

# Pancreatic Trauma in Children and Its Early Diagnosis

Subjects: **Pediatrics**

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Blunt pancreatic injury (BPI) is relatively uncommon in children, and is associated with relatively high morbidity and mortality, especially if diagnosis is delayed. Blunt trauma represents the primary cause of pancreatic injury in the pediatric population. Pancreatic trauma in children remains a major challenge for emergency physicians as well as general and pediatric surgeons. Its rate of occurrence is 0.2–2%, and it contributes to 0.3% of all childhood injuries.

pancreatic trauma

children

diagnosis

treatment

imaging

ultrasonography (US)

## 1. Blunt Pancreatic Trauma in Children—General

The mortality rate associated with BPI remains low, ranging between 4.7–5.3%, with most fatalities linked to concurrent injuries. While there are established protocols for diagnosing and surgically managing pancreatic injuries in adults, the approaches to handling high-grade BPI involving the major pancreatic duct in children remain a subject of debate. In 2022, The Western Trauma Association (WTA) published clinical practice guidelines on pancreatic trauma in the adult population <sup>[1]</sup>. The WTA evaluation and management algorithm applies to the diagnosis and management of adult patients with BPI. Since delayed diagnoses can result in increased morbidity and mortality of up to 62% of patients <sup>[1]</sup>, the WTA Committee recommends early performance of CT as part of the initial trauma workup. Imaging findings of transection of the pancreas, disruption of the MPD, or of a large amount of peripancreatic fluid mandate operative exploration. When imaging findings are not sufficiently clear-cut, other investigations may be useful, and they include serial abdominal examinations, serum amylase and lipase enzyme levels, MRCP, endoscopic retrograde cholangiopancreatography (ERCP), and transduodenal pancreatography. The major determinant in management decisions in adults with BPI is the presence or absence of injury to the main pancreatic duct (MPD). Since low-grade pancreatic trauma (Grades I and II) are contusions and lacerations that spare the pancreatic duct, they are mostly managed conservatively. In adult patients with low-grade injuries who have indications for laparotomy, drain placement to control the leakage is recommended only if there is pancreatic capsule disruption. In accord with the WTA algorithm, most adults with “high-grade” pancreatic injuries (Grades III = MPD injury to the left of the superior mesenteric vein [SMV], Grade IV = MPD injuries to the right of the SMV, and Grade V = involving disruption of the head of the pancreas) require definitive surgical treatment to avoid duct-related complications that carry a morbidity of up to 60% <sup>[1]</sup>.

There are no clear-cut guidelines for the initial management of BPI in children among whom the diagnosis, classification, and treatment remains a challenge. Non-operative management of ISO injuries in stable children is also pertinent to the management of BPI. The BPI we report in a six-year-old girl, which manifested with unclear

clinical presentations of an MPD injury, resulted in delayed diagnosis and surgical intervention. During her operation, spleen-sparing surgery was not feasible, and she underwent a distal pancreatectomy and splenectomy. Postoperatively, she developed a pancreatic fistula that was treated by external catheter drainage and required total parenteral nutrition (TPN) for two weeks, and repeat administration of Sandostatin. The percutaneous pancreatic fistula drain was removed one month later, and the fistula closed spontaneously. The child’s outcome was ultimately favorable, with no recurrence of symptoms during the 12-month follow-up period.

## 2. Early Diagnosis—Pitfalls

Early diagnosis of pancreatic trauma is key to optimal management, but it remains a challenge even with more advanced imaging modalities. Traumatic BPIs are associated with high morbidity and mortality rates in both adults and children, making it crucial to minimize time for diagnosis and appropriate intervention. Due to its protected retroperitoneal location, injuries of the pancreas are uncommon in children and are often misinterpreted. The symptoms and physical signs of BPI in children may be nonspecific or even absent, and are frequently overlooked for not being readily apparent on initial examination. Additionally, abdominal symptoms such as abdominal pain, nausea, and vomiting do not always correlate with trauma severity.

