Delayed diagnosis and treatment of high grade blunt pancreatic trauma. Case report and review of literature.



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INTRODUCTION: Despite technological advancement, high grade pancreatic injuries following blunt abdominal trauma continues to remain a disease that is associated with high morbidity and mortality rates, particularly in cases of delayed diagnosis. The aim of this paper was the presentation of delayed diagnosis and treatment peculiarities of high grade pancreatic trauma and a review of literature.

CASE REPORT: A 55-years old man, involved in motor vehicle crashes, was referred to our level I trauma center. Hemodynamically stable. Abdominal physical exam, laboratory and focused abdominal sonography for trauma were normal. First total body multidetector CT scan, performed only after 24 hours, showed almost complete left pneumothorax, left third to fifth rib fractures and subcutaneous emphysema. Left chest tube was applied. On the eighth post-traumatic day, the general condition of the patient started to deteriorate. The patient showed abdominal pain, fever, nausea, vomiting, and bilateral flank ecchymosis. Only the third CT scan performed, on twelfth day, after the peritoneal signs, changes in blood and biochemical parameters appear, we revealed linear laceration and hypo-attenuation area of the neck and a part of distal body pancreas. In laparotomy fat necrosis, giant retroperitoneal abscess, necrosis of the neck and distal body of the pancreas, was found. Distal pancreatectomy with splenectomy was performed. Postoperative course with extensive wound infection and necrotic leakage from peripancreatic drain was complicated. The patient was discharged two months after his operation without any events.

CONCLUSION: On time diagnosis of pancreatic trauma, especially in polytrauma patients, continues to remain a challenge for trauma surgeons. Main pancreatic duct injury is an important prognostic factor and the major one determining therapeutic approaches. Adequate surgical approaches decrease morbidity and mortality in pancreatic trauma.

KEY WORDS: Delayed diagnosis, Distal pancreatectomy, Pancreatic blunt trauma

Introduction

In general, pancreatic trauma (PT) is a rare disease, while high grade blunt pancreatic trauma (BPT) is even rarer. The pancreas gland is (mostly) located in retroperitoneal space, in transverse position and anterior to the first lumbar vertebra, in close proximity with vital structures such as the portal vein, cava inferior vein, mesenteric vessels, and aorta. Hence, pancreatic injuries require a great energy force with an anterior-posterior direction. Clinical signs and symptoms of PT itself are vague. Biochemical findings related with PT are nonspecific and sometimes displayed with delay. For these reasons, PT diagnosis is often delayed. So, this disease is associated with higher morbidity (ranges from 8% to 45% and in delayed treatment over 60%) and mortality (ranges from 9% to 34%) especially in cases of delayed or missed diagnosis ¹⁻³. The presence of the main pancreatic duct (MPD) injury and delayed diagnosis is associated with higher pancreas-specific mortality and morbidity rates ^{4,5}.

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The predominant mechanism of PT varies from one country to another ^{2,6,7}. This includes penetrating trauma (gunshot wounds, stab wounds) and blunt trauma (direct blow to the abdomen, a fall onto bicycle handlebars, motor vehicle crash, and fall from a height). Regardless of trauma causes, the prognosis of PT is closely connected with the grade of pancreatic injury and the presence of associated injuries 2 .

In general, patients with PT can complain of pain in the epigastric region, a belt of pain that radiates on the back, nausea, vomiting, fever, and weakness. On physical examination, the patient may feel abdominal pain in deep palpation and may reflect light muscular defense. Symptoms and signs of physical examination are also connected with the grade of pancreatic injury. Biochemical markers (serum levels of amylase, lipase, and urinary amylase level) routinely used to assess PT are not pathognomonic and sometimes display with delay ^{8,9}. Amylase and lipase levels are suggestive, but not diagnostic of pancreatic injury⁵. Several classification systems of traumatic pancreatic injuries are presented, but the pancreatic organ injury scale (OIS) proposed by the American Association for the Surgery of Trauma (AAST) is actually widely accepted. To make the diagnosis of PT, except the anamnesis, clinical and biochemical data, ultrasonography plays an important role. Ultrasound findings include edema, contusion, peripancreatic fluid and fluid collection of lesser sac. Sometimes these data can be obtained after some hours or a few days and after repeated ultrasonography. CT scan of the abdomen remains the first line imaging modality in the assessment of abdominal trauma. Multidetector computed tomography provides data on pancreatic fracture, contusion, edema, hematoma, peripancreatic and lesser sac fluid collections and evaluating pancreatic ductal injury. Magnetic resonance cholangiopancreatography (MRCP) provide more qualitative information regarding the extent of injury. CT and MRI correctly identified the grade of pancreatic injury in 91.7% and 92.86% respectively ^{10, 11}. Endoscopic retrograde cholangiopancreatography (ERCP) is the earliest investigation method of ductal system, it does have some advantages in terms of diagnosing the site and extent of ductal injury and direct image-guided therapy ¹². Treatment of PT is linked first of all with the pancreatic organ injury scale. Most of pancreatic injuries may

TABLE I - AAST classification of pancreatic trauma.

