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Pancreatic trauma: A concise review

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Abstract

Traumatic injury to the pancreas is rare and difficult to diagnose. In contrast, traumatic injuries to the liver, spleen and kidney are common and are usually identified with ease by imaging modalities. Pancreatic injuries are usually subtle to identify by different diagnostic imaging modalities, and these injuries are often overlooked in cases with extensive multiorgan trauma. The most evident findings of pancreatic injury are post-traumatic pancreatitis with blood, edema, and soft tissue infiltration of the anterior pararenal space. The alterations of post-traumatic pancreatitis may not be visualized within several hours following trauma as they are time dependent. Delayed diagnoses of traumatic pancreatic injuries are associated with high morbidity and mortality. Imaging plays an important role in diagnosis of pancreatic injuries because early recognition of the disruption of the main pancreatic duct is important. We reviewed our experience with the use of various imaging modalities for diagnosis of blunt pancreatic trauma.

Key words: Pancreas; Trauma; Pancreatitis; Radiology

Core tip: The pancreas is a relatively uncommon organ to be injured in abdominal trauma and difficult to diagnose. Pancreatic injuries are usually subtle to identify by different diagnostic imaging modalities and these injuries are often overlooked in cases with extensive multiorgan trauma. They are associated with considerably high morbidity and mortality in cases of delayed diagnosis, incorrect classification of the injury, or delays in treatment. This review provides an overall concise update on pancreatic trauma and highlights the findings of pancreatic trauma on various imaging modalities.

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INTRODUCTION

The pancreas is a relatively uncommon organ to be injured in trauma, occurring in less than 2% of blunt trauma cases, and this injury is associated with considerably high morbidity and mortality in cases of delayed diagnosis, incorrect classification of the injury, or delays in treat-

ment[1,2]. Mortality for pancreatic injuries ranges from 9% to 34%; however, only 5% of the pancreatic injuries are directly related to the fatal outcome. Physical examination is usually not reliable in the setting of acute pancreatic trauma[3]. Early and accurate diagnosis can decrease morbidity and mortality, and various imaging modalities play a key role in recognition of pancreatic injuries[4,5].

Knowledge about the mechanisms of pancreatic injury, the presence of coexisting injuries, the time to diagnosis, the presence or absence of major ductal injury, and the roles of various imaging modalities is essential for prompt, early and accurate diagnosis. Early detection of disruption of the main pancreatic duct is of paramount importance because such disruption is the main cause of delayed complications like pseudopancreatic cyst[6]. The most common site of traumatic pancreatic injury is at the junction of the body and tail. Significant pancreatic injury may occur in the absence of abnormality on various imaging modalities.

Pancreatic trauma occurs commonly in connection with multiple injuries after motor vehicle accidents in adults and bicycle handlebar injuries in children[7]. Conservative management is mainly advocated for pancreatic trauma without ductal injuries. Computed tomography (CT) is routinely used as the first-line imaging modality in acute abdominal trauma cases and is helpful in recognizing injuries to the pancreas and other organs and their associated complications[8]. Ultrasonography (US) is useful in cases of pancreatic ascites and pseudocyst formation, which are more likely to occur in cases with traumatic pancreatitis[3,9]. Magnetic resonance cholangiopancreatography (MRCP) allows direct imaging of the pancreatic duct and its disruption[10]. The purpose of this paper is to review the findings of pancreatic trauma on various imaging modalities.

ANATOMIC CONSIDERATIONS

The pancreas is a long J-shaped, soft, lobulated retroperitoneal organ. It is situated transversely across the posterior abdominal wall, at the back of the epigastric and left hypochondriac regions at level of lumbar (L1-2) spine (Figure 1). In adults, the pancreas is about 15-20 cm long, 1.0-1.5 cm thick and weighs approximately 90-100 g[11]. The main pancreatic duct of Wirsung traverses the entire length of the gland. The superior pancreaticoduodenal artery from the gastroduodenal artery and the inferior pancreaticoduodenal artery from the superior mesenteric artery run in the concave contour of the second part of the duodenum to supply the head of the pancreas. The pancreatic branches of the splenic artery supply the neck, body and tail of the pancreas. The body and neck of the pancreas drain into the splenic vein, whereas the head drains into the superior mesenteric and portal veins. The lymphatic drainage of the pancreas is *via* the splenic, celiac and superior mesenteric lymph nodes. The proximity of many larger vessels such as the inferior vena cava (IVC), portal vein and abdominal aorta makes injuries to the pancreas difficult to manage because of the risk of exsanguinating hemorrhage, which is a frequent cause of death in patients with a pancreatic injury. The splenic artery and splenic vein run superior and posterior to the body and tail of the pancreas and are relatively easier to expose and control compared to the IVC and portal vein. The vascular anatomy causes problems in repairing the injuries to the head of the pancreas whereas injuries to the body and tail are easier to manage[11,12].

