

# Short Hospitalization after Early Intervention in Managing Grade III Pancreatic Injuries in Children: A Possible New Trend

Ayman H. Al-Jazaeri

Division of Pediatric Surgery,  
Department of Surgery,  
College of Medicine, King Saud  
University, Riyadh, Saudi Arabia

**Address for correspondence:**

Dr. Ayman Aljazaeri,  
Department of Surgery, King  
Saud University Riyadh 11472,  
Saudi Arabia, PO Box 7805i.  
E-mail: aaljazaeri@ksu.edu.sa

## ABSTRACT

The presence of ductal disruption in pancreatic trauma is a major indicator of severity leading to higher morbidities and prolonged hospital stay. However, the adoption of early interventional approach in selected cases of documented grade III pancreatic trauma could result in shorter hospitalization and early recovery. We are describing our approach of early presentation-tailored interventions in managing two consecutive children diagnosed with grade III pancreatic injuries, which constitute the two main ends of the presentations' spectrum. For the early presenter a spleen preserving distal pancreatectomy was performed, while for the late presenter with large symptomatic pseudocyst endoscopic drainage was attempted. Both early and late presenting children had quick and uneventful recoveries leading to 5 and 6 days of hospitalization, respectively. Both cases continued to be asymptomatic at 4 and 12 months post procedure. In the pseudocyst case, the gastro-cystostomy stents were removed after 10 weeks, and 2.5 months later a completely healed pancreas was demonstrated by magnetic resonance cholangio-pancreatography. Unlike other abdominal solid organ injuries in children, adopting early presentation-tailored intervention can be associated with quicker recovery and short hospitalization for grade III pancreatic injuries. While the series is still small, achieving such remarkable outcomes in two consecutive cases is possible and could set a new trend in managing these injuries in children.

**Key Words:** Endoscopic drainage, grade III, pancreatectomy, pancreatic injury, pancreatic trauma

Received 29.01.2011, Accepted 11.07.2011

**How to cite this article:** Al-Jazaeri AH. Short hospitalization after early intervention in managing grade III pancreatic injuries in children: A possible new trend. Saudi J Gastroenterol 2011;17:363-6.

Compared to other solid organs, pancreatic injury is uncommon and constitutes less than 12% of all childhood blunt abdominal traumas.<sup>[1,2]</sup> While it is less frequent, ductal disruption which occur in only 0.12% to 0.3% of all pediatric traumas<sup>[3,4]</sup> is associated with significant morbidities. According to Organ Injury Scaling Committee of the American Association for the Surgery of Trauma,<sup>[5]</sup> the presence of ductal injury is a major determinant of the trauma severity leading to injury upscale to grade III or IV. Grade III is classified as ductal disruption distal to the superior mesenteric vein. In these injuries, leaking pancreatic secretions cause significant intra-abdominal inflammatory response that manifests as severe pain, intolerance to feed, and subsequent pseudocyst formation. Based on the recent advances in understanding of this

type of injury,<sup>[3]</sup> patients' presentations to specialized trauma services can follow two main clinical patterns. Early presenters constitute the majority who present within few days with evidence of ductal injury on computed tomographic (CT) scan. The current treatment options for this group includes nonoperative management (NOM), early intervention in the form of acute endoscopic retrograde cholangiopancreatography (ERCP) and possible pancreatic duct stenting, or early spleen-preserving distal pancreatectomy (SPDP). In the second group are the late presenters of ductal injury who typically present with symptomatic pseudocysts as a result of either missed injury or more frequently as a complication of expectant management of type III injuries.<sup>[1-3]</sup>

Regardless of the elected management, pancreatic injuries with ductal disruption have been always associated with prolonged length of hospitalization (LOH), frequent interventions and higher morbidities.<sup>[1,2,6]</sup> We are discussing the different approaches in two consecutive cases representing the early and late groups of grade III pancreatic injuries. These approaches have successfully minimized the potential morbidities, and significantly shortened the LOH.