Grade	Injury	Discription
1	Haematoma	Minor contusion without ductal injury
	Laceration	Superficial laceration without ductal injury
п	Haematoma	Major contusion without duct injury or tissue loss
	Laceration	Major laceration without duct injury or tissue loss
Ш	Laceration	Distal transection or parenchymal injury with duct injury
IV	Laceration	Proximal transection or panereatic parenehymal injury not involving the ampulla
v	Laceration	Massive disruption of pancreatic head

be treated with a conservative approach or with a simple surgical procedure (lavage and drainage). The surgical procedures for the management of high-grade pancreatic injury depend on the patient's hemodynamic status, the presence or absence of MPD injury and associated duodenal injury.

As mentioned above, clinical presentations, diagnosis and therapeutic approaches are connected with the grade of pancreatic injury. Several classification systems of traumatic pancreatic injuries are presented, but the pancreatic organ injury scale (OIS) proposed by the American Association for the Surgery of Trauma (AAST) is actually widely accepted ¹³ (Table I).

Case Report

A 55-year old man was involved in a motor vehicle crash. After first aid at the regional hospital, he was referred to our level I trauma center. On admission, the patient was hemodynamically stable, complained of difficult breathing, chest pain, headache, and right forearm pain. He had mild alterations in consciousness and no guarding or tenderness on abdominal palpation. The patient suffered from bronchial asthma. Chest and forearm radiographs confirmed clinical suspicion of subtotal left pneumothorax, fractures of the left third to fifth ribs and right distal radius fracture. Chest tube and forearm plaster splint was applied. A head soft tissue injury was sutured. First total body multidetector CT scan, performed only after 24 hours, showed subtotal left pneumothorax, pneumomediastinum, atelectasis of the left lower lobe, minimal hemothorax, rib fractures and extensive subcutaneous emphysema (Fig. 1). Injury Severity Score, (ISS) 21. Focused abdominal

sonography for trauma and CT of the abdomen were



Fig. 1: Thoracic CT showed subtotal left pneumothorax, pneumomediastinum, atelectasis of the left lower lobe, minimal hemothorax, rib fractures and extensive subcutaneous emphysema.



Fig. 2: Flank ecchymosis after delayed blunt pancreatic trauma.



Fig. 3: Axial CT image demonstrated linear laceration and hypoattenuation area of the neck and a part of distal body pancreas, lesser sac and perihepatic fluid collections.

normal. Hemogram and biochemical analysis of blood serum were normal as well. Intravenous fluids, broadspectrum antibiotic, analgesic, PPI and anticoagulant therapy were given. On the eighth post-traumatic day, the general condition of the patient started to deteriorate. The patient showed abdominal pain, fever, nausea, vomiting and bilateral flank ecchymosis (Fig. 2).

Physical examination revealed tenderness and defense on epigastric region. Laboratory studies showed leukocytosis (26100/mm³), a slight anemia (3,300,000/mm³), low hemoglobin levels (10.7 gr/dL) and low hematocrit (30%), hyperglycemia (230 mg/dL), azotemia (152 mg/dl), normal creatinine level, elevated serum (1633 U/L) and urinary amylase (4282 U/L), elevated serum lipase (1430 U/I), severe hypocalcemia (0.9 mmol/L), metabolic alkalosis (ph 7.5) and base excess (12 mmol/l). Ultrasonography revealed lesser sac and perihepatic fluid collections. Only the third CT scan performed, on twelfth day, after the peritoneal signs, changes in blood and biochemical parameters appear, we revealed linear laceration and hypo-attenuation area of the neck and a part of distal body pancreas, lesser sac and perihepatic fluid collections (Fig. 3). The patient underwent laparotomy and fat necrosis, giant

The patient underwent laparotomy and fat necrosis, giant retroperitoneal abscess, necrosis of the neck and distal body pancreas were found (grade III of AAST) (Fig. 4 a,b,c).