PATHOPHYSIOLOGY OF INJURY

Injuries to the pancreas most commonly result from penetrating trauma caused by gunshot or stab wounds and occur in approximately 20%-30% of all patients with penetrating traumas. The penetrating injury caused by firearms results in the highest frequency of pancreatic trauma. The relatively protected retroperitoneal location of the pancreas protects it from most instances of blunt abdominal trauma. Blunt trauma to the pancreas is, in most instances, caused by a sudden localized force to the upper abdomen that compresses the pancreas against the vertebral column (*e.g.*, steering wheel injury in a motor vehicle accident in adults and from bicycle handlebar injury or direct blow from a kick or fall in children)[8]. Blunt pancreatic injury is more common in children and young adults because they have a thinner or absent mantle of protective fat, which surrounds the pancreas in older adults[10]. In order of frequency, injuries to the pancreas involve the body, head and tail. Pancreatic injury is rarely a solitary injury, and in the majority of instances there is at least one coexistent injury; 60% are duodenopancreatic lesions, while 90% involve at least one other abdominal organ[1]. Therefore, multiple organ injuries are a red flag suggesting the possibility of coexistent pancreatic injury.

CLINICAL PRESENTATIONS

Patients with pancreatic trauma present usually with features of acute pancreatitis. The typical clinical triad of pancreatic trauma is upper abdominal pain, leukocytosis, and elevated serum amylase level, that may, however, be absent in adults during the first 24 h and even for several days[12,13]. Pancreatic trauma is difficult to recognize because of coexisting injuries to other intra-abdominal organs and its retroperitoneal location, which makes signs and symptoms less marked, and consequently this trauma ends up causing higher morbidity and mortality rates than observed in injuries to other intra-abdominal organs[14,15]. Symptoms of injury to other intra-abdominal organs or structures commonly mask or supersede that of pancreatic injury, both early and late in the course of trauma. Therefore, a high degree of suspicion is required to ensure that pancreatic injuries are not overlooked or missed either early or late in their course.

LABORATORY FINDINGS

Raised amylase in serum or diagnostic peritoneal lavage (DPL) fluid can be useful in diagnosis, but there is

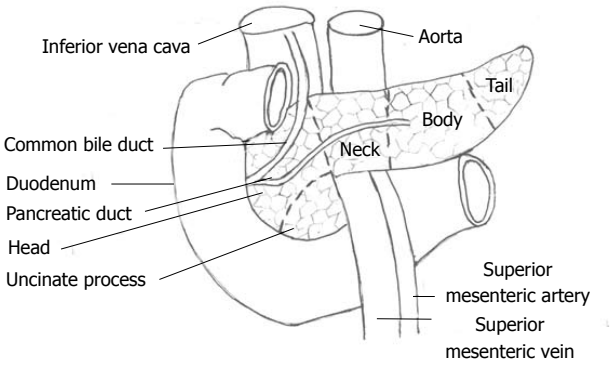

Figure 1 Gross anatomy of the pancreas.