**Table 1** summarizes a current (the past 5 years) literature review of publications on the early diagnostic tools during initial management in children with BPI.

**Table 1.** The summary of previous literature regarding early diagnostics of pancreatic injury in children.

Authors/ Year	Number Patients (Mean Age/y)	Serum Amylase (No Pts/PV%)	Serum Lipase (No Pts/PV%)	US (No Pts/PV%)	CT (No Pts/PV%)	MRI (No Pts/PV%)	ERCP (No Pts/PV%)
Zhang et al. (2023) <a href="#">[2]</a>	51 (7.3)	LGI—81% HGI—100%	LGI—53% HGI—100%	50 68%	45 77%	11 100%	0
Catellani et al. (2023) <a href="#">[3]</a>	10 ad (28.2) 20 chld (10.5)	10 49%	N/A	N/A	10 90%	N/A 100%	N/A 100%
Gong et al. (2023) <a href="#">[4]</a>	31 (11.7)	N/A	N/A	16 N/A	29 61%	N/A	15 86%
Everson et al. (2023) <a href="#">[5]</a>	19 (13)	N/A	19 74%	1 N/A	19 79%	3 N/A	0
Goldberg- Murow et al. (2021) <a href="#">[6]</a>	11 (9)	11 60%	N/A	FAST 11/ NA	11 90%	1 100%	0

Authors/ Year	Number Patients (Mean Age/y)	Serum Amylase (No Pts/PV%)	Serum Lipase (No Pts/PV%)	US (No Pts/PV%)	CT (No Pts/PV%)	MRI (No Pts/PV%)	ERCP (No Pts/PV%)
Ibrahim et al. (2021) <a href="#">[7]</a>	28 (7.14)	N/A	N/A	N/A	27/ 93%	10 100%	0
Rosenfeld et al. (2018) <a href="#">[8]</a>	21 (7.8)	N/A	N/A	N/A	21 38%	NA 62%	0
Wiik-Larsen et al. (2020) <a href="#">[9]</a>	10 (8.3)	9 67%	N/A	N/A	9 67%	3 100%	0

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2. Zhang, T.; Luo, W.; Wang, W.; Long, Q.; Ma, M. Blunt pancreatic injury in children: Lessons from 11-year experience in a pediatric center. *Asian J. Surg.* 2023, **47**, 269–273.

3. Catellani, B.; Garacciolo, D.; Magistri, P.; Guidetti, C.; Menduni, N.; Yu, H.; Odorizzi, R.; Guerrini, G.P.; Ballarin, R.; Di Sandro, S.; et al. Laparoscopic management of blunt pancreatic trauma in adults and pediatric patients: A systematic review. *BioMed Res Int.* 2023, **2023**, 9296570. Available in emergency rooms, and the imaging study is routinely part of the initial assessment of children with blunt abdominal trauma. US may serve as a good rapid screening procedure, particularly in patients too unstable to undergo an abdominal CT scan. However, US is limited by its low sensitivity and specificity when determining acute pancreatic injuries. The reported sensitivities for the detection of pancreatic injuries by US ranged from 27% to 96% [\[10\]](#).

4. Gong, S.H.; An, S.; Shin, I.S.; Jung, P.Y. Usefulness of endoscopic retrograde cholangiopancreatography in the diagnosis and treatment of traumatic pancreatic injury in children. *Diagnostics* 2023, **13**, 2044.

5. Everson, E.; Buschel, H.; Carroll, J.; Palamuthusingam, P. Paediatric pancreatic trauma in North Queensland: A 10-year retrospective review. *BMC Pediatr.* 2023, **23**, 88–95.

6. Zhang et al. reported a 68% accuracy rate for detecting pancreatic injury in 51 children by early US (Table 1). Ultrasound imaging, however, cannot provide valuable information regarding the size, location, and characteristics of BPis [\[8\]](#).

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