In these circumstances, after evacuation of 400 ml fluid pus and necrotic tissue, large lavage of peritoneal cavity, distal pancreatectomy with complete removal of necrotic tissue and splenectomy were performed. The proximal pancreatic stump with interrupted 4-0 Prolene sutures in a U-type fashion was hand-sewn. After cholecystectomy, T-tube in the common bile duct, peripanretroperitoneal drains were creatic and placed. Intraoperative trans-cystic methylene blue leak testing of biliary-pancreatic tree resulted negative. Intravenous fluids, analgesic, PPI, anticoagulant, red blood cells, fresh frozen plasma and broad-spectrum antibiotics therapy postoperatively were given. Intraoperative bacterial cul-



Fig. 4 (a,b,c): Fat necrosis, giant retroperitoneal abscess, necrosis of the neck and distal body pancreas.



Fig. 5: Extensive wound infection after delayed blunt pancreatic trauma was by secondary intention healed.



Fig. 6. Postoperative t-tube cholangiopancreatography demonstrated no contrast extravasation from the pancreatic duct.

ture was negative. The patient developed temporary endocrine pancreatic insufficiency that returned to normality within two months. In the early postoperative period, extensive wound infection displayed and the wound was healed by secondary intention (Fig. 5).

Postoperative t-tube cholangiopancreatography was performed 17 days after surgery to assess MPD leak, before removal of t-tube resulted negative (Fig. 6). Necrotic leakage from peripancreatic drain lasted for forty six days and its amylase content was not significant. The patient was discharged after two month postoperative day uneventful. The follow-up three and six months after surgery showed no pancreatic function and structure abnormalities.

Discussion

The clinical picture of BPT is no specific. The clinical signs and symptoms of BPT are obscure, especially when it is associated with other intra or extra-abdominal injuries ¹⁴. Such injuries contribute to mimic clinical features of BPT. A skin sign that needs to increase attention toward BPT is Cullen's sign (periumbilical ecchymosis) and/or Grey Turner's sign (flank ecchymosis). Those signs are a result of liberated pancreatic enzymes causing the diffusion of fat necrosis and inflammation with retroperitoneal bleeding. In case of clinical suspicion of injury more biochemical and imaging investigation are required.

PT induced changes in levels of biochemical markers, but those changes are not specific. Raised serum and urinary amylase and serum lipase can occur also in injuries of the head and face, salivary gland, esophageal rupture, duodenal trauma, hepatic trauma, and in intoxicated patients ^{8,9}. Plain abdominal radiograph findings (like distension of the duodenum, distension of the colon, a sentinel loop) are nonspecific in patients with PT.

In addition to being used for the initial assessment of blunt abdominal trauma to detect the presence of free intraperitoneal fluids, ultrasonography is also used intraoperative to assess pancreatic duct injuries ¹⁵. Endoscopic ultrasound is helpful also in guided drainage of fluid collection, pancreatic pseudocysts, abscesses, infected necrosis, and in the follow-up of such complications ¹⁶. Multidetector abdominal CT scan is the imaging examination of choice for hemodynamically stable patients with abdominal trauma to detect traumatic pancreatic injury. CT performed within 12 h after trauma in 20%-40% of patients with PT may result normal ¹¹. So, in case of clinical suspicion of pancreatic injury, repeated CT scan of abdomen may be required. Based on the grading scale of pancreatic injury, CT scan gives us information about MPD injury.

ERCP and MRCP are specific diagnostic tools for evaluating pancreatic duct integrity. While MRCP provides the entire pancreatic parenchymal and ductal anatomy, as well as fluid collections, ERCP can be used for diagnosing ductal injury and in selected patients allows nonoperative treatment ^{12,17}.

After the control of hemorrhage and spillage of intestinal contents, the therapeutic approach depends upon the integrity of the MPD, anatomical location of the injury, and the patient's overall status. Based on pancreatic OIS grading system of the AAST, Grades I and II can be managed with debridement of devitalized tissue and simple drainage ⁵. Suturing such injuries is unnecessary and may result in greater complication rates (pseudocyst) compared to drainage alone ¹⁷. Another option in the initial management of isolated BPT, especially in children, is medical treatment. This treatment consists of bowel rest, nasogastric tube drainage, and total parenteral nutrition ^{18,19}.

