1. Introduction

The incidence of pancreatic injuries after blunt abdominal trauma is very low, with rates of less than 1% quoted for all trauma admissions.1 However, missed pancreatic injuries are often associated with numerous complications, such as pancreatitis, pancreatic fistula, abscess and pseudocyst.2 The increasing adoption of non-operative management for blunt abdominal trauma has only served to focus attention on the importance of accurate identification of the presence and extent of the pancreatic insults.3 However, the diagnosis of pancreatic injuries is challenging for several reasons: the lack of early physical signs, its retroperitoneal location and the unreliability of current standard diagnostic modalities.4

We present a case of complete transection of pancreas following blunt injury abdomen. The diagnosis was delayed due to his mild symptoms and signs. The patient was managed by external drainage and serial follow-up. Non-operative management which includes bowel rest, total parenteral nutrition and serial follow-up has also been shown to be successful without significant complications.4

2. Case Report

A 46 year old man presented to emergency department with pain abdomen radiating to back. Patient gave history of
significant blunt trauma to abdomen one week back. Patient was hemodynamically stable with mild tenderness in epigastric region. Serum amylase was 140IU/L and lipase 450IU/L. Rest of blood investigations were within normal limit. Contrast enhanced computer tomography of abdomen revealed complete transection of tail of pancreas with peri pancreatic fluid collection. No other solid organ or bowel injuries were present. In view of hemodynamic stability and no signs of active bleed or peritonitis, non operative management was adopted. A CT guided pigtail catheter was placed to drain the peripancreatic collection. Peripancreatic fluid analysis showed high levels of amylase. Since pigtail output was initially 200ml/day no ocreotide infusion was started. Gradually the catheter output reduced to less than 25ml/day over 16 days. The pigtail catheter was removed and patient discharged. Patient is on regular follow-up and at 6 months has had no episode of pancreatitis or other complications.

**Figure 1- CT scan complete transaction of body of pancreas with peripancreatic collection.**

3. Discussion

Pancreatic injuries occur after blunt trauma when the pancreas is crushed against the vertebrae. The spectrum of injuries ranges from minor contusions to massive disruption of the pancreatic. In addition, pancreatic injuries rarely occur by themselves and are often associated with other intra-abdominal injuries, such as those of the liver, duodenum and major vessels. Due to retroperitoneal location of the organ, symptoms and signs of pancreatic trauma are subtle making diagnosis more difficult and easily missed. Symptoms may be absent, in upto 20% of patients there is neither abdominal pain nor tenderness.

Initial serum amylase levels are not sensitive or specific for predicting pancreatic injury. Jones reported that up to 35% of patients with complete transaction of the main pancreatic duct may exhibit normal serum amylase levels. Serial or delayed serum amylase levels have been more useful.

Helical contrast-enhanced CT scan is the initial imaging study of choice for detection of pancreatic injury in a stable patient. Reported sensitivity and specificity rates are as high as 90%. Some of the CT findings suggestive of pancreatic injuries include peri-pancreatic fluid in the lesser sac; pancreatic hematoma or laceration and focal edema at the site of the injury. Lacerations greater than 50% of the pancreas raise the suspicion of duct injury, but even smaller
lacerations can involve the duct. As there remains a risk of missing or underestimating the severity of pancreatic trauma, a low threshold for repeat CT scanning must be adopted, especially in the presence of persistent symptoms. The use of MDCT has dramatically reduced the scan acquisition time, resulting in improved patient compliance and image quality. On MDCT, pancreatic fractures or lacerations appear as hypoattenuating linear findings in the pancreatic parenchymal phase, ideally with separated structures, which can be missed on native CT images. On the other hand, pancreatic contusions appear as a diffuse or localized hypo attenuating area in the pancreatic parenchymal phase within the normally enhancing parenchyma. Complete disruption of the pancreas can result in extended hypoperfusion of the organ. CT scan findings of pancreatitis, such as focal or diffuse organ enlargement, contour irregularity and loss of definition of adjacent fat planes, were not recorded on images taken immediately after the injury. Posttraumatic pancreatitis results from direct blunt force and autodigestion by liberation of pancreatic enzymes after the injury. Consequently, detectable pancreatic inflammatory changes evolve later. This limitation of CT scans should be kept in mind while dealing with suspected pancreatic injuries. Serial CT scans in admitted patients is strongly recommended for accurate and reliable information. The presence of peripancreatic fluid in the absence of obvious abdominal viscus injury strongly suggests pancreatic injury.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury</th>
<th>Description</th>
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<tbody>
<tr>
<td>I</td>
<td>Hematoma</td>
<td>Mild contusion without duct injury</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Superficial laceration without duct injury</td>
</tr>
<tr>
<td>II</td>
<td>Hematoma</td>
<td>Major contusion without duct injury</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Major laceration without duct injury</td>
</tr>
<tr>
<td>III</td>
<td>Laceration</td>
<td>Distal transaction or parenchymal injury with duct injury.</td>
</tr>
<tr>
<td>IV</td>
<td>Laceration</td>
<td>Proximal transaction or parenchymal injury involving ampulla.</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
<td>Massive disruption of pancreatic head.</td>
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ERCP is an invaluable tool in the overall management of pancreatic trauma. In the early stages or preoperatively, it is able to provide real-time diagnostic images and allow guided intervention. It can even be performed intraoperatively or in the late stages of pancreatic trauma. Apart from demonstrating the nature and extent of any ductal injuries, stenotic segments can also be diagnosed. Through its interventional ability by placement of an endoscopic stent, major surgery can be averted even in the presence of pancreatic ductal injuries ERCP is also useful in managing post-injury or post-operative complications. Pseudocysts, pancreatic fistulae and chronic pancreatitis are some of these conditions which could be diagnosed and managed endoscopically without major surgery.

