, multiple resections were performed. Despite the absence of biliary tract lesions identified during laparotomy, a biliary leak occurred on the following post-operative days. Biliary complications after liver injury include biloma, biliary fistula, bilhemia, and bile peritonitis (incidence 2.8–30%) [10,11]. The positioning of a nasobiliary drain made it possible to solve this complication in a few days. An excellent bile leak stop rate after endoscopic interventions is reported in the literature [12]. However, the complication that most prolonged our patient's hospital stay was the pancreatic fistula. In this regard, some considerations are necessary. It is known that ambiguous initial symptoms and the lack of specific clinical signs frequently delay diagnosis and treatment of pancreatic injury [13,14]. The reported incidence of post-traumatic pancreatitis is 17% [2]. During the initial evaluation of the patient moderate increase in plasma levels of amylase and lipase was found: since CT showed, in the pancreas, only cephalic edema without evidence of lesions of the main duct, no surgical or endoscopic procedure was initially deemed necessary. This conservative approach is consistent with what is suggested in the literature [2]. It is reasonable to assume that the angioembolization of the pseudoaneurysm of the gastroduodenal artery found during angiography may have subsequently worsened pancreatic damage. Despite this, at the laparotomy performed for liver lesions, the pancreas appeared only edematous with no evidence of parenchymal lacerations. The failure to diagnose duct involvement early may lead to delay of adequate therapy, causing relevant morbidity, since early diagnosis of severe pancreatic injury is associated with better outcome [15,16]. Since there were no signs of pancreatic duct injury in the early stages, second level investigations such as MRCP and ERCP where performed only when a pancreatic fistula became clinically evident. These tests allowed to identify the presence of a lesion of the main pancreatic duct, which the previous CT had not identified. Consequently, transpapillary endoscopic stent was placed: in the following day

the pancreatic fistula flow rate decreased, but without achieving complete healing. NOM with endoscopic or percutaneous interventions of pancreatic duct injury is associated with success rate of 68-94% [3,17,18]. The failure of the endoscopic procedure may be attributable to an inappropriate definition of the type of pancreatic ductal lesion. In fact, a correct diagnosis, performed with high-quality preoperative cross-sectional imaging and a proper pancreatogram during ERCP is very important in planning the treatment [19]. It is well known that a persistent leak from disruption of the MPD is often complicated by development of pseudocyst, internal fistula formation, or external pancreatic fistulas [20]. Traditionally, most pancreatic fistulas are successfully treated with medical treatment including fluide drainage, total parenteral nutrition and pancreatic secretion inhibitors; on the other hand surgical treatment is generally reserved for persistent leaks. However, in recent years, endoscopic tratment has been increasingly used [21]. As previously anticipated, an accurate anatomical definition of the duct lesion in essential to facilitate the success of the endoscopic procedure. An endoscopy-oriented classification has already been proposed [19]. According with such classification, type II pancreatic fistulas occur when the leak is located at the main pancreatic duct, with disconnected/disrupted pancreatic duct syndrome being the main representative condition. In addiction, two variants depending on the condition of the disruption site are classified: the open variant, (type IIO) where the distal (toward the papilla) disruption site is open and easily transversable and the closed/obstructed variant (type IIC) where the distal disruption site is closed. In the case reported, a type IIC fistula was identified and the positioning of the stent beyond the proximal ductal stump and inside the peripancreatic collection, allowed to completely heal the fistula. It is possible to recanalize a disconnected duct with a transpapillary approach. Puncture of the pancreatic stump at the level of its interruption allows to exit into the peripancreatic collection. From that point, an attempt is made to access the proximal duct with a wire. If the wire enters inside the pancreatic tail, the punctured stump is dilated and a stent to bridge the disruption is inserted. If access to the proximal duct is impossible, the stump is dilated and a transpapillary stent inside the collection is placed to serve as a transpapillary collection drain [19]. In such situations, endoscopic therapy results effective, minimally invasive and safe.

Conclusion

This case represents a true example of a multidisciplinary approach to a serious condition such as abdominal trauma with hepatic and pancreatic involvement, in which the patient's life is at risk both in the early stage, due to the possible onset of shock and late stage, due to the serious complications that can arise such as pancreatic fistula. Accurate radiological diagnostis, with repeated CT and MRCP scan, is mandatory. NOM, when possible, should be preferred. Unfortunately, despite advances in care, morbidity and mortality following severe hepatic and pancreatic trauma remain high. For this reason, the management of hepatic and pancreatic injuries must be multidisciplinary.

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