Access this article online	
	<b>Quick Response Code:</b>
	<b>Website:</b> www.saudijgastro.com
	<b>PubMed ID:</b> 21912067
<b>DOI:</b> 10.4103/1319-3767.84500	

## PATIENTS AND METHODS

### Case 1

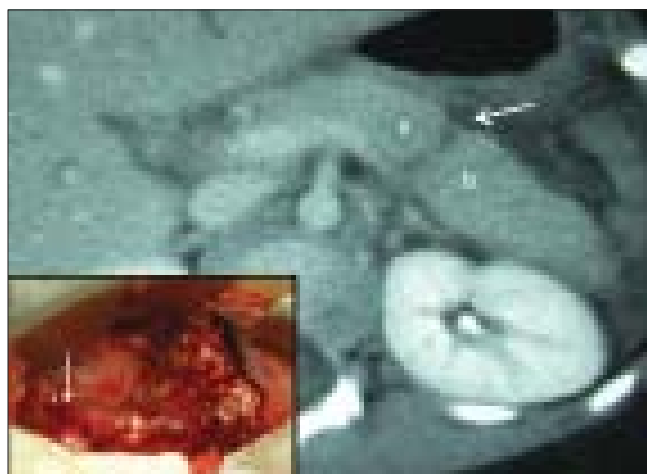
An 8-year-old girl transferred from a regional hospital with suspected pancreatic injury and signs of generalized peritonitis. Two days earlier an old TV set fell directly on her abdomen and since has been complaining from worsening abdominal pain. After resuscitation her initial amylase level was 2,035 IU/L and a contrast enhanced CT-abdomen showed an isolated grade III pancreatic injury with moderate amount of free fluids in lesser sac [Figure 1]. Based on the CT findings of large amount of free fluid and the clinical picture, we decided that SPDP was the best management choice. Intraoperatively, a complete pancreatic transection was identified left to superior mesenteric vein [Figure 1] consequently, the planned SPDP was performed. Postoperatively, the patient had smooth recovery featured by the resolution of pain, early resumption of oral feed on the third day, and discharged home by the fifth day. The total time on TPN was 3 days. During her second visit two weeks later, she was pain-free, tolerating full diet and two years later she continued to be asymptomatic and maintained the normal weight for her age.

### Case 2

A 3-year-old boy presented with 3 weeks history of abdominal pain, progressive intolerance to oral feeds, and persistent vomiting, which became worse during the last 4 days. Apparently, this started with a blow to his upper abdomen while playing with his sibling. His CT abdomen showed grade III pancreas injury and a large pseudocyst compressing the stomach in addition to a picture of small bowel obstruction [Figures 2a and b]. After rehydration and nasogastric decompression an endoscopic ultrasound-guided cystogastrostomy was performed the next day [Figure 2c]. Following a balloon dilatation to 15 mm, two 7-Fr double-J stents were placed crossing the pseudocyst into gastric lumen [Figure 2d]. An ERCP performed during the procedure demonstrated complete ductal disruption for which a sphincterotomy was done. Two days later he was started on oral diet once his intestinal obstruction had resolved. He was discharged home at the fifth day after his ultrasound revealed almost a complete pseudocyst collapse. His total TPN time was 3 days and total hospitalization was 6 days. Three weeks later a CT-abdomen showed no residual pseudocyst [Figure 3a] and this was followed by stents removal after 10 weeks. Completely healed pancreatic tail with restoration of ductal continuity was demonstrated by MRCP performed 2.5 months later [Figure 3b]. The patient continued to be asymptomatic and gaining weight two months after stents removal.

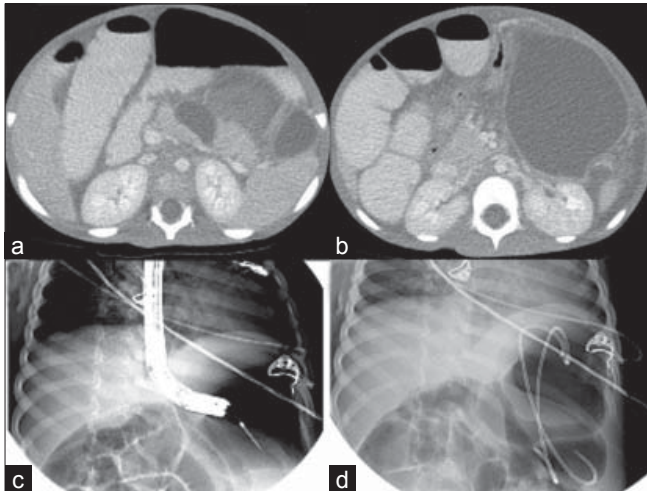
## DISCUSSION

Despite the high success rate of non-operative management of solid organs trauma in children, pancreatic injuries