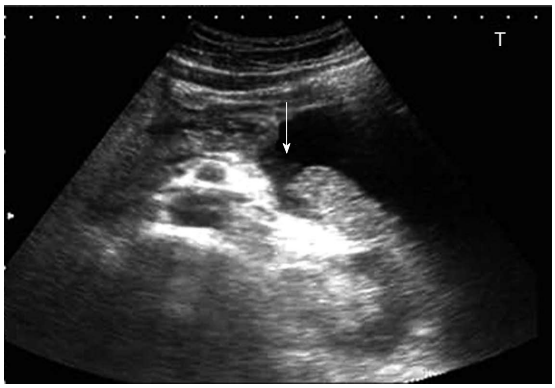

Figure 2 Ultrasound image. Axial ultrasound image shows localized traumatic enlargement of the pancreas with diffuse edema. Transection of distal body of pancreas communicating with large fluid collection anterior to pancreas (white arrow).

poor correlation between raised amylase and pancreatic trauma because amylase may be elevated in injuries of the salivary gland, in duodenal trauma, hepatic trauma, and injuries to the head and face, and in an intoxicated patient[16-18]. A raised amylase level after blunt pancreatic trauma is time dependent, and a persistently elevated or a rising amylase level is a more reliable indicator of pancreatic trauma, but it does not indicate the severity of the injury[14]. Amylase detected in DPL fluid is a much more sensitive and specific indicator of pancreatic injury than blood or serum amylase estimations. Serum lipase activity is also not specific for pancreatic injury[12].

RADIOLOGIC STUDIES

Diagnostic imaging plays an important role in the recognition, evaluation, and follow-up of traumatic pancreatic injuries. The imaging findings in patients with pancreatic trauma are nonspecific and often indistinguishable from those of inflammatory pancreatitis.

Conventional radiography

A plain X-ray of the abdomen in patients with pancreatic trauma is nonspecific and none of the radiologic abnormalities on plain films can be used for specific diagnostic purposes. Conventional radiography can be valuable in detecting penetrating trauma by visualizing and localizing foreign bodies such as bullet fragments and projectile-induced bony injury, as well as pulmonary parenchymal injury, gastric dilatation and pneumoperitoneum.

Findings are often indistinguishable from those of inflammatory pancreatitis. Pancreatic hemorrhage and edema widen the duodenal sweep with distension of the duodenum. Dissection along the transverse mesocolon results in gaseous distension of the colon, which may terminate abruptly usually at the splenic flexure to produce the "colon-cutoff sign". A sentinel loop representing localized ileus may be seen in the mid-abdomen.

US

Although US is easy to perform, portable and cost-effective, pancreatic injuries are difficult to diagnose in spite of technically adequate sonograms[19]. However, it is reliable in the follow-up of complications such as pseudocysts. Real-time contrast-enhanced US is an effective technique in emergency imaging, but its role should not be considered as a replacement for CT[20].

US may show localized traumatic enlargement of the pancreas or diffuse edema simulating inflammatory pancreatitis. In trauma patients, peripancreatic fluids may be a sign of pancreatic contusion[21]. A traumatic pseudocyst of the pancreas may be detected by US and monitored on serial examinations. Since complications of trauma are most likely to occur from rupture or stenosis of the main pancreatic duct, it is important to try to delineate this structure in all cases of pancreatic injury. Transection throughout the pancreas parenchyma is suggestive of ductal injury (Figure 2).

CT

CT is the simplest and least invasive diagnostic modality currently available for evaluating suspected pancreatic trauma and its complications, because of the subtlety of the US findings. However, this study is only rarely useful in acute penetrating injury. Computed tomography is the radiographic examination of choice for hemodynamically stable patients with abdominal trauma as it provides the safest and most comprehensive means of diagnosis of traumatic pancreatic injury[10].

The pancreas may appear normal in 20%-40% of patients when CT is performed within 12 h after trauma because pancreatic injuries may produce little change in the density which may not be detectable on CT scan[1,22]. In addition, there may be minimal separation of lacerated pancreatic fragments (Figure 3A). Currently, multidetector-row CT scanners are used for evaluation of abdominal trauma cases as they are faster to scan, which greatly reduces bowel artifacts and resolves many previous technical problems[8]. Lacerations tend to occur at the junction of the body and tail due to shearing injuries with compression against the spine (Figure 3A).

