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ORIGINAL ARTICLE

Management of pancreatic trauma

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Pancreatic trauma;
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Review

Summary
Introduction: Pancreatic trauma (PT) is associated with high morbidity and mortality; the therapeutic options remain debated.
Material and methods: Retrospective study of PT treated in the University Hospital of Grenoble over a 22-year span. The decision for initial laparotomy depended on hemodynamic status as well as on associated lesions. Main pancreatic duct lesions were always searched for. PT lesions were graded according to the AAST classification.
Results: Of a total of 46 PT, 34 were grades II or I. Hemodynamic instability led to immediate laparotomy in 18 patients, for whom treatment was always drainage of the pancreatic bed; morbidity was 30%. Eight patients had grade III injuries, six of whom underwent immediate operation: three underwent splenopancreatectomy without any major complications while the other three who had simple drainage required re-operation for peritonitis, with one death related to pancreatic complications. Four patients had grades IV or V PT: two pancreatoduodenectomies were performed, with no major complication, while one patient underwent duodenal reconstruction with pancreatic drainage, complicated by pancreatic and duodenal fistula requiring a hospital stay of two months. The post-trauma course was complicated for all patients with main pancreatic duct involvement. Our outcomes were similar to those found in the literature.
Conclusion: In patients with distal PT and main pancreatic duct involvement, simple drainage is associated with high morbidity and mortality. For proximal PT, the therapeutic options of drainage versus pancreatoduodenectomy must be weighed; pancreatoduodenectomy may be unavoidable when the duodenum is injured as well. Two-stage (resection first, reconstruction later) could be an effective alternative in the emergency setting when there are other associated traumatic lesions.

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Introduction

Pancreatic trauma (PT) occurs in only 5% of non-penetrating abdominal injuries [1,2]. These are severe injuries, with mortality ranging from 5 to 30%, and morbidity reaching nearly 50% [3,4]. Over the last two decades, non-operative management (NOM) has been increasingly proposed as standard treatment for non-penetrating abdominal injuries. This therapeutic modality was initially developed for liver and splenic hemorrhagic injuries [4—6], and became envisionable for PT thanks to progress in imaging and interventional therapeutic techniques. Specific characteristics of PT are worthy of note:

- the deep retroperitoneal location of the pancreas means that clinical signs are often subtle possibly leading to delayed diagnosis;
- risk of pancreatic necrosis, autodigestion of neighboring vascular or visceral structures, and infection may result in severe consequences;
- the intimate proximity of the pancreatic head to the common bile duct and duodenum means that their associated injury can be the most serious component of prognosis.

Precise evaluation of the type of injury is key to the management of PT, above all, the search for ductal involvement. No standardized management plan can be found in the literature, and many different therapeutic options have been described. The goal of this review is to determine the current management of PT in the era of NOM for abdominal trauma and modern imaging techniques, in the light of our experience over the last two decades and review of recent data from the literature.

Material and methods

The records of all cases of PT managed in the Grenoble University Hospital Level 1 trauma center between October 1989 and January 2012 were reviewed retrospectively. Positive diagnosis was established either by abdominal CT scan or intraoperatively. The decision to perform initial laparotomy depended on hemodynamic status at presentation, and/or the presence of associated injuries requiring surgical exploration. Intraoperative pancreatic exploration was performed only for stable patients. Main duct disruption was searched for routinely. In case of persistent physiologic compromise (hemodynamic instability, hypothermia, acidosis, multiple transfusions...), abbreviated (''damage control'') laparotomy was performed.

Contrast-enhanced CT scan was performed routinely for all patients who were stable upon admission. In case of any doubt as to ductal injury, magnetic resonance cholangiopancreatography (MRCP) was performed within a few days. When non-operative management was decided, patients were closely followed in intensive care or surgical units and patients were treated as if they had acute pancreatitis. All injuries were categorized according to the American Association for Surgery Trauma (AAST) classification [7] (Table 1).

The following parameters were recorded: age, gender, mechanism of injury, associated intra- or extra-abdominal lesions, type of pancreatic lesion, AAST classification, associated duodenal injury, serum pancreatic enzyme levels at admission, diagnostic delay, referred management, treatment, morbidity and mortality.

The complications observed were bleeding, posttraumatic acute pancreatitis (AP), peritoneal inflammation, external pancreatic fistula (PF) and pancreatic pseudocyst (PPC). Complications were considered to be major when they required surgical or interventional treatment or intensive care, corresponding to Dindo-Clavien grades III or greater [8]. Posttraumatic AP was defined by plasma lipase greater than threefold normal values during three or more consecutive days in association with characteristic clinical symptoms. Peritoneal inflammation was defined as generalized guarding associated with systemic inflammatory response syndrome (SIRS). Postoperative PF was defined as drainage fluids with at least three times greater than normal serum amylase levels [9]. The minimal period of follow-up was six months.

Results

Forty-six cases of PT were seen between October 1989 and January 2012. Among these, 13 patients were referred from an outlying hospital: in 10 cases the diagnosis of PT had already been made and the patient was referred for management (5 patients) or for complications (5 patients); in three cases, the clinical picture was one of otherwise unexplained peritoneal signs leading to the delayed diagnosis of PT 3—12 days after the initial trauma.

Table 1 American Association for the Surgery of Trauma (AAST) classification of duodenal injuries [7].

Grade[a]	Hematoma	Laceration	Score AIS
I	Minor contusion without main ductal involvement	Superficial laceration without main ductal involvement	I
II	Major contusion without main ductal involvement or parenchymal loss	Major laceration without main ductal involvement or parenchymal loss	II
III		Distal transection of main pancreatic duct or parenchymal lesion with ductal involvement	III
IV		Proximal[b] transection of main pancreatic duct or parenchymal lesion with proximal main duct involvement[b]	IV
V		Massive destruction of the pancreatic head	V

AIS: Abbreviated Injury Scale.
[a] Increase one grade in case of multiple lesions.
[b] To the right of the superior mesenteric vessels.