**Figure 1:** The larger image is of the contrast-enhanced computed tomography scan showing the line of pancreatic split while smaller image is of the intra-operative picture. The arrows represent the split area; a, is the proximal and b, is the distal pancreas

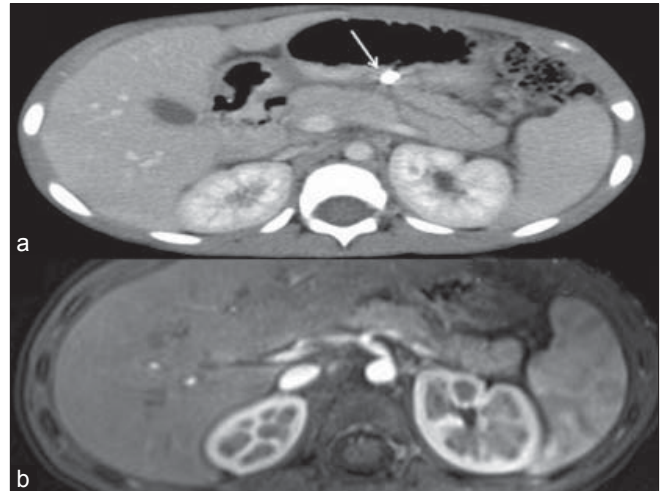
particularly those with ductal disruption still pose a major challenge for pediatric surgeons. Due to the high rate of subsequent complications and the need for multiple interventions most authors focus on mortality and long term morbidities as the main outcomes.<sup>[1-4,7,8]</sup> However, our better understanding of health care outcomes would take into account other parameters such as patients and parents' experiences in addition to the cost of provided care. Major trauma and severe illnesses are known to cause significant psychological distress to both children and their parents,<sup>[9,10]</sup> which is related to the number of required invasive procedures.<sup>[11]</sup> Minimizing these procedures, their possible complications, and early patients' discharge to their natural environment are likely to reduce their stress and hospitalization related anxiety. Despite the reported success in non-operative treatment of early presenters of grade III pancreatic trauma, the choice is often associated with high reported rate of treatment failure<sup>[10]</sup> and frequently complicated by pseudocyst and fistula formation in 45% to 100% of the cases.<sup>[1,2,6]</sup> The required nasogastric decompression and total parenteral nutrition (TPN) might lead to additional morbidities such as central line infections<sup>[1,2]</sup> and even mortality.<sup>[6]</sup> If left untreated, only 40% to 60% of pseudocysts are likely to resolve spontaneously<sup>[1,2]</sup> and in the presence of ductal injury the chance is much smaller. The rest will require one or more attempts of internal, external drainage procedures. Moreover, many authors relied on CT diagnosis which might not be very specific in diagnosing pancreatic ductal injuries.<sup>[12,13]</sup> This could have included less severe pancreatic injuries and therefore, improved morbidities rate and shortened the reported LOH in the NOM group. Despite that, the reported median LOH in expectant management in grade III pancreatic trauma is 24 days (6–52 days) and time to



**Figure 2:** (a) Contrast enhanced CT showing the pancreatic split and leak with dilated small bowels (b) CT showing the large pseudocyst (c) X-ray of the ultrasound guided pseudocyst puncture (d) X-ray abdomen of the two double-J stents

full feed extends to 2 months (0.1–5.5 months).<sup>[2]</sup> A mean LOH of 24 days is also reported in NOM that included all pancreatic injuries grades.<sup>[1]</sup> Faced with limited resources such plan could be more expensive not only to the health care system but to parents who are frequently referred to the tertiary center away from their homes. Although the series is relatively small, in two consecutive cases of simple and complicated grade III injuries, we were able to reduce hospitalization, and safely discharge our patients within 5 and 6 days of their presentations, respectively.