Direct signs of pancreatic injury include laceration, transection, focal pancreatic enlargement and inhomo-

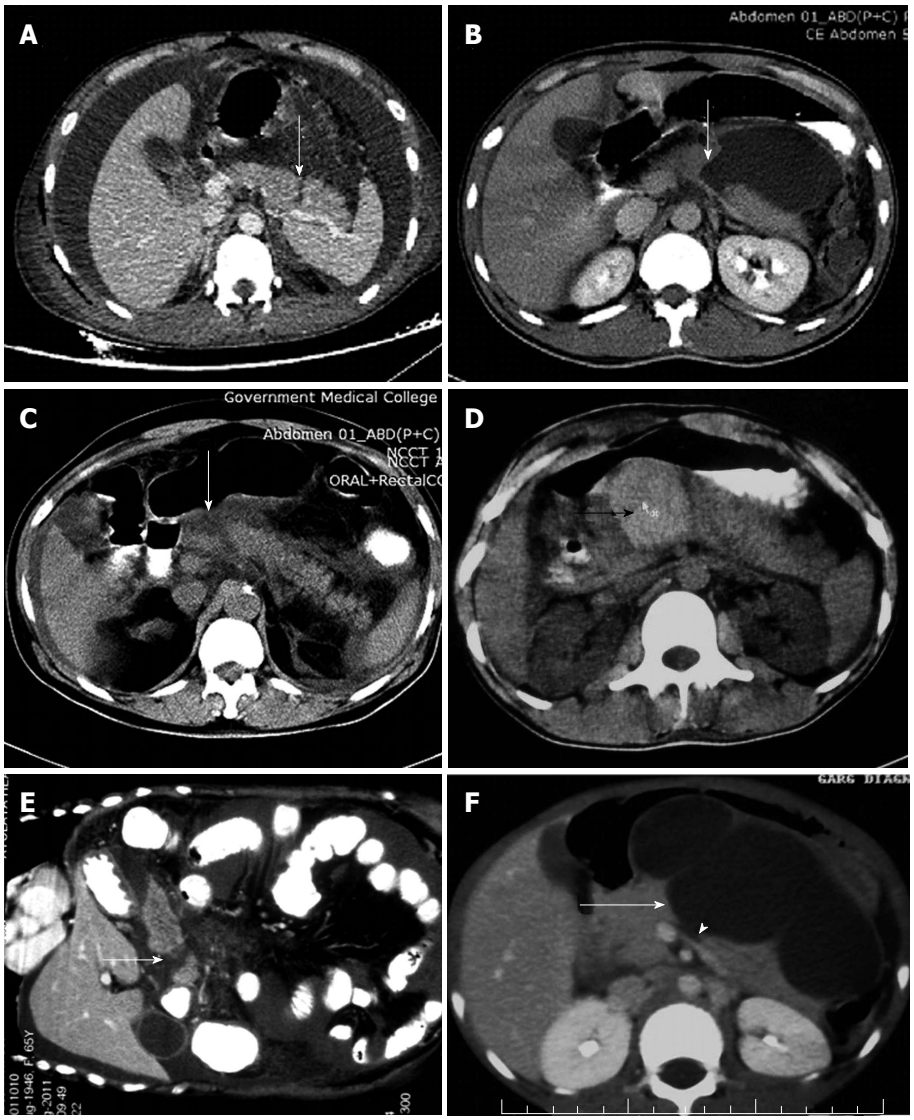

Figure 3 Computed tomography images. A, B: Axial contrast-enhanced computed tomography shows a heterogeneous appearance of the body and tail of pancreas with a linear laceration (white arrow) across the distal body of the pancreas. There is also fluid in the lesser sac, perihepatic space, perisplenic space and hemoperitoneum. There is free air into chest wall muscles on right side in a case of blunt pancreatic trauma (A), and transection throughout extent of pancreatic parenchyma in proximal body region (suggestive of ductal injury) with a large fluid collection (white arrow) anterior to pancreas communication with the transection in another case of blunt injury to upper abdomen (B); C: Contrast-enhanced computed tomography demonstrating mild diffuse hypodensity of the body of pancreas. Contusions of the head and neck also demonstrated (white arrow) with secondary signs of traumatic pancreatitis, *i.e.*, increased density of the peripancreatic fat, thickening of left anterior pararenal fascia, fluid in the lesser sac and hemoperitoneum; D: Plain axial computed tomography section at the level of pancreas shows a large hyperdense hematoma (black arrow) in proximal body of pancreas suggestive of pancreatic injury. E: Multiplanar reconstruction image of contrast-enhanced computed tomography demonstrating a pancreatic fracture (white arrow) in neck region with separation of pancreatic fragments; F: Contrast-enhanced axial computed tomography scan in a child with bicycle handlebar injury more than a month old shows a large lobulated pseudocyst anterior to pancreas communicating with pancreatic laceration in the neck of pancreas representing ductal injury. There is fluid between posterior pancreas and the splenic vein (arrow heads).

geneous enhancement. Fluid collections like hematoma and pseudocyst are usually seen communicating with the pancreas at the site of laceration or transection (Figure 3B). Secondary signs include peripancreatic fat stranding, peripancreatic fluid collections, fluid between the splenic vein and pancreas, hemorrhage, thickening of the left anterior pararenal fascia and associated injuries to adjacent structures[10] (Figure 3C, Table 1).

