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Pediatric pancreatic trauma: predictors of nonoperative management failure and associated outcomes

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Abstract

Background: Nonoperative management (NOM) is an accepted treatment of pediatric solid organ injuries and is typically successful. Blunt pancreatic trauma tends to require operative intervention more frequently. We sought to identify predictors of failure of NOM and compare the outcome of operative management against NOM.

Methods: A retrospective analysis was performed from January 1993 to December 2002 of all children with blunt pancreatic injuries from the trauma registries of 7 designated level 1 pediatric trauma centers. Failure of NOM was defined as the need for intraabdominal operative intervention. Injuries were graded I to V, and ductal injury was defined as grades III to V. Parameters included mechanism of injury, injury severity score (ISS), organ grade, Glasgow Coma Scale score, and outcome. Data were analyzed by Fisher exact test and Mann-Whitney U test, with mean values $\pm$ SD and significance of $P < .05$.

Results: Pancreatic injuries were present in 173 (9.2%) of 1823 patients. Of these, 43 (26.0% [43/173]) required an operation. Valid morbidity data was obtained in 118 of 173 patients. ISS was significantly higher in all patients treated operatively. Patients with an injury of grade III to V failed NOM more frequently than all patients with pancreatic injury (P =.0169). Length of stay was longer, and the incidence of pseudocysts, drainage procedures, and pancreatitis was higher in NOM patients, although not significant.

Conclusions: Patients with pancreatic injuries had a NOM failure rate of 26.0%. ISS and injury grades III to V were predictors of NOM failure. Patients with pancreatic ductal injury require more aggressive management.

Worldwide, trauma is the leading cause of death and disability in children, with most owing to blunt mechanisms. Blunt abdominal trauma often leads to solid organ injury, primarily to the spleen, liver, and kidneys. Injury to the

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Table 1 Participating institutions: Level I pediatric trauma centers

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Columbus Children's Hospital, Ohio State University, Columbus, OH
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pancreas is the fourth most common, occurring in 3% to 12% of patients with blunt abdominal trauma [1]. Nonoperative management (NOM) has become the standard of care in most solid organ injuries, including pancreatic trauma [2-4]. However, treatment of major ductal disruption is controversial. Few reports describe the clinical outcome of operative management of pancreatic injuries, compared to NOM.

1. Methods

A multiinstitutional retrospective case review was conducted from January 1993 to December 2002 of all patients with blunt pancreatic injuries from the trauma registries of 7 designated level I pediatric trauma centers. (Table 1) Failure of nonoperative management was defined as the need for an intraabdominal operative intervention. Injuries were graded I to V according to Organ Injury Scaling of the American Association for the Surgery of Trauma. Ductal Injuries were defined as grades III to V.

Data were collected for age, sex, mechanism of injury, associated injuries, Glasgow Coma Scale and Injury Severity Score (ISS). Morbidity factors obtained were hospital length of stay (LOS), length of intensive care unit (ICU) stay, number of days requiring total parenteral nutrition (TPN), development of pancreatitis, and formation of pancreatic fistulas or pseudocysts. Operative information included time to operative intervention; cause for intervention; and need for invasive procedures including external drainage, endoscopic retrograde cholangiopancreatography (ERCP), or internal drainage procedures.

Data were analyzed by one-way Fisher exact test and Mann-Whitney U test with mean values ± SD. Significance was defined as $P \leq .05$. Approval was obtained by the institutional review board of each institution.

2. Results

There were 1823 patients identified with blunt abdominal trauma, 173 with injury to the pancreas (9.5%). Forty-three patients with pancreatic injury required operative intervention (26.0%). Ductal injuries were present in 53, with 23 requiring an operation (43.4%). The mean age of patients treated nonoperatively was 7.84 years (range, 1 month to 17 years) and was 7.56 years (range, 1-17 years) in patients requiring an operation. Boys accounted for 63.3% of operative patients and 62.2% of those nonoperatively managed. Mechanism of injury in all patients was bicycle in 21.1%, motor vehicle collision in 28.9%, and 31.1% and 22.2% of patients with a ductal injury, respectively. Mean ISS for all patients with pancreatic injury was not significantly different for those treated with NOM (15.5 ± 13.7) and those managed operatively, (25.4 ± 15.5) (P = .917). However, those patients with a ductal injury who were treated operatively had a significantly higher ISS than those treated nonoperatively (24.0 ± 12.6 vs 15.8 ± 11.0, P = .025), but no association was seen with a specific organ or organ system.

Indications for operative intervention included free intraperitoneal air in 4 children (8.9%), shock or refractory hypotension in 12 (26.7%), and 1 for other cause (2.2%). The pancreas was cited as the cause for operative intervention of 57.8% of all patients and 82.6% of patients with ductal injury.

Table 2 Data results: Comparison of patients treated nonoperatively and operatively. Patients with ductal injuries (Grade III-V) were also isolated and compared

	All pancreatic injuries			Ductal injuries		
	NOM (n = 128)	Failure (n = 45)	P	NOM (n = 30)	Failure (n = 23)	P
Age (y)	7.7 ± 4.6	7.6 ± 3.9		9.2 ± 4.1	6.9 ± 3.7	
Sex (% male)	63.3%	63.2%				
ISS	15 ± 14	27 ± 18	.917	16 ± 11	29 ± 16	.025
GCS	13 ± 4	10 ± 6	.916	14 ± 3	11 ± 5	.884
Bicycle	21.8%	32.6%		40%	30%	
MVC	26.6%	20.9%		16.7%	17.4%	
LOS (d)	9.6 ± 19.8	12.1 ± 12.0	.675	13.8 ± 10.1	9.7 ± 8.4	.668
ICU LOS (d)	4.17 ± 19.5	3.58 ± 5.0	.675	1.31 ± 2.1	1.60 ± 2.5	.139