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Original article

Outcomes of hemodynamically stable patients with pancreatic injury after blunt abdominal trauma

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ABSTRACT

Background: To date there is no systematical report about blunt pancreatic injury focused on hemodynamically stable patients. This study reports on our experience in this rare subgroup at a tertiary referral hospital.
Methods: A total of 58 adult patients were identified during a 10-year period and their clinical data were analyzed. Injury to the main pancreatic duct (MPD) was basically confirmed by pancreatography or surgical findings.
Results: MPD disruption was confirmed in 36 patients (62%) and was more frequent in the pancreatic neck and body. The median time from trauma to confirmation was 14 days [interquartile range (IQR) 3–23 days] including time from admission to confirmation of 10.5 days [IQR 3–20 days]. Patients with MPD injury showed higher injury severity score, more frequent pancreas-specific complications and longer hospital stays. The sensitivity and specificity of initial computed tomography (CT) for MPD injury were 63.9% (23/36) and 81.8% (18/22), respectively. The mortality rate was 7%, and all deaths were directly attributed to pancreatic injury. Complications occurred in 22 patients (37%) and 17 developed during hospitalization. Time from trauma to confirmation of MPD disruption (odds ratio 1.132; 95% confidence interval 1.021–1.255, $P = 0.019$) was the only independent factor associated with unfavorable events among patients with high-grade injury.
Conclusions: MPD injury was not infrequent in hemodynamically stable patients. Physicians were more responsible for the delay in diagnosis of MPD disruption, which was primarily associated with adverse outcomes. A rapid, multidisciplinary approach may lead to better outcomes in hemodynamically stable patients with blunt pancreatic injury.

1. Introduction

Blunt trauma of pancreas occurs infrequently because of organ's retroperitoneal location and has vague initial presentation frequently resulting in delayed treatment. In addition, higher frequency of failure in nonoperative management occurs, in comparison with analogous injury to other visceral organs, because of unrecognized pancreatic duct injuries [1,2]. Most deaths occur in the early period of injury, mainly due to hemorrhagic shock associated with combined vessel or solid organ injuries [3,4]. Without these critical injuries, management of pancreatic injury depends upon the presence or absence of main pancreatic duct (MPD) disruption, since trauma to the MPD can induce autodigestion of the adjacent tissue from exocrine secretion and lead to the associated risk of secondary infections or organ failures. However, identification of pancreatic duct injury is often difficult and commonly delayed in clinical practice, even using modern sophisticated computerized tomography (CT) scanners [5–7]. Endoscopic retrograde pancreatography (ERP) or magnetic resonance cholangiopancreatography (MRCP) can be used to better assess pancreatic duct injury, but are difficult to perform in the

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setting of acute trauma since ERP is invasive and requires considerable expertise while MRCP is relatively time consuming and interferes with resuscitation [8–12]. Hemodynamically stable patients with sufficient time and physical condition for meticulous diagnosis can be candidates.

Necessarily, management algorithm and outcomes are different between hemodynamically stable and unstable patients with pancreatic injury [13,14]. An unstable patient is more likely to undergo early laparotomy for damage control during which the pancreas can be evaluated. On the other hand, a stable patient can be initially managed conservatively and definite treatment decision can be made based on further diagnostic assessments. Regarding this nonoperative management, an effort to define the accurate status of MPD is an important issue for hemodynamically stable patients since delay in diagnosis of pancreatic duct injury consequentially results in delay in proper management and increased complications. To date there is no systematical report about blunt pancreatic injury focused on hemodynamically stable patients. We report our experience and assessed the clinical features, outcomes, and factors determining prognosis of hemodynamically stable patients with pancreatic injury after blunt abdominal trauma.

2. Methods

2.1. Subjects

The prospectively collected trauma registry database at the Asan Medical Center, a tertiary referral hospital in Seoul, South Korea, was reviewed to identify patients with pancreatic injuries between January 2000 and August 2010. Approval was obtained from the local institutional review board before data collection. Among the 3193 patients with abdominal trauma during the study period, 86 had pancreatic injury based on CT scan, ERP, MRCP or surgical findings. Patients with penetrating injury or overt hollow organ perforation and those with massive hemoperitoneum or shock within 24 h of admission due to major vessel or associated organ injury were excluded. We identified 58 adult patients with hemodynamically stable injury, including 29 with isolated pancreatic injury (Fig. 1). All included patients were required to maintain systolic blood pressure above 90 mmHg during the first 24 h after admission, without requiring transfusion, vasopressor or inotropic support.