Contusion appears as focal or diffuse low attenuation areas and laceration is seen as a linear hypodense line perpendicular to the long axis of the pancreas[6,23,24]. Pancreatic fracture on CT is diagnosed if there is a clear separation of fragments across the long axis of the pancreas[25]. Intrapancreatic hematoma is a very specific sign of pancreatic injury[26] (Figure 3D). Fluid between the splenic vein and pancreas is a very non-specific sign but it may suggest pancreatic injury if associated with history of blunt abdominal trauma[27]. Pseudocysts are more likely to occur in patients with traumatic pancreatitis[28]. The risk of abscess or fistula formation in patients with disruption of the pancreatic duct approaches 25% and 50%, respectively, in comparison with 10% without duct injuries[7]. So it is important that imaging focuses on the integrity of the duct or findings that suggest damage to the pancreatic duct. The accuracy of detecting a major ductal injury by CT has been reported to be as low as 43%[10,17,29-31].

Computed tomography may not always directly demonstrate the ductal disruption; injury to the duct can be suggested based on the degree of parenchymal injury and can only be inferred following visualization of a through and through laceration of the pancreas (Figure 3E). A computed tomography grading scheme has been devised (Table 2), which parallels the surgical classification of Moore[10,32]. Grade A injuries with laceration involving < 50% pancreas are usually seen with an intact pancreatic duct by surgical grading, whereas grade B and C injuries correlate with duct disruption, especially when CT shows deep lacerations or pancreatic transection[32]. Overestimation on CT can occur in grade C Ⅰ and C Ⅱ injuries if merely deep lacerations or "single scan" transections are identified at the pancreatic head. However, urgent endoscopic retrograde cholangiopancreatography (ERCP) may be quite valuable in such patients with strong clinical

Table 1 Computed tomographic signs of pancreatic injury

Specific signs	Fracture of the pancreas
	Pancreatic laceration
	Focal or diffuse pancreatic enlargement/edema
	Pancreatic hematoma
	Active bleeding/extravasation of intravenous contrast
	Fluid separating the splenic vein from posterior aspect of pancreas
Non-specific signs	Inflammatory changes in peripancreatic fat and mesentery
	Fluid surrounding the superior mesenteric artery
	Thickening of the left anterior renal fascia
	Pancreatic ductal dilatation
	Acute pseudocyst formation/peripancreatic fluid collection
	Fluid in the anterior and posterior pararenal spaces
	Fluid in transverse mesocolon and lesser sac
	Hemorrhage into peripancreatic fat, mesocolon and mesentery
	Extraperitoneal fluid
	Intraperitoneal fluid

Table 2 Computed tomographic grading of blunt pancreatic injuries

CT grading	CT findings of blunt pancreatic injury
Grade A	Pancreatitis and/or superficial lacerations at any site
Grade B	
B Ⅰ	Deep laceration at distal pancreas
B Ⅱ	Transections at distal pancreas
Grade C	
C Ⅰ	Deep lacerations at proximal pancreas
C Ⅱ	Transections at proximal pancreas

Reproduced from Wong *et al*[32]. CT: Computed tomography.

evidence of pancreatic injury and an equivocal CT scan, to establish the final diagnosis[10,32]. A patient with a post-traumatic pseudocyst should be considered to have a ductal leak until proven otherwise[1] (Figure 3F).

