CASE REPORT

Steering wheel injury with major pancreatoduodenal and splenic injuries - A management challenge

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Abstract

Introduction:

Traumatic pancreatic injury is uncommon, difficult to diagnose and challenging to manage. Pancreatic injury has been called an enigma because in many instances it defies detection by current armamentarium of diagnosis and there is no clear guideline for management. This is in spite of availability of advanced diagnostic methods and sophisticated modern medical management modalities. Surgeons have had to contend with the rarity of the disease process. With improving technology and understanding previous conclusions would be rendered invalid.

Case report:

We present a 47 year old unrestrained saudi man who presented with steering wheel injury to emergency department of King Abdullah Hospital Bisha with severe abdominal and chest trauma, in whom CT scan initially showed subtle changes in the peripancreatic area with associated chest injury. He developed clear physical signs within 48 hours, and radiographic features became more obvious. He was treated surgically with good outcome but developed ICU complications with prolonged recovery. This is a case in point where diagnosis and management of a rare entity can be challenging.

Conclusion:Diagnosis of pancreatic injury is can be as elusive as the management can be daunting.

Key words: Road traffic accident (RTA), steering wheel injury, pancreatic injury, management challenge, Exploratory laparotomy

Introduction:

Pancreatic injury from blunt abdominal trauma is an uncommon injury because of its protected position in the retroperitoneum. The pancreas is injured in 3-4% of abdominal trauma cases.[1] Motor vehicle accidents account for the vast majority of cases. The blunt force required to injure the pancreas is considerable and usually, by its nature, involve other organs like the duodenum, major vessels, the spleen and liver. In particular, steering-wheel trauma in adults, bicycle handle trauma and child abuse from battery result in the usual mechanism. As population increases the global burden of trauma increases and trauma mechanisms evolve, this entity is likely to be recognized more often. Pancreatic injury may, at first, be symptom free and physical examination is unreliable. The classic triad of upper abdominal pain, raised white cell count, and amylase is rare.[2] Injuries to the pancreas may even be overlooked as injuries to other abdominal organs involved mask the symptoms and signs of pancreatic injury. CT scan is the investigation modality of choice in blunt trauma of the pancreas which may provide direct or indirect evidence of injury.[3] Changes may include peripancreatic haematoma or fluid collection, pancreatic enlargement or oedema and pancreatic laceration. However, these detectable changes are time dependent. Magnetic Resonance Cholangiopancreatography (MRCP) may demonstrate the pancreatic duct and its integrity. The main determinant of outcome in pancreatic trauma is the degree of ductal injury. Approach to management should

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Figure 1:

Figure 2:

Figure 3:

Figure 4:

take this into consideration. The site of ductal trauma, extent of parenchymal injury and other organs involved also influence treatment and outcome. Treatment may be non operative, conservative surgical employing simple drainage to pancreatectomy. Complications include pancreatic complications (pancreatic fistula, pseudocyst, major duct stricture, pancreatitis), intensive care unit (ICU) complications (acute respiratory distress syndrome, pneumonia, real failure, multiple organ dysfunction syndrome), abdominal complications (abscess, wound infection, ventral hernia, enteric fistula) and death.

Case Report:

A 47 year old unrestrained male driver of a car was involved in a road traffic accident (RTA) where he sustained blunt trauma to the chest and upper abdomen by compressive force from the steering wheel. He initially had stable vital signs but with bilateral chest tenderness and diminished breath sounds at both lung bases. Initial abdominal examination revealed vague tenderness at the upper abdomen, some guarding and no distention. Laboratory findings were within normal range. Initial CT of the abdomen and chest revealed mild free fluid collection in hepatorenal and splenorenal spaces, with low attenuation areas of segments 4, 5 and 8 of the liver. Other abdominal organs appeared normal. Chest CT showed bilateral multiple rib fractures with basal lung contusion and minimal haemothoraces (Figure 1). A decision was reached to adopt conservative management and patient was admitted in ICU. Intravenous fluid, antibiotics and analgesics were administered. The condition passed unevenly and soft diet was allowed. After 48 hours, the patient developed abdominal pain referred to the back with abdominal tenderness and guarding became more obvious. There was restlessness and tachycardia. CT scan was immediately repeated with the following findings: Significant amount of pelvic fluid and increase volume of pancreas, at mainly the head and body, with peripancreatic fluid collection; increase amount of right perirenal collection and an increased perisplenic collection (Figure 2). With reference to the above clinical and radiological criteria patient was shifted to the operation room (OR). Exploratory laparotomy via a midline incision was carried out with finding of a significant haemoperitoneum. The omentum was thickened, edematous, amalgamated with adhesions and studded with calcium soap granules (typical saponification). Saponification was also present on the mesentery, stomach and colon. The lesser sac was opened through the gastro-colic ligament revealing major damage to the tail of pancreas evidenced by active bleeding and necrosis of the pancreatic parenchyma at the tail with peripancreatic fat necrosis.(figure3 and 4) show some of the intraoperative findings. The body and head of the pancreas show superficial necrosis and are covered by fat necrosis. There was injury to splenic hilar vessels with tear on inferior splenic surface. There were patches of duodenal hematoma. Liver contusion in segment 4, 5 and 8 also detected. The following was carried out: distal pancreatectomy with splenectomy, superficial pancreatic necrosectomy. Both duodenum and liver injuries were managed conservatively. Proper haemostasis was secured by initial packing prior to splenectomy with distal pancreatectomy, nonabsorbable suture ligation of superficial pancreatic vessels, nonabsorbable suture ligation of small superficial pancreatic ductules, synthetic haemostatic sealant sheets (collagen haemostatic patches) placed on the whole pancreatic surface and at the distal end. Copious peritoneal washing with saline was

Table 1: Pancreatic organ injury scale per the AAST[a]

Grade	Description	
I	Hematoma	Minor contusion without duct injury
	Laceration	Superficial laceration without duct injury
II	Hematoma	Major contusion without duct injury
	Laceration	Major laceration without duct injury or tissue loss
III	Laceration	Distal transection or parenchymal injury with duct injury
IV	Laceration	Proximal[b] transection or parenchymal injury involving ampulla
V	Laceration	Massive disruption of pancreatic head

[a] Data from Moore et al., 1990.[4]

[b] Proximal pancreas is to the patients' right of the superior mesentric

done. A large irrigation tube was placed over the pancreas and three drainage tubes in the bed and pelvis. Abdomen was closed en mass. Patient was shifted back to ICU where continuous irrigation and drainage was done for one week (Figure 5). Nasogastric tube feeding was started and abdominal wound stitches were removed after one week. Unfortunately patient developed adult respiratory distress syndrome (ARDS) and was managed on mechanical ventilator for about 50 days. This was complicated by Acinetobacter infection which was treated with colistin and isolation. He also had cardiac arrest, underwent CPR and was revived. Onward management continued with ICU care and chest physiotherapy. Prolonged intubation with mechanical ventilation necessitated tracheostomy. Thereafter, the patient improved remarkably and was gradually weaned off ventilator, and started on oral feeding, ambulation, continuous rehabilitation and physiotherapy till eventual removal of tracheostomy tube. Patient was discharged in a good and satisfied condition.

Discussion:

The ability to evaluate pancreatic injury early and accurately remains limited. This report demonstrates how difficult the early diagnosis of pancreatic injury can be, how daunting the management and the classical outcome of such condition. In our patient, physical signs were nonspecific and were masked by injury to surrounding organs. The mechanism of injury should alert the clinician on the possibility of pancreatic injury.[4] It is due to compression of the pancreas by an external force against the spine. Typical mechanism of injury includes a steering wheel injury, as in the index patient, or handle bar bicycle injury.

