Surg Today (2009) 39:115–119
DOI 10.1007/s00595-008-3823-6

SURGERY TODAY

Management of Blunt Pancreatic Trauma in Children

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Abstract

Purpose. Blunt abdominal trauma is the major cause of abdominal injury in children. Because of the retroperitoneal location, insidious signs and symptoms and the lack of sensitivity with common imaging modalities often lead to difficulties in making an accurate diagnosis. The most common complication is the formation of a pancreatic fistula, pancreatitis and a pancreatic pseudocyst, which usually manifests within 3 or 4 weeks after injury.

Methods. The case records of seven children (4 male, 3 female) treated for blunt pancreatic injury in the department of pediatric surgery, University Hospital, Split were reviewed.

Results. The treatment modalities were selected according to the grade of the pancreatic injury, hemodynamic status and associated injuries. Because all of the patients were classified as grade I or II according to the American Association for the Surgery of Trauma (AAST) classification, a conservative treatment was selected for all seven patients. In four patients the conservative treatment resulted in the total regression of the clinical, biochemical and radiological signs within four weeks (AAST grade I). In the other three patients, pancreatic pseudocysts arose within 3 or 4 weeks after the injury (AAST grade II).

Conclusions. The status of the main pancreatic duct and the location of the pancreatic injury constitute the basis of the AAST scoring system. This scale should be used as a guide to selecting a surgical or conservative strategy. Based on these data, two factors appear to be the most important determinants of the treatment strategy for children with pancreatic injury: the grade of the pancreatic injury, which is determined according to the status of the main pancreatic duct and the clinical status of the patient.

Key words Pancreatic trauma · Pancreatic pseudocyst · American Association for the Surgery of Trauma classification

Introduction

Blunt abdominal trauma is the major cause of abdominal injury in children. Whereas injury to the pancreas is uncommon, the pancreas is the fourth most common solid organ injury, after the spleen, renal and hepatic trauma. In addition, it is the most common cause of acute pancreatitis in children. Pancreatic trauma occurs in only 3%–12% of blunt injuries and 1.1% of all patients with penetrating wounds.[1] Blunt traumas from an automobile injury, a bicycle handlebar, or deliberate blows have all been implicated as causes of injury to the pancreas and duodenum. Because of the retroperitoneal location, insidious signs and symptoms and the lack of sensitivity of the common imaging modalities often cause a difficulty in the diagnosis. The more frequently used modalities for diagnosis, including serum amylase and lipase levels, computed tomography and ultrasound are limited by their low sensitivity and specificity for acute injury when performed as part of the initial evaluation.[2,3] The most common complications are the formation of pancreatic fistulas, pancreatitis and pancreatic pseudocysts, which usually manifest within 3 or 4 weeks after injury. The size of the pseudocyst is an important factor in their management. Today, no other surgical treatment of pancreatic injury has become more frequent in hemodynamically stable patients with no other indication for surgery.[3] The grading of pancreatic injury severity has been proposed to help with their management and also in the comparison of outcomes.[4] The

Reprint requests to: Z. Pogorelić
Received: February 14, 2008 / Accepted: April 24, 2008

Table 1. Pancreatic organ injury scale of the American Association for the Surgery of Trauma

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

Data from Moore et al.[5]

pancreatic Organ Injury Score (OIS) of the American Association for the Surgery of Trauma (AAST; Table 1)[5] is used for this purpose.

Materials and Methods

The case records of seven children (4 male, 3 female) treated for blunt pancreatic injury in the department of pediatric surgery, University Hospital, Split from January 2003 through January 2007 were reviewed. The age range was 5–13 years (mean 8.3 years). During this 5-year study period, there were 189 patients admitted for blunt abdominal trauma and of these 7 involved pancreatic traumas (3.17%). In five patients (71.4%) the pancreatic injury arose because of a bicycle injury, and two patients (28.4%) had blunt trauma from an automobile injury. Considering the AAST classification, four patients (42.8%) were classified as Grade I, two of them had a minor contusion of the pancreas without duct injury, and one had a superficial laceration without duct injury. The other three patients (57.2%) were classified as Grade II; one of them had a major contusion without a duct injury and two had a major laceration without a duct injury or tissue loss. The pancreatic trauma was diagnosed using a combination of clinical, biochemical, and radiological examinations (computed tomography [CT], ultrasonography, endoscopic retrograde cholangiopancreatography). Pancreatitis was defined as persistent inflammation of the pancreas, manifested by continued hyperamylasemia (>100 U/l), hyperlipasemia (>60 U/l), and abdominal pain. Abdominal CT scanning and ultrasound were the most common diagnostic tools that were used. Five patients had initially mild symptoms (abdominal pain, hyperamylasemia, and hyperlipasemia), one had elevated serum lipase and amylase 2 days after the injury, and one had concomitant injuries (spleen laceration and cerebral commotion; Figs. 1 and 2). All seven patients were positive on the first abdominal CT scanning and three of the seven patients had positive ultrasound immediately after the injury. Four patients were negative on the first ultrasound examina-