MRCP

Since the outcome of pancreatic trauma patients largely depends upon the integrity of the pancreatic duct, evaluation of the duct is essential. In the past, ERCP was the only method available for evaluating pancreatic duct integrity. More recently, MRCP has emerged as an attractive alternative non-invasive diagnostic tool for direct imaging of the pancreatic duct and it is being used more frequently to assess injury to the ductal components[33]. Dynamic secretin-stimulated (DSS) MRCP is a variation on standard MRCP and may compete with ERCP in diagnostic accuracy. Like ERCP, DSS MRCP provides dynamic information as to whether there is continuing leakage from an injured main pancreatic duct. The advantages of DSS MRCP include it being noninvasive, faster and more readily available than ERCP, and it can illustrate the entire pancreatic parenchymal and ductal anatomy, as well as pathologic fluid collections and ductal disruptions[34]. The main pancreatic duct (MPD) can be identified by MRCP within the pancreatic head

Table 3 Classification of pancreatic injuries by endoscopic retrograde cholangiopancreatography

Grade	Description
Ⅰ	Normal main pancreatic duct on ERCP
Ⅱa	Injury to branches of main pancreatic duct on ERCP with contrast extravasation inside the parenchyma
Ⅱb	Injury to branches of main pancreatic duct on ERCP with contrast extravasation into the retroperitoneal space
Ⅲa	Injury to the main pancreatic duct on ERCP at the body or tail of the pancreas
Ⅲb	Injury to the main pancreatic duct on ERCP at the head the pancreas

Reproduced from Takishima *et al*[38]. ERCP: Endoscopic retrograde cholangiopancreatography.

in up to 97% of cases and within the pancreatic tail in up to 83%[35]. In addition, MRCP may demonstrate abnormalities not visible at ERCP, such as fluid collections upstream of the site of duct transection (Figure 4A), and is helpful in assessing parenchymal injury[36]. For assessing the parenchyma, fat-suppressed T1- and T2-weighted sequences are performed. Magnetic resonance pancreatograms are acquired by using heavily T2-weighted breath-hold or non-breath-hold sequences. Fast spin-echo (two-dimensional or three-dimensional) and rapid acquisition with relaxation enhancement sequences performed in the coronal and axial planes are usually sufficient[10].

ERCP

ERCP is increasingly being used to help in both early and in delayed diagnosis of pancreatic ductal injuries in patients with strong clinical evidence of pancreatic injury and an equivocal CT scan. Endoscopic retrograde cholangiopancreatography is the most accurate investigation for diagnosing the site and extent of ductal injury by demonstrating extravasation or a cutoff, especially in patients with delayed presentations[37]. It can be performed preoperatively, intraoperatively or postoperatively in patients with pancreatic injury. Although ERCP is the most useful procedure for the diagnosis of pancreatic ductal injury in stable patients, surgery should be considered in hemodynamically unstable patients. A classification of pancreatic injuries (Table 3) has been devised according to the findings on ERCP[38]. Although MRCP (Figure 4B) has become the noninvasive imaging method of choice when evaluating for pancreatic duct injury, ERCP remains important because of its potential to direct image-guided therapy (Figure 5). Endoscopic retrograde cholangiopancreatography in selected patients allows non-operative treatment in the absence of ductal injury and earlier operative treatment or primary therapy as stent placement in the presence of ductal injury[39]. It also aids the treatment of late complications of pancreatic duct injuries such as pseudocysts and pancreatic fistulae. Both endoscopic transpapillary and transmural drainage are effective options for managing delayed local complications of pancreatic trauma. The endoscopist must be skilled

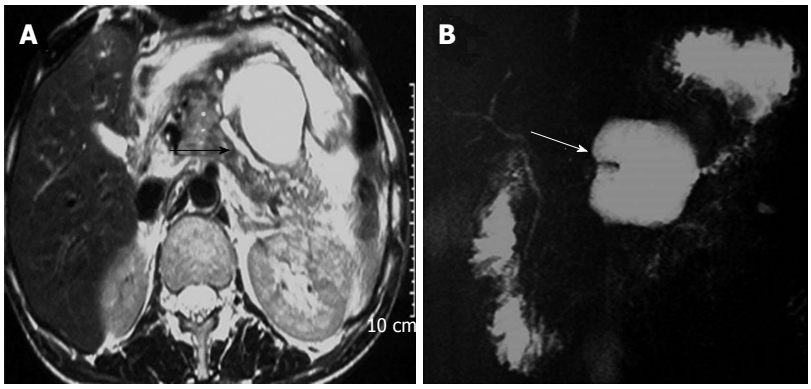

Figure 4 Magnetic resonance images. T2 weighted axial image (A) and magnetic resonance cholangiopancreatography (B) in a case of traumatic pancreatitis show heterogenous signal intensity of pancreas with peripancreatic stranding. Main pancreatic duct is dilated in the body and tail region (black arrow). A lobulated pseudopancreatic cyst is seen in lesser sac anterior aspect of body of pancreas (white arrow) demonstrated in magnetic resonance cholangiopancreatography.