MRCP is a non-invasive diagnostic tool which is capable of evaluating pancreatic injuries with a high sensitivity and specificity. It avoids the risks of pancreatitis, hemorrhage and gastrointestinal perforation associated with ERCP. However, its purely diagnostic nature and its inability to provide real-time visualization of ductal filling and extravasation are some of its disadvantages. In addition, the time taken for MRCP to be performed has restricted its usage to only hemodynamically stable patients.

Assessment of the injury includes determining the degree of parenchymal involvement, location of injury within the gland and presence of pancreatic ductal involvement. For grade I and II injuries, adequate hemostasis, debridement and external drainage are usually sufficient. Adequate drainage will reduce the risk of both pancreatic abscesses and fistulae. Non-operative management which includes bowel rest, total parenteral nutrition and serial follow-up has also been shown to be successful without significant complications. While some advocate repair of a capsular laceration, others have shown that closure would lead to the formation of a pancreatic pseudocyst and hence is not advised.

Distal pancreatectomy with spleen preservation had a lower complication rate (22.2%) compared with the other procedures, and is suggested for grade III and grade IV injuries. A study from Taiwan showed that Distal Pancreatectomy is a superior operative treatment for distal injuries when compared to pancreaticojejunostomy, which had a high complication rate of 60% due to anastomotic leakage. While an attempt at splenic preservation in stable patients is an option, this task
too time-consuming with no proven benefit in the adult trauma setting. In addition, the extensive inflammation encountered in cases of delayed treatment, makes this even more difficult and is a commonly cited reason for performing splenectomy. Management of the pancreatic stump after distal resection is controversial. Numerous techniques are described in the literature including duct ligation, handsewn or stapled closure, ultrasonic dissection, meshes and omental patches, as well as biologic glues and other sealants. No method has proven superior for preventing postoperative fistulas or leaks.\textsuperscript{19,20} Preservation of the pancreatic tail must be attempted in patients with injury to the right of the mesenteric vessels, where complete resection can lead to endocrine compromise in up to 50\% of patients.

A Roux-en-Y to the proximal end of the pancreas following distal resection is occasionally indicated in the presence of severe associated contusion of the head to prevent pancreatic fistula and pseudocyst. Injuries which would require 80\% or greater resection are better managed with a Roux-en-Y to the distal pancreas, following proven injury to prevent diabetes and pancreatic insufficiency.\textsuperscript{21}

Incomplete disruption of the MPD or complete disruption of the MPD without duct obstruction is the best candidate for the pancreatic duct stent therapy. Transductal pancreatic stent allows internal drainage of the pancreatic secretion and re-establishment of duct continuity.\textsuperscript{16} Disruption or complex injuries of the pancreatic head involving the ampulla, or devitalizing injuries of the pancreas head and duodenum usually are non-reconstructable injuries. In stable patients, pancreaticoduodenectomy is the best definite treatment for grade IV injuries. In some cases, such as complete transection of the pancreatic body from the head, a distal pancreaticojejunostomy and closure of the proximal end of the pancreas rupture as in the Letton & Wilson procedure.\textsuperscript{22}

### Table 2. Treatment options for isolated pancreatic injuries based on the American Associations for the Surgery of Trauma (AAST) pancreas Organ Injury Scale.\textsuperscript{23}

<table>
<thead>
<tr>
<th>AAST GRADE</th>
<th>TREATMENT OPTIONS</th>
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<tbody>
<tr>
<td>I</td>
<td>Observation</td>
</tr>
<tr>
<td>II</td>
<td>Omental pancreateorrhaphy with simple external drainage Simple external drainage</td>
</tr>
<tr>
<td>III</td>
<td>Distal pancreatectomy with/without splenectomy Roux-en Y distal pancreaticojejunostomy</td>
</tr>
<tr>
<td>IV</td>
<td>Pancreatectoduodenectomy Roux-en Y distal pancreaticojejunostomy Anterior Roux-en Y pancreaticojejunostomy Endoscopically placed stent Simple drainage in damage control situations</td>
</tr>
<tr>
<td>V</td>
<td>Pancreatectoduodenectomy</td>
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</table>

Prognosis is determined by the cause of the injury, the extent of blood loss, the presence or absence of shock, rapidity of resuscitation, magnitude of associated injuries and nature and site of the pancreatic injury.\textsuperscript{24} The trend to increasingly conservative surgery for most pancreatic injuries without elaborate enteric anastomoses or obligatory intraoperative pancreatography represents a simplification of past methods and allows preservation of pancreatic tissue without increasing morbidity.\textsuperscript{24}

### 4. Conclusion

Although several methods of management have been advocated for pancreatic trauma, most important is identification of ductal injury at presentation and institution of appropriate definitive treatment. When a pancreatic injury is identified, the method of management is determined by the condition of the patient, the severity of injury and anatomic location. Adequate external drainage is an important principle in the management of pancreatic injuries. With careful assessment of the injury by inspection, pancreatic complications can be reduced without the need for complex resections, enteric diversions and pancreaticoenteric anastomoses.
References