The initial resuscitation, evaluation and management of patients with pancreatic injury should follow the ATLS protocol. FAST is available in many centers but may miss retroperitoneal injury in up to two thirds of cases.[5] Real time contrast enhanced ultrasound is increasingly being used by some to increase sensitivity of the test, though its value has not been fully assessed. CT remains first choice diagnostic test in haemodynamically stable patients.[6] Currently, multidetector scanners provide better resolution and accuracy because they reduce bowel artifacts. However, grading of injury tend to be underestimated on CT Scan. In up to 20%-40% the pancreas may appear normal in the first 12 hours of trauma[7] as was the case in our patient (comparing Figure 1 against Figure 2). Hence, the inevitable delay in diagnosis and management with attendant potential disaster. ERCP is most accurate in diagnosing site and extent of ductal injury, but it is invasive and not widely available.

Laboratory work-up are very unreliable and may be within reference ranges even in the presence of ductal disruption and pancreatic transection. Serum amylase levels in pancreatic injury are non specific; Lipase levels are no more specific.[8] Amylase detected in diagnostic peritoneal lavage (DPL) is more specific than serum amylase but this procedure is not standard protocol in most centers. In addition, the procedure is time consuming when performed and in waiting for results.

Many guidelines have been proposed in literature but as yet there is no consensus on the optimal management of pancreatic injuries. There are no established Class 1 data from prospective randomized clinical trial to warrant a universal guideline for management. Most recommendations are based on published observational studies and expert opinions.

Many reports in the literature and a multi-institutional study have emphasized the importance

of injury to the main pancreatic duct to morbidity and mortality.[9] Grading of pancreatic injury has been proposed to help with management and to compare outcomes.[10] There are several classification systems for traumatic pancreatic injuries[11,12] but the pancreatic Organ Injury Scale (OIS) proposed by the American Association for the Surgery of Trauma (AAST) in Table 1, is currently universally accepted.[13] The major points of this classification are the parts of the pancreas injured (head, body, tail) and status of the main pancreatic duct. Morbidity and mortality increases in patients with major ductal injuries unless operation is carried out within 24 hours.[4] Isolated ductal injuries may be missed at operation.[4] In our patient the pancreatic injury severity was assessed on the basis of the operative finding. Distal pancreatectomy and splenectomy carried out due to nature of the injuries. A synthetic fibrin sealant patch was found useful for haemostasis. Simple drainage is widely accepted in managing pancreatic injuries where there is no or a low suspicion of duct injury.[4] However, continuous saline lavage (Berger's lavage) of pancreatic bed was necessary for evacuation of biologically active substances and devitalized tissue as popularized by Berger et al in 1988.[14] This method is also found to reduce the occasion of clinically significant pancreatic fistula and its related complications.[15] In patients with associated splenic injury who are unstable (as in the index patient), total splenectomy is recommended; in those who are stable, all efforts should be made to preserve the spleen.[16]

It is noteworthy that majority of injuries to pancreas are of low grade and may require nonoperative or simple surgical intervention. On the other hand, complex injuries require timely surgical intervention, resection reconstruction and energetic close monitoring in the Intensive Care Unit. Morbidity post-surgery can be devastating especially ICU complication which, in our patient, was associated with prolonged hospital stay. A retrospective study by Krige et al of 107 patients who underwent distal pancreatectomy at a Level 1 Trauma Centre in Cape Town found that about two thirds patients had a postoperative complication; the commonest postoperative complication being pancreatic leak with a mortality of 12%.[17]

Conclusion:
Early diagnosis of major pancreatic injury can be elusive. Knowledge of mechanism of injury and high index of suspicion is critical. The management can be daunting

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Role and contribution of authors:
Dr Yasser MH Khalifa, consultant surgeon, Department of Surgery, King Abdullah Hospital, Bisha, Saudi Arabia, manage this patient. He wrote introduction, mangement, discussion and conclusion of this patient.

Dr Bawa Dauda, Department of Surgery, Dalhatu Araf Specialist Hospital, Lafia, Nasarawa State, Nigeria. Critically review the article and gave the final touchup to the article.

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