Figure 5 Endoscopic retrograde cholangiopancreatography image. Another case of traumatic pancreatitis. Fluoroscopic image showing main pancreatic duct disruptions during endoscopic retrograde cholangiopancreatography with multiple contrast filled outpouching is seen, suggestive of pseudocysts (white arrow). Multiple contrast filled tracts are also visualized (black arrowhead). Few tracts are seen in retroperitoneum and one of the tracts is reaching into mediastinum (black arrow). Endoscope is visible.

Table 4 American Association for the surgery of trauma classification of pancreatic trauma

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

Reproduced from Campbell *et al*[42].

and experienced in its use as this procedure has potential complications that can limit its usefulness in patients with pancreatic trauma.

COMPLICATIONS OF PANCREATIC TRAUMA

Early diagnosis and treatment are associated with better overall outcomes in traumatic pancreatic injury patients. Mortality associated with pancreatic injuries approximates 20% and results primarily from hemorrhage caused by injuries to other intra-abdominal organs and from sepsis[40,41]. There is an increase in infectious complications in patients who have pancreatic wounds co-associated with injury to small and large intestine. Blunt pancreatic injuries without ductal leak usually resolve with mere conservative management. On the other hand, damage to the ductal system, if inadequately treated or untreated, can result in prolonged morbidity. Complications of traumatic pancreatic injury are manifold and range from minor pancreatitis to death[40,42]. Fistula formation is the most frequently observed complication. Traumatic pancreatitis, pseudocyst formation, abscesses and duct stricture are common complications. Other less frequent complications include peritonitis, intestinal obstruction, gastrointestinal bleeding, endocrine or exocrine insufficiency, splenic artery pseudoaneurysm formation or rupture and splenic vein thrombosis[6,24].

CLASSIFICATION AND GRADING OF PANCREATIC INJURIES

Pancreatic injuries are classified and graded according to the damage to the pancreatic parenchyma and the ductal system. Grading of pancreatic injuries enables an exact description of injuries, can influence management, and allows a comparison of outcomes and effective quality control of treatment[12]. There are several classification systems of traumatic pancreatic injuries[32,38] (Tables 2 and 3) but the pancreatic organ injury scale (OIS) proposed by the American Association for the Surgery of Trauma (AAST) fulfills most of these criteria and at present is the universally accepted classification scheme[43]. This OIS scale involves five grades, which concedes the significance of more complex injuries to the pancreas, and particularly those injuries affecting the pancreatic duct and the pancreatic head (Table 4). This classification scheme can also be correlated with other organ injury scales, as well as integrated into more complex scoring systems, such as injury severity score or trauma score - injury severity score from which probability of survival of an individual case is determined.

