

Case Report

Three cases of paediatric pancreatic injury involving the main pancreatic duct

Takeshi Omura^{a,b,*}, Kenta Matsushita^a, Miharu Arase^c, Toshiyuki Yagi^a

^a Department of Surgery, Tokushima Prefectural Central Hospital, Kuramotocho, 1-10-3, Tokushima-city, Tokushima, Japan

^b Emergency Surgery and Trauma Center, Tokushima Prefectural Central Hospital, Kuramotocho, 1-10-3, Tokushima-city, Tokushima, Japan

^c Department of Emergency Medicine, Tokushima Prefectural Central Hospital, Kuramotocho, 1-10-3, Tokushima-city, Tokushima, Japan

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ABSTRACT

We report on 3 patients aged 9–12 years with pancreatic injury involving the main pancreatic duct. None of them presented with shock. They were initially transported to secondary emergency care facilities, leading to delays in diagnosis and treatment. Two patients underwent organ (spleen and pancreatic tail)-preserving surgery and one underwent non-operative management (NOM). They recovered and were discharged without major complications. Although the indications for NOM for paediatric pancreatic injury might increase in the future, we believe that it is preferable for patients to be transferred to the tertiary care hospital from the very beginning to receive appropriate diagnosis and treatment.

1. Introduction

The pancreas is located in the retroperitoneum; thus, it is relatively rare to be included in the abdominal injuries. However, because it is surrounded by numerous blood vessels and organs, pancreatic injury is often associated with bleeding complications (e.g. shock). Additionally, the pancreas contains alkaline digestive enzymes that cause autolysis, which is associated with a high rate of perioperative complications and mortality.

Meanwhile, minor injury accounts for 75% of all paediatric abdominal injuries. As these are often isolated injuries of the pancreas, they tend to be overlooked.

2. Frequency of paediatric trauma at our institution

We investigated 414 patients aged 0–17 years who were admitted to our hospital for trauma from January 2013 through March 2018 (Table 1). 28 patients of them showed an Abbreviated Injury Scale score of at least 3 in the thoracoabdominal or pelvic regions, and 12 patients of those underwent surgery or interventional radiology. Of these 12 patients, 5 had pancreaticoduodenal trauma.

* Corresponding author. Department of Surgery, Tokushima Prefectural Central Hospital, Kuramotocho, 1-10-3, Tokushima-city, Tokushima, Japan.

E-mail address: omu@tph.gr.jp (T. Omura).

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Table 1

Frequency of paediatric trauma cases at our hospital (patients aged 0–17 hospitalised for trauma during the 4 years and 3 months from January 2013 through March 2018).

Hospitalised for paediatric trauma	414	(11%)
Hospitalisation in the surgical department	62	15%
Thoracoabdominal or pelvic injury (AIS > 3)	28	6.8%
Therapeutic intervention	12	2.9%
Surgery	5	1.2%
Mortality	1	0.2%

AIS, Abbreviated Injury Scale.

3. Case reports

3.1. Case 1: A 12-year-old boy (height: 155 cm, weight: 40 kg)

Cause of injury: While riding a bicycle, he was struck by a passenger vehicle traveling at 30–40 km/h.

After emergency transfer to a nearby hospital, no significant abnormalities were found on physical examination or computed tomography (CT) imaging; thus, the patient returned home. However, because abdominal pain and fever persisted. Pancreatic injury was found on CT reassessment, prompting the hospital admission. He developed fever (38 °C) and peritonitis on day 2 from the admission, and was referred to our hospital.

He had no remarkable medical history.

Findings: No abdominal bruising was found, but the affected area had tenderness and rebound tenderness.

A serum amylase level on arrival was 613 IU/l. According to the plain CT scan (Fig. 1, upper left) taken at the previous hospital, the pancreatic injury and surrounding inflammation became evident on day 2 after injury.

At our hospital, we decided to perform an emergency laparotomy. A hematoma had formed on the surface of the pancreas, and three-quarters of the pancreatic tail had ruptured (Fig. 1, upper right). Spleen-preserving distal pancreatectomy was performed.

Water intake was allowed on day 1 and food intake on day 3 postoperatively. He was hospitalised for 15 days.

Before discharge, CT revealed a pancreatic pseudocyst, which resolved spontaneously during outpatient follow-up.