Distal pancreatic injuries with ductal involvement (Grade III) are recommended to manage with distal pancreatectomy and drainage ^{5,7}. The neck of the pancreas is avascular plan, can be transected after freeing its posterior aspect to make exposure to the mesenteric and portal vessels and control of hemorrhage ²⁰. The control of transected margin can be performed using the stapling device or hand-sewn. Roux-en-Y pancreaticojejunostomy is not encouraged due to the potential morbidity associated with pancreatico enteric anastomosis ^{18,19}.

Surgical treatment of grades IV and V pancreatic injuries include many options. However, recent reports have shown that proximal ductal injuries which were treated with closed suction drainage alone have had less morbidity than those treated with more aggressive approaches ²¹.

Surgical procedures for managing combined pancreatico-

duodenal injuries depend on the degree of injury. They range from simple repair of the duodenum and drainage of pancreatic injury with or without pyloric exclusion to pancreaticoduodenectomy. Freeing the lateral aspect of the head of the pancreas from duodenum results in ischemia of the duodenum and it should never be considered ²⁰.

Pancreaticoduodenectomy is only rarely necessary, unless it is about severe injuries of both the head of the pancreas and the duodenum. Generally, this should be performed in a two-stage surgery fashion ¹⁸.

Many management algorithms for pancreatic injuries are published over time. In our opinion, the one published by the Western Trauma Association (from Biffl et al. Tab. II) is the most concise and complete ²².

Overall complication rates following PT in most of cases are associated with the presence of MPD injury ²³. As already reported, pancreatic abscess is the most frequent complication after PT, followed by pancreatic fistula, post-traumatic pancreatitis, postoperative hemorrhage, a temporary endocrine pancreatic insufficiency and pancreatic pseudocyst as a late manifestation ⁷. Most of the complications following PT can be managed conservatively. Early mortality for PT is due primarily to hemorrhage from associated injury, while late mortality is associated with sepsis ²⁴.



Table II - Western Trauma Association management algorithm for pancreatic injuries.

Conclusion

On time diagnosis of PT, especially in polytrauma patients, continues to remain a challenge for trauma surgeons. MPD injury is an important prognostic factor and the major one determining the therapeutic approaches. Adequate surgical approaches decrease morbidity and mortality in PT.

Riassunto

Nonostante il progresso tecnologico, le lesioni pancreatiche di grado elevato in traumi addominali chiusi continuano a rimanere condizione patologica associata ad alte percentuali di morbilità e mortalità, in particolare nei casi caratterizzati da diagnosi tardiva. Lo scopo di questo contributo è di presentare un caso clinico con diagnosi e trattamento tardivo con revisione della letteratura pertinente più recente.

Un uomo di 55 anni, coinvolto in un incidente automobilistico, giunge al nostro centro, ospedale terziario dedicato al trauma. All'ingresso, si presenta emodinamicamente stabile. L'esame fisico dell'addome, i dati di laboratorio e lo studio ecografico dell'addome risultano normali. La tomografia computerizzata totale, eseguita dopo 24 ore, ha dimostrato pneumotorace quasi completo a sinistra, con fratture omolaterali della terza, quarta e quinta costa ed enfisema sottocutaneo. E' è stato applicato drenaggio toracico a sinistra. In VIII giornata, le condizioni generali del paziente peggiorano rapidamente. Compare febbre, dolore addominale, nausea e vomito. Risultavano evidenti ecchimosi sul fianco bilateralmente. Una terza indagine TC, eseguita in XII giornata, dopo l'esordio di segni di irritazione peritoneale ed alterazione dei dati bio-umorali, rivelava lacerazione lineare con area di ipo-attenuazione del collo, corpo e pancreas distale. Alla laparotomia, era presente un voluminoso ascesso retroperitoneale con necrosi pancreatica estesa dal collo sino alla porzione distale della ghiandola. Si procedeva quindi a pancreasectomia distale con splenectomia. Il decorso postoperatorio è stato caratterizzato da estesa infezione della ferita, e da fistola pancreatica. Il paziente è stato dimesso, chirurgicamente guarito a sessanta giorni dal ricovero. La diagnosi tardiva dei traumi del pancreas, in particolare in pazienti politraumatizzati, costituisce una sfida per i chirurghi di trauma. Le lesioni principali del dotto pancreatico sono un documentato, importante fattore prognostico negativo. Il trattamento chirurgico precoce ed adeguato riduce morbilità e mortalità nei traumi del pancreas.

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