Other authors have reported the good outcomes and shorter hospitalization with early SPDP for distal ductal injury.<sup>[14,15]</sup> Meier DE *et al.*,<sup>[4]</sup> reported a median postoperative LOH of 11 days (7–29 days) and median duration of TPN of 8.3 days in early operative group after pancreatic transaction while the TPN duration varied between 20 to 45 days for non-operative group. In the series by Canty *et al.*,<sup>[3]</sup> of the 9 patients treated with SPDP, none developed pancreatic complications and 5 were discharged on normal diet at day 7 after injury. Wood *et al.*<sup>[9]</sup> observed in a group of 25 patients with grade II-IV injuries a lower rate of pancreatic complications in operative compared to the non-operative group (21% vs. 73%). In their series, the presence of such complications has significant impact on extending the median LOH from 9 to 22 days. Proponents of nonoperative approach argued against the general risk of any major surgery and the possible high rate of associated morbidity as reported by Cogbill *et al.*<sup>[14]</sup> However, despite the large volume of cases in their series, the report is quite old, added adults to children population, and mixed both penetrating and blunt injuries. Furthermore, many of their patients had other major associated injuries that might have contributed to the treatment failure. Mattix *et al.*,<sup>[16]</sup>



**Figure 3:** (a) Contrast enhanced CT at 10 weeks showing the disappearance of pseudocyst with obvious pancreatic fracture lines, the arrow points to the stents (b) MRI at 2.5 months showing the complete healing of the pancreases

reported no difference in morbidity of grade III injury between operative and non-operative group, however, their morbidity data were incomplete and both the reason and type of surgical interventions were not clearly identified.

While relying on CT image to confirm ductal injury might not be very accurate particularly when surgery is the choice, in our case the presence of large pseudocyst and considerable amount of free fluid with a CT evidence of isolated grade III injury could not be explained otherwise. The significant risk of ERCP complications outweighs the potential benefits in this situation. Furthermore, ERCP and stenting in the presence of complete distal duct transaction, has high reported failure rate<sup>[17]</sup> and stricture formation,<sup>[18]</sup> which could have entailed for us all the potential complications of NOM.

Internal drainage (ID) of pancreatic pseudocyst, whether endoscopic or surgical, has more favorable outcomes over percutaneous external drainage (PED). In adult series, compared to surgical drainage patients who had PED, had lower success rate (42% vs. 88%) and longer hospitalization.<sup>[19,20]</sup> On the other hand, long term success of endoscopic ID of pseudocysts is around (88% to 97%), with recurrence rates between 5% and 18%.<sup>[21,22]</sup> In children, the extra care required in PED children might push surgeons to place them on TPN and octerotide to enhance ductal healing and remove the drain sooner. Endoscopic drainage does not require special care and children can resume their diet and normal activities once their symptoms improve. This should minimize the need for TPN, speed up recovery and minimize hospitalization. In addition, performing sphincterotomy or placing a tranpapillary stent during the ID procedure could further enhance the chance of pancreatic ductal healing as is the case in our study.

We believe that similar to other solid organs, nonoperative management is still the ideal choice for grade I and II pancreatic injuries, while early intervention in the form of SPDP could enhance the recovery and significantly shorten the LOH in early presenters with a clear diagnosis of isolated grade III injury. In order to achieve a similar trend in late presenters with symptomatic pseudocyst, endoscopic drainage in addition to sphincterotomy or transpapillary stenting can be considered. However, NOM will continue to play a role in managing critically ill patients or in the presence of major splenic injury that might increase the risk of splenectomy during SPDP. Although such injuries are rare, larger series are still needed to confirm the consistency of this trend.