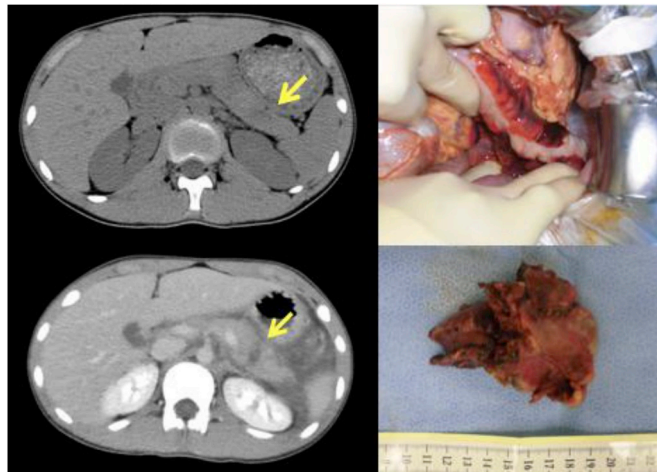


Fig. 1. Upper left: Injury to the pancreatic tail was found in the plain computed tomography (CT) scan taken at the previous hospital. Lower left: Contrast-enhanced CT scan taken at our hospital showing clear injury, with prominent fluid retention around the pancreas. Upper right: Photograph taken during surgery. A hematoma had formed on the surface of the pancreas. Lower right: Resected specimen. About three-fourths had ruptured at the tale of the pancreas.

3.2. Case 2: A 9-year-old girl (height: 135 cm, weight: 34 kg)

Cause of injury: The patient's parents reported that she fell down about 5 stair steps and struck her abdomen. However, the accident was not witnessed and abuse was suspected.

After the injury, the patient had vomited. She was examined at a nearby hospital and sent home for observation. The following day, she developed fever and abdominal pain; thus, she was examined at a different hospital. Because her inflammatory response was increasing and pancreatic injury was suspected from plain CT imaging, she was referred to our hospital on day 2 after the injury.

Medical history: Skin graft for facial burn.

Findings: There were no clear signs of trauma to the abdomen. The abdomen was flat and slightly firm on palpation. There was severe tenderness and rebound tenderness over the entire abdomen.

A serum amylase level was 1760 IU/l. CT (Fig. 2, upper left) revealed a hematoma at the pancreatic head. The diagnosis was pancreatic injury.

An emergency endoscopic retrograde cholangiopancreatography was performed, which revealed a rupture at the main pancreatic duct (MPD), making it impossible to advance a wire beyond the rupture point (Fig. 2, upper right).

An emergency laparotomy was performed. The injury was located at the pancreatic head, and the Letton-Wilson procedure was performed with the aim of preserving the pancreatic tail (Fig. 2, bottom).

Postoperatively, oral intake was allowed on day 3. The hospitalisation period was 40 days, partly for child protection reasons.

Although the patient developed cholecystitis during hospitalisation, it resolved with antibiotic administration.

After discharge, she had two more short hospitalisations for mild pancreatitis.

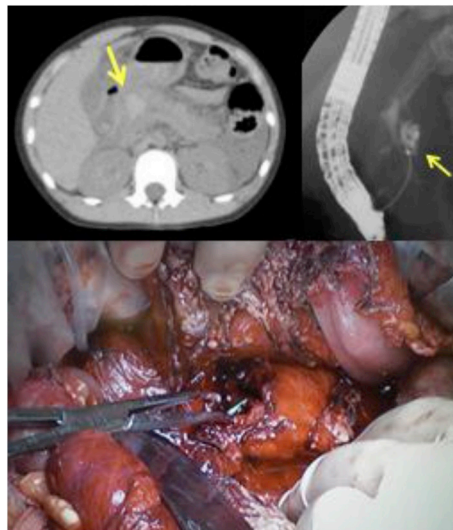


Fig. 2. Upper left: Plain computed tomography (CT) scan showing the formation of a hematoma at the pancreatic head, as well as inflammatory signs around the pancreas. Upper right: Endoscopic retrograde pancreatography image showing rupture of the main pancreatic duct. A wire could not be advanced to the tail side of the duct. Bottom: Photograph taken during surgery. There is rupture of the pancreatic head, and exposure of the catheter inserted endoscopically.

3.3. Case 3: an 11-year-old boy (height: 134 cm; weight: 32 kg)

Cause of injury: A friend struck the patient in the abdomen with the end of a rake. The patient subsequently experienced abdominal pain and had vomited 5 times during the night. Because the pain persisted, he was examined the following day at a nearby hospital. An abdominal CT scan revealed an injury to the pancreatic tail (Fig. 3, upper), and he was transported to our hospital.

Medical history: Asthma and tonsillitis.

Findings: The abdomen was flat and soft without spontaneous pain. There was tenderness in the upper left quadrant, but there was no rebound tenderness or abdominal guarding.

A serum amylase level was 616 IU/l. Although endoscopic retrograde cholangiopancreatography revealed a rupture at the MPD (Fig. 3, lower), abdominal symptoms were stable and CT showed almost no peripancreatic fluid collection. An endoscopic naso pancreatic drainage tube was placed, and a non-operative management (NOM) strategy was decided upon.

Water intake was allowed on day 1 after treatment and food intake on day 8. The hospitalisation period was 23 days.

There were no relevant complications.