Fig. 1. Clinical signs of pancreatic trauma

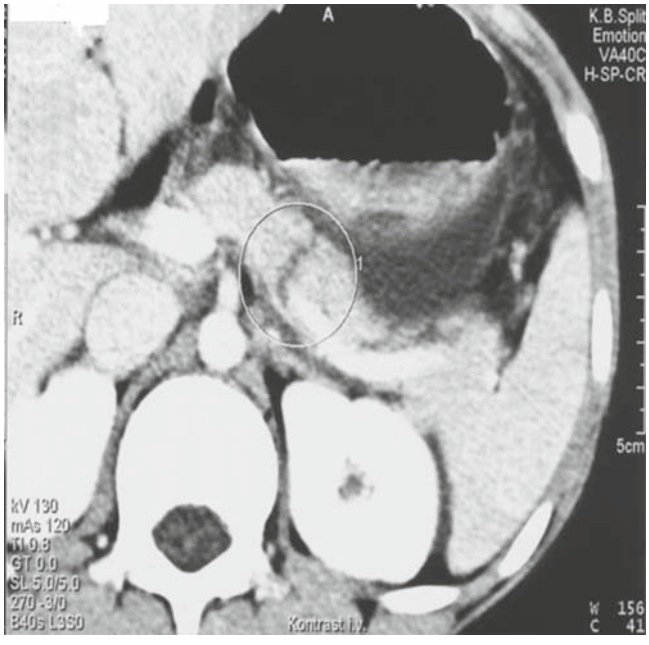

Fig. 2. Computed tomography examination of pancreatic trauma

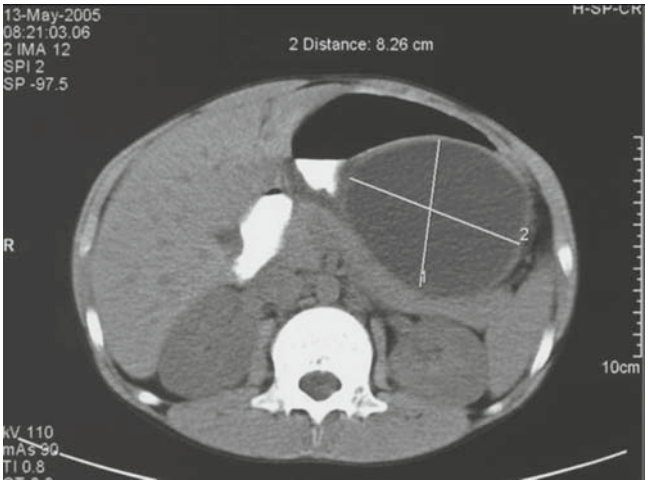

Fig. 3. Computed tomography examination of a pancreatic pseudocyst

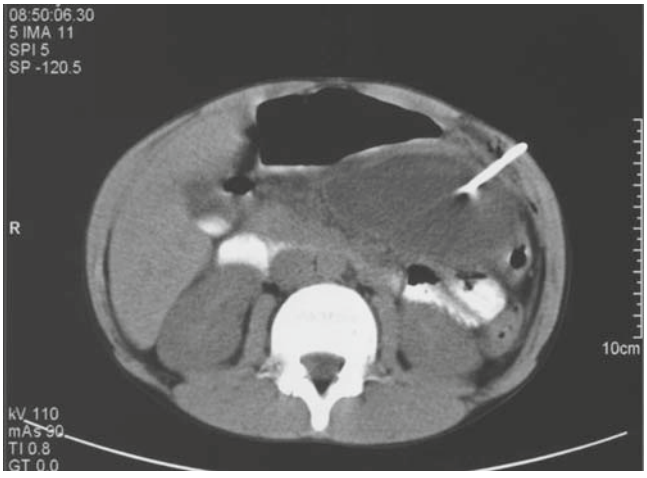

Fig. 4. Computed tomography of the controlled drainage of a pancreatic pseudocyst

tion, but became positive on another examination. In three patients graded as AAST Grade II, endoscopic retrograde pancreatography (ERP) was performed. Intact ducts, without extravasation of the contrast, were reported in two patients and the third patient had an unsuccessful ERP.