## REFERENCES

- de Blaauw I, Winkelhorst JT, Rieu PN, van der Staak FH, Wijnen MH, Severijnen RS, *et al.* Pancreatic injury in children: Good outcome of nonoperative treatment. *J Pediatr Surg* 2008;43:1640-3.
- Shilyansky J, Sena LM, Kreller M, Chait P, Babyn PS, Filler RM, *et al.* Nonoperative management of pancreatic injuries in children. *J Pediatr Surg* 1998;33:343-9.
- Canty TG Sr, Weinman D. Management of major pancreatic duct injuries in children. *J Trauma* 2001;50:1001-7.
- Meier DE, Coln CD, Hicks BA, Guzzetta PC. Early operation in children with pancreas transection. *J Pediatr Surg* 2001;36:341-4.
- Moore EE, Cogbill TH, Malangoni MA, Jurkovich GJ, Champion HR, Gennarelli TA, *et al.* Organ injury scaling, II: pancreas, duodenum, small bowel, colon, and rectum. *J Trauma* 1990;30:1427-9.
- Kouchi K, Tanabe M, Yoshida H, Iwai J, Matsunaga T, Ohtsuka Y, *et al.* Nonoperative management of blunt pancreatic injury in childhood. *J Pediatr Surg* 1999;34:1736-9.
- Colville G, Darkins J, Hesketh J, Bennett V, Alcock J, Noyes J, *et al.* The impact on parents of a child's admission to intensive care: Integration of qualitative findings from a cross-sectional study. *Intensive Crit Care Nurs* 2009;25:72-9.
- Holbrook TL, Hoyt DB, Coimbra R, Potenza B, Sise M, Anderson JP. High rates of acute stress disorder impact quality-of-life outcomes in injured adolescents: Mechanism and gender predict acute stress disorder risk. *J Trauma* 2005;59:1126-30.
- Wood JH, Partrick DA, Bruny JL, Sauaia A, Moulton SL. Operative vs nonoperative management of blunt pancreatic trauma in children. *J Pediatr Surg* 2010;45:401-6.
- Mattix KD, Tataria M, Holmes J, Kristoffersen K, Brown R, Groner J, *et al.* Pediatric pancreatic trauma: Predictors of nonoperative management failure and associated outcomes. *J Pediatr Surg* 2007;42:340-4.
- Huckabay LM, Tilem-Kessler D. Patterns of parental stress in PICU emergency admission. *Dimens Crit Care Nurs* 1999;18:36-42.
- Sivit CJ, Eichelberger MR, Taylor GA, Bulas DI, Gotschall CS, Kushner DC. Blunt pancreatic trauma in children: CT diagnosis. *AJR Am J Roentgenol* 1992;158:1097-100.
- Phelan HA, Velmahos GC, Jurkovich GJ, Friese RS, Minei JP, Menaker JA, *et al.* An evaluation of multidetector computed tomography in detecting pancreatic injury: Results of a multicenter AAST study. *J Trauma* 2009;66:641-7.
- Cogbill TH, Moore EE, Morris JA Jr, Hoyt DB, Jurkovich GJ, Mucha P Jr, *et al.* Distal pancreatectomy for trauma: A multicenter experience. *J Trauma* 1991;31:1600-6.
- McGahren ED, Magnuson D, Schaller RT, Tapper D. Management of transected pancreas in children. *Aust N Z J Surg* 1995;65:242-6.
- Mattix KD, Tataria M, Holmes J, Kristoffersen K, Brown R, Groner J, *et al.* Pediatric pancreatic trauma: Predictors of nonoperative management failure and associated outcomes. *J Pediatr Surg* 2007;42:340-4.
- Shrode CW, McDonough P, Northup PG, Sauer B, Ku J, Rehan ME, *et al.* Multimodality endoscopic treatment of pancreatic duct disruption with stenting and transenteric pseudocyst drainage: how efficacious is it? *Gastrointest Endosc* 2009;69:AB 2 66-7.
- Lin BC, Liu NJ, Fang JF, Kao YC. Long-term results of endoscopic stent in the management of blunt major pancreatic duct injury. *Surg Endosc* 2006;20:1551-5.
- Heider R, Meyer AA, Galanko JA, Behrns KE. Percutaneous drainage of pancreatic pseudocysts is associated with a higher failure rate than surgical treatment in unselected patients. *Ann Surg* 1999;229:781-9.
- Soliani P, Franzini C, Ziegler S, Del Rio P, Dell'Abate P, Piccolo D, *et al.* Pancreatic pseudocysts following acute pancreatitis: Risk factors influencing therapeutic outcomes. *JOP* 2004;5:338-47.
- Hookey LC, Debroux S, Delhaye M, Arvanitakis M, Le Moine O, Devière J. Endoscopic drainage of pancreatic fluid collections in 116 patients: A comparison of etiologies, drainage techniques, and outcomes. *Gastrointest Endosc* 2006;63:635-43.
- Baron TH, Harewood GC, Morgan DE, Yates MR. Outcome differences after endoscopic drainage of pancreatic necrosis, acute pancreatic pseudocysts, and chronic pancreatic pseudocysts. *Gastrointest Endosc* 2002;56:7-17.

**Source of Support:** Nil, **Conflict of Interest:** None declared.