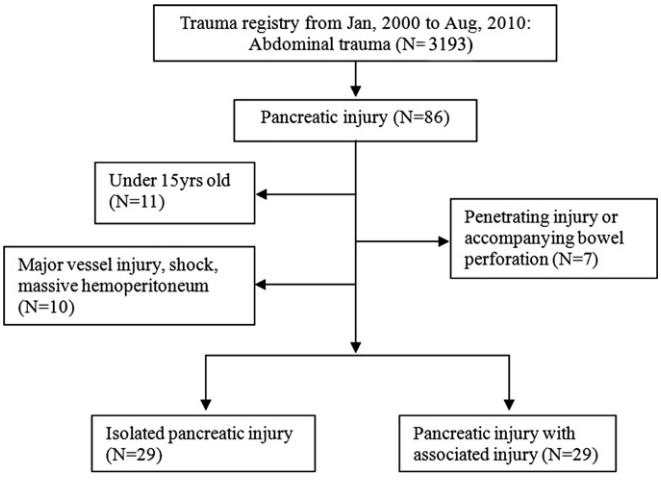

Fig. 1. Flow sheet of study participants.

2.2. Management strategy

Current management guideline for hemodynamically stable patients in our trauma center includes abdominal CT scanning for visualization of pancreas and evaluation of injury severity when pancreatic trauma is suspected. If high probability of MPD injury is suspected from CT scanning, surgery is scheduled immediately. Otherwise, patient is initially managed non-operatively and repetitive CT scans or ERP (or MRCP) may be arranged for further evaluation. The final treatment option is selected based on individual results. In selected cases, especially for proximal duct disruption, endotherapy can be performed.

2.3. Evaluation of parenchymal and MPD injury

All patients underwent an initial contrast-enhanced CT scan with a 16-channel multidetector-row CT scanner located next to the emergency room. Portal venous phase images were obtained by using a fixed 72-s delay after intravenous injection of iodinated contrast material and images were reconstructed with a section thickness of 3–5 mm. MPD injury was regarded as highly probable when CT showed deep lacerations (more than 50% of pancreatic thickness) or pancreatic transection.

MPD injury was basically verified by ERP, MRCP or surgical findings. ERP was performed upon request by the attending trauma surgeon and MRCP was performed in patients who had refused to undergo ERP. ERP results indicating MPD injury included extravasation of contrast medium from the duct or abrupt cut-off of the duct, suggesting duct obstruction whereas MRCP results indicating MPD injury included focal interruption of duct continuity and apparent communication with peripancreatic fluid collections (when present). MPD injury was also indicated surgically by identification of a transected pancreas or an exposed duct. Two patients required intraoperative pancreatography because ductal injury was grossly unclear. Seven patients who did not undergo ERP, MRCP or surgery were evaluated by serial CT and measurements of amylase concentration in percutaneous catheter drainage.

2.4. Clinical and statistical analysis

Laboratory findings, hospital management and outcome were determined by careful analysis of the in-hospital medical records. Post discharge follow-up data were collected by direct telephone interviews and a detailed review of all medical records to determine the occurrence of late complications. Pancreatic trauma was graded according to the system of the American Association for the Surgery of Trauma (AAST) [15]. Injury Severity Score (ISS) was used as an index of overall anatomical injury [16]. Pancreas-specific complications included pancreatic pseudocyst, fistula, symptomatic MPD stricture and peripancreatic abscess. Data analysis was performed using SPSS (version 12.0; SPSS Inc., Chicago, IL, USA) software. Numeric variables were summarized as median and interquartile range (IQR). Between-group comparisons were performed using the Mann-Whitney U test or Fisher's exact test, as appropriate. Factors including age, gender, mode of injury, location and degree of MPD disruption, ISS and time delay from trauma to confirmation of MPD disruption was used for univariate analysis. Parameters that showed an association with unfavorable events were entered into backward stepwise multivariable logistic regression analysis to identify independent predictors of the development of pancreas-specific complications or in-hospital deaths. All P values were two-sided, and a probability value of $P < 0.05$ was considered significant.