Results

The treatment modalities were selected according to the grade of the pancreatic injury, hemodynamic status, and associated injuries. Because all patients were classified as grade I or II according to the AAST classification, conservative treatment was selected for all seven patients, which included nasogastric decompression, careful fluid and electrolyte replacement, analgesics, and total parenteral nutrition for 3–6 weeks. In three patients, the conservative treatment resulted in total regression of the clinical, biochemical, and radiological signs within 4 weeks. Pancreatic pseudocysts arose in another three patients within 3 or 4 weeks after the injury (AAST grade II). Two of them had a gastric outlet obstruction due to huge pseudocysts (Fig. 3). Two of them had sepsis due to the central vein catheter and one had left pleural effusion. One of those patients had three small pseudocysts, which resolved spontaneously after 3 months of conservative treatment. This resulted in a successful long-term recovery, without recurrence of the cysts, after a follow-up of 36 months. The other two patients with huge pseudocysts (10×8 cm and $17 \times 9 \times 18$ cm) were treated by the administration of CT-assisted external percutaneous drainage. The first patient was drained percutaneously for 6 weeks and the other for 8 weeks (Fig. 4). After that period, CT imaging

Fig. 5. Computed tomography examination after total pseudocyst regression

showed total cyst regression in both patients (Fig. 5). These treatments proved successful, with no cyst recurrences in either of the patients during a follow-up period of 24 months.

Discussion

Blunt upper abdominal trauma is the primary mechanism of injury to the pancreas and duodenum. The pancreas is particularly vulnerable to blunt compression because it crosses the vertebral column at the junction of the body and tail. Despite an increase in high-speed motor vehicle crashes and urban violence, pancreatic injury in children remains relatively uncommon. The

diagnosis of such injuries is difficult because the assessment techniques lack specificity, although radiographs, blood analysis, and peritoneal lavage are helpful.[6,7] Ultrasonography and computed tomography with gastrointestinal contrast series are the preferred methods to delineate pancreatic injury. The clinical presentation of pancreatic trauma, especially blunt trauma, is often subtle because of the retroperitoneal location of the pancreas, frequently resulting in delayed treatment.[8,9] Prompt and accurate diagnosis, especially with respect to the major duct status and proper management, are needed to decrease the morbidity and mortality. The overall accuracy of dynamic CT scanning for diagnosis of pancreatic trauma was the lowest of all the abdominal organs.[10] When abdominal CT imaging shows a laceration of more than half of the parenchyma tissue, a major duct injury should be suspected and surgery should be scheduled.[8,11,12] Therefore, it is necessary to determine the status of the main pancreatic duct in defining the injury grade. Previous authors have documented a correlation between the ductal status and the outcome using a scoring system (AAST). Patients with duct transection and proximal crush injuries who were managed with resection had increased morbidity in comparison to the less severely injured patients who were managed with drainage alone. These authors concluded the ductal status to be an important predictor of outcome in pancreatic trauma and essential for treatment decisions.[13] The AAST classification for the pancreas takes into account the status of the main pancreatic duct and the location of the pancreatic injury.[4] Pancreas-related complications are reported to occur in 11%–62% of patients after a traumatic pancreatic injury, with an average morbidity rate of 36.6%.[14] The most commonly reported complications are pseudocysts, fistulas, abscesses, and pancreatitis. In the current series, 50% of the patients had one pancreas-related complication (pseudocyst or pancreatitis). The most common pancreatic complication in the current series was pseudocysts, which is not consistent with other reports. Pancreatic fistulas are the most common reported complications.[1,4,14]

There have been several studies warning of serious, life-threatening complications related to the conservative non-interventional treatment of pancreatic pseudocysts. The current experience of conservative treatment of pancreatic pseudocysts in patients over a study period of 5 years has been similar to the results reported in the literature by Vitas and Sarr[15] and Cheruvu et al.[16] The only difference from the Vitas and Sarr study was the management of an asymptomatic pancreatic pseudocyst persisting over 6 weeks, which in the present study was 8 weeks.

Conclusion

The status of the main pancreatic duct and location of the pancreatic injury constitute the basis of the AAST scoring system. This scale should be used as a guide to selecting either a surgical or conservative treatment strategy. Based on these data, two factors appear to be the most important determinants of the treatment strategy for children with pancreatic injury: the grade of the pancreatic injury, which is determined by the status of the main pancreatic duct, and the clinical status of the patient. Despite dramatic advances in the field of radiology and the current knowledge of the natural history of pancreatic pseudocysts, it is still not possible to predict complications in individual patients. Therefore, a more conservative approach is employed and the results indicate that conservative treatment can be successful in a selected group of patients. The size or persistence of pancreatic pseudocysts is not considered to be a prime indication for surgical intervention. Many patients with pancreatic pseudocysts can be managed conservatively if the presenting symptoms are well controlled.

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