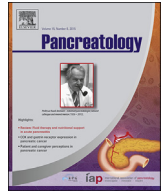




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Review article

Management of pancreatic trauma: A pancreatic surgeon's point of view

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ABSTRACT

Background: Pancreatic trauma occurs in 0.2% of patients with blunt trauma and 1–12% of patients with penetrating trauma. Traumatic pancreatic injuries are characterised by high morbidity and mortality, which further increase with delayed diagnoses. The diagnosis of pancreatic trauma is challenging. Signs and symptoms can be non-specific or even absent.

Methods: A critical review of studies reporting the management and outcomes of pancreatic trauma was performed.

Results: The management of pancreatic trauma depends on the haemodynamic stability of the patient, the degree and location of parenchymal injury, the integrity of the main pancreatic duct, and the associated injuries to other organs. Nevertheless, the involvement of the main pancreatic duct is the most important predictive factor of the outcome. The majority of pancreatic traumas are managed by medical treatment (parenteral nutrition, antibiotic therapy and somatostatin analogues), haemostasis, debridement of devitalised tissue and closed external drainage. If a proximal duct injury is diagnosed, endoscopic transpapillary stent insertion can be a viable option, while surgical resection by pancreaticoduodenectomy is restricted to an extremely small number of selected cases. Injuries of the distal parenchyma or distal duct may be managed with distal pancreatectomy with spleen preservation. At the pancreatic neck, when pancreatic transection occurs without damage to the parenchyma, a parenchyma-sparing procedure is feasible.

Conclusion: The management of pancreatic injuries is complex and often requires a multidisciplinary approach. Here, we propose a management algorithm that is based on parenchymal damage and the site of duct injury.

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Introduction

Pancreatic trauma occurs in 0.2% of patients with blunt trauma and 1%–12% of patients with penetrating injuries. Approximately 60% of pancreatic injuries are caused by vehicle crashes as a result of impact with the steering wheel in adults or with bicycle handlebars in children. In pancreatic trauma, injuries to other organs, such as spleen, liver or kidney, are associated with 50%–98% of the cases [1,2].

In the literature, pancreatic injuries have been reported to affect multiple pancreatic locations in 50.5% of the cases, the pancreatic head in 17.3%, the body in 9.6% and the tail in 22.6% [3]. Traumatic pancreatic injuries are characterised by high morbidity and mortality rates [4]. The morbidity rates range from 30% to 40%, and morbidity is primarily related to injuries to other associated organs. Major pancreatic-related complications including acute necrotic haemorrhagic pancreatitis (15%), pseudo-cysts (9%), abscesses (6%) and fistulas (4%).

The mortality rates range from 9% to 34% and, mortality is primarily dependent on the involvement of other organs, the mechanism, site and degree of pancreatic injury, and the delay in diagnosis [3,5,6]. Early mortality primarily occurs due to uncontrolled haemorrhage, and late mortality is related to sepsis and associated organ failure. The mortality rates directly attributed to pancreatic injuries range from 2% to 17% [7–9].

This paper focuses on the urgent and delayed management of pancreatic trauma in a tertiary hepato-bilio-pancreatic referral centre without accounting for severe traumas requiring emergency operations with damage control surgery.

Classifications

The American Association for the Surgery of Trauma (AAST) scale for pancreatic injuries was introduced in 1990, and this scale is the most used grading system [3,9–12] (Table 1). The AAST scale emphasises the importance of injury to the head and to Wirsung's duct. Due to its simplicity and correlation with treatment, this scale represents a valuable tool for the management of and decision-making related to pancreatic trauma. According to the AAST scale, grade I and II injuries (representing 60% and 20% of all pancreatic injuries, respectively) are generally managed by conservative treatment, while grades III, IV and V typically require surgical treatment [6].

Other grading systems for pancreatic injuries include the Lucas [13] and the Frey and Waddell [14] classifications. While these

Table 1
Pancreatic Organ Injury Scale: American Association for the Surgery of Trauma (AAST) [10].

Grade	Injury description
I	Minor contusion or superficial laceration without duct injury
II	Minor contusion or laceration without duct injury or tissue loss
III	Distal transection or parenchymal injury with duct injury
IV	Proximal (right or superior mesenteric artery) transection or parenchymal injury
V	Massive disruption of pancreatic head

systems have been adopted in the past, they have more recently been nearly completely abandoned [15].

Management

The management of pancreatic trauma depends on the haemodynamic stability of the patient, the presence of associated organ injury, the location of parenchymal injury, the integrity of the pancreatic duct, and the presence of complications, such as necrotic acute pancreatitis, abscesses, fistulas or pancreatic pseudo-cysts [1]. In blunt trauma, the incidence of injuries to organs other than the pancreas ranges from 45% to 85%, while in penetrating trauma, this rate is nearly 100% [3].

Delays in diagnosis (>24 h from trauma) are associated with high post-operative morbidity and mortality rates, particularly in cases of pancreatic duct rupture [16]. The involvement of the main pancreatic duct is the most important predictive factor of outcome. Undiagnosed ductal disruptions lead to complications and lengthened in-hospital and ICU stays. Such disruptions occur in 15% of pancreatic traumas and are particularly common in penetrating injuries.

Unstable patients with pancreatic trauma

In unstable patients, pancreatic trauma presents peculiar and challenging aspects in terms of diagnosis, grading, and treatment. Haemodynamic stability must be considered and managed first. Once haemodynamic stabilisation is guaranteed, pancreatic injuries should be investigated with intraoperative complete exploration of the pancreatic gland to avoid the risk of misdiagnosed lesions (Fig. 1). Such exploration is accomplished by the opening of the lesser sac and the complete mobilisation of the duodenum according to the Kocher manoeuvre.

When the presence of a main pancreatic injury is suspected, and the patient's condition allows for further diagnostic procedures, a more precise assessment through intraoperative cholangiography (i.e., through the cystic duct or by direct puncture of the common bile duct) or duodenoscopy (followed eventually by transpapillary cholangiography and/or wirsunography) should be considered. In cases of pancreatic duct visualisation, intraoperative wirsunography should be considered to exclude other possible pancreatic lesions. After initial haemodynamic stabilisation, pancreaticoduodenectomies can be necessary in patients with injuries of the duodenum or pancreas for which repair is not feasible. This procedure can be completed with a one- or two-step approach, but this procedure is still associated with significant morbidity and mortality and should be restricted to selected cases [9].

Stable patients with pancreatic trauma

Due to the retroperitoneal location of the pancreas, the physical signs and symptoms of traumatic pancreatic injury may be non-specific or even absent.

The level of pancreatic serum amylase has been demonstrated to be unreliable with specificities of 65%–75% at a cut-off value of 200 U/L [17].

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