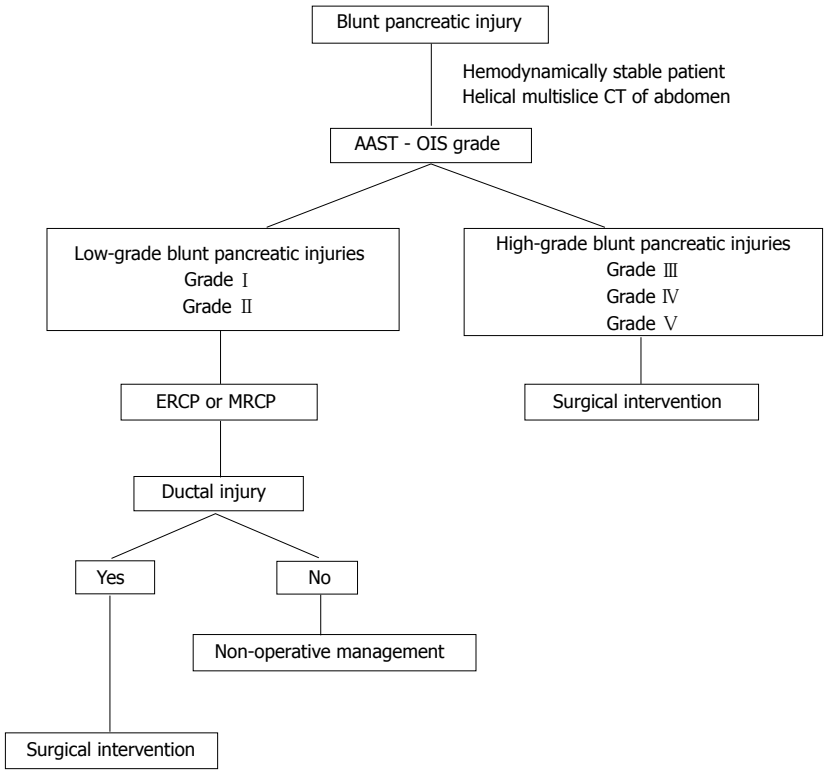

Figure 6 Management algorithm for traumatic pancreatic injury patients. Reproduced from Ilahi *et al*[14]. ERCP: Endoscopic retrograde cholangiopancreatography; MRCP: Magnetic resonance cholangiopancreatography.

MANAGEMENT OF PANCREATIC INJURIES

Many patients with pancreatic injuries have multiple associated injuries including vascular and other intra-abdominal organs injury; priority must be given to stabilizing the patient before any definitive management of the pancreatic injury. The initial priorities include control of hemorrhage and spillage of intestinal contents. The decision regarding therapeutic approach of the traumatic pancreatic injury, either with a conservative approach or a surgical approach, depends upon the integrity of the MPD, extent of pancreatic parenchymal damage, anatomical location of the injury, stability of the patient and degree of associated organ damage (Figure 6)[44]. In patients with an isolated pancreatic contusion or superficial lacerations without ductal disruption, conservative management may be warranted. Treatment of traumatic pancreatitis consists of bowel rest, nasogastric suction, and nutritional support[29]. ERCP-guided stent placement to the MPD injury has been indicated in select cases[45]. Endoscopic transpapillary drainage has been successfully used to heal duct disruptions in the early phase of pancreatic trauma and in the delayed phase to treat the complications of pancreatic duct injuries. However, in patients with major ductal injury in blunt pancreatic trauma cases, morbidity and mortality greatly increase unless surgery is undertaken within the first 24 h. By using the pancreatic OIS grading system of the AAST to help to guide the appropriate surgical management, the morbidity and mortality in blunt pancreatic injury are decreased[46]. Grades I and Ⅱ are treated with non-operative management techniques or simple drainage, whereas grade Ⅲ or higher injuries often require resection with possible reconstruction and/or drainage procedures[47]. There are a number of alternative procedures that can be used for the management of high-grade blunt pancreatic injury, such as duodenal diversion, pyloric exclusion, the Whipple procedure or simple drainage, with the choice dependent on the patient's hemodynamic status and the presence or absence of associated duodenal injury[48,49]. Sometimes, the decision to perform a pancreaticoduodenectomy is unavoidable in select cases. If the patient is hemodynamically unstable, pancreaticoduodenectomy should be performed as a two-step procedure. After the initial damage control surgery, anastomoses are completed at a second surgery when the patient is stable[50].

The standard of care in penetrating injuries is a surgical approach depending upon the location of the injury and associated abdominal injuries. Damage control surgery in hemodynamically unstable patients with massive injury to the pancreas and associated intra-abdominal organs reduces morbidity and mortality.

CONCLUSION

Pancreatic injury is uncommon and usually difficult to diagnose. Because of the subtlety of the ultrasound findings, computed tomography is the preferred method for evaluating suspected pancreatic trauma; however, pancreatic duct injury may not be detected on computed tomography scan except when there is through and through laceration. In select situations, including minor injuries, a conservative approach may be successful. With modern imaging modalities and expertise in endoscopic retrograde cholangiopancreatography, isolated pancreatic

duct injury can be successfully managed. A surgical approach is appropriate with major pancreatic injury that necessitates urgent surgical intervention.

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