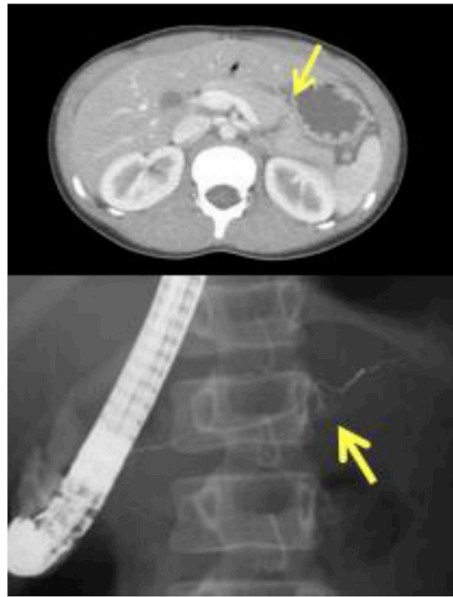


Fig. 3. Top: Pancreatic injury was found. Bottom: There is injury to the wall of the main pancreatic duct, and leakage of the contrast agent is noted.

4. Complications

In case 1, we found a Clavien-Dindo grade I pancreatic fistula. In case 2, a grade I pancreatic fistula and grade II cholecystitis was found. In case 3, pancreatitis was caused by endoscopic retrograde pancreatography. Nevertheless, the problems resolved in all cases, and all patients were discharged from the hospital.

5. Discussion

None of these three patients experienced shock. In Japan, it is possible that even paediatric patients with isolated injuries to the abdomen have a relatively good general condition after injury, and thus sent to secondary emergency facilities. All 3 cases were referred from other institutions, and 1–2 days had elapsed since the injury in each case. All diagnoses in the referring hospitals were based on plain CT, which is not routinely employed for the diagnosis of intraabdominal injury (IAI) because it lack sensitivity and specificity. Even though all 3 patients got MPD injury, taking into consideration the patients' age, the treatment performed at our hospital for the 3 cases was spleen-preserving surgery, pancreatic tail-preserving surgery, and NOM, respectively.

Unlike penetrating trauma, which is usually apparent upon inspection, blunt abdominal trauma must be suspected from historical information, particularly the mechanism of injury, and careful physical examination. Physical signs that indicate an increased risk of IAI include each of the following: ecchymoses (particularly of the umbilical or flank regions), such as in handlebar injuries, abrasions, tire-track marks, seat belt sign in restrained passengers from motor vehicle collisions, abdominal tenderness, abdominal distension, peritoneal irritation (eg, abdominal wall rigidity, rebound, guarding, or pain in the left shoulder induced by palpation of the left upper quadrant [Kehr's sign]), and absent bowel sounds indicating a prolonged ileus (greater than 4 h) [1]. Abdominal CT is associated with significant radiation exposure, and this imaging risk must be balanced with the likelihood of finding a clinically important IAI. A multicenter, prospective observational study of 12,044 children with blunt torso trauma has derived clinical features that predict a very low risk of IAI requiring intervention (eg, laparotomy, angiographic embolization, blood transfusion, or hospitalisation for two nights or longer) as follows: Glasgow coma scale ≥ 14 , no evidence of abdominal wall trauma or seat belt sign, no abdominal tenderness, no complaints of abdominal pain, no vomiting, no thoracic wall trauma, and no decreased breath sounds [2]. Implementation of this rule, if validated, has significant potential to reduce the number of abdominal and pelvic CTs in children.

According to the Eastern Association for the Surgery of Trauma guidelines, resection is recommended for grade III/IV pancreatic injuries in adults [3]; however, there is no mention of paediatric pancreatic injuries. Regarding the Letton-Wilson procedure, there is only one case series compared with DP. It was concluded Letton-Wilson procedure seems otherwise equivalent to DP and preserves significant pancreatic glandular tissue and spleen [4]. Although, in recent years, reports have been increasingly supporting NOM for paediatric pancreatic injury [5,6], therapeutic protocols are not yet established.

All 3 patients were initially transported to a secondary emergency facility, and diagnosis and treatment were delayed. Delayed surgery owing to delayed diagnosis is associated with increased complication and mortality rates [7]. Caution is needed as pancreatic injuries can require surgical treatment despite appearing minor, and organ preservation should be considered depending on the circumstances during surgery. However, because pancreatic surgery is often accompanied by complications, it is ideally performed at facilities experienced in the procedure.

To reduce delays in diagnosis, avoid excess x-ray exposure, and perform minimally invasive treatment, we believe that it is appropriate for paediatric abdominal trauma to be initially addressed at trauma centres or children's hospitals familiar with paediatric trauma.

6. Conclusion

We encountered 3 cases of paediatric pancreatic injury involving the MPD. Organ-preserving surgery was performed in 2 cases, whereas NOM treatment was possible in 1 case. To provide appropriate care from an early stage, it is preferable for patients with paediatric abdominal trauma to be immediately transported to trauma centres.

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