Sabuncuoglu Serefeddin Health Sciences (SSHS)

ISSN: 2667-6338, 2024/Vol.6:1/41-50

A LATE COMPLICATION OF BLUNT TRAUMA IN A CHILD: HEMORRHAGIC PANCREATIC PSEUDOCYST

[*1]Burcu AKMAN, [1]Ahmet Turan KAYA

[1]Amasya University, Faculty of Medicine, Department of Radiology, Amasya, Türkiye

Case report

Received: 02/05/2024 Accepted: 08/07/2024

*Corresponding author:burcuakman80@gmail.com

Abstract

Trauma is one of the most important cause of morbidity and mortality in the pediatric population. Pancreatic injury is relatively rare but has high morbidity and mortality when the diagnosis is delayed. The diagnosis of pancreatic trauma may be difficult. Ultrasound is limited for diagnosing pancreatic injury. Magnetic resonance imaging (MRI) is very useful for detecting direct and secondary signs of pancreatic injury and its complications such as abscess, fistula, pancreatitis, and pseudocyst. We presented a case of 10-year-old boy with a hemorrhagic pancreatic pseudocyst due to blunt trauma that happened a week ago. His laboratory findings showed elevated serum amylase and lipase levels. In abdominal ultrasonography, bilobular thick-walled fluid collections in the pancreatic parenchyma and peripancreatic location were observed. MRI showed areas of subacute hemorrhage within the pseudocyst. The pseudocysts were treated by cysto-gastrostomy. Children should be carefully evaluated for pancreatic injury and late complications such as hemorrhagic pancreatic pseudocyst to reduce mortality after blunt trauma.

Keywords: Magnetic Resonance, Pancreatic pseudocyst, Pancreatic trauma, Ultrasound

Özet

Travma, pediatrik popülasyonda en önemli morbidite ve mortalite nedenlerinden biridir. Pankreas yaralanması nispeten nadirdir ancak tanı geciktiğinde yüksek morbidite ve mortaliteye sahiptir. Pankreas travmasının tanısı zor olabilir. Pankreas hasarını teşhis etmek için ultrason sınırlıdır. Manyetik rezonans görüntüleme (MRG), pankreas hasarının doğrudan ve ikincil belirtilerini ve apse, fistül, pankreatit ve psödokist gibi komplikasyonlarını saptamada çok faydalıdır. Çalışmamızda, bir hafta önce künt travmaya bağlı hemorajik pankreatik psödokisti olan 10 yaşında bir erkek çocuk vakasını sunduk. Laboratuvar bulgularında yüksek serum amilaz ve lipaz seviyeleri mevcuttu. Batın ultrasonografisinde, pankreas parankiminde ve peripankreatik lokalizasyonda, bilobüler kalın duvarlı sıvı koleksiyonları görüldü. MRG'de psödokist içerisinde subakut hemoraji alanlarını görüldü. Psödokistler sisto-gastrostomi ile tedavi edildi. Künt travma sonrası mortaliteyi azaltmak için çocuklar, pankreatik yaralanma ve hemorajik pankreatik psödokist gibi geç komplikasyonlar açısından dikkatle değerlendirilmelidir.

Anahtar Kelimeler: Manyetik Rezonans, Pankreas psödokisti, Pankreas travması, Ultrason

1. Introduction

Trauma is one of the most important cause of morbidity and mortality in the pediatric population. Pancreatic injury is relatively rare compared to other solid organs. Due to the retroperitoneal location of the pancreas, it is protected from many minor abdominal traumas. Pancreatic injury happens in less than 2% of patients with blunt abdominal trauma (Gupta, Stuhlfaut, Fleming, Lucey, & Soto, 2004). Penetrating traumas are the most common cause of pancreatic injury. Pancreatic trauma has high morbidity and mortality when the diagnosis is delayed. In pancreatic injuries mortality rates of patients range from 9% to 34% (Debi et al., 2013).

The diagnosis of pancreatic injuries is difficult compared to other solid organ injuries. It is difficult to diagnose pancreatic injuries by US examination. Enlargement of the pancreas, peripancreatic fluid, and traumatic pseudocyst of the pancreas can be detected by the US (Debi et al., 2013). Multidetector computed tomography (CT) plays a major role in the early and accurate

diagnosis of injuries to the pancreas and adjacent organs. CT scans are quite effective for detecting both direct and indirect symptoms of pancreatic damage and associated consequences, such as abscess, pseudocyst, pancreatitis, and fistula. CT can not reveal pancreatic duct damage. The pancreatic duct and regions of disruption can be seen directly with Magnetic resonance cholangiopancreatography (MRCP). Because the integrity of the pancreatic duct is the most significant prognostic indicator, MRCP and endoscopic retrograde cholangiopancreatography (ERCP) are critical for directing therapy (Debi et al., 2013; Gupta et al., 2004; Linsenmaier, Wirth, Reiser, & Körner, 2008).

It can be reported as normal in cross-sectional modalities taken in the early post-traumatic period. Therefore, in patients with a history of trauma and progressive increase in amylase and lipase, a contrast-enhanced CT scan should be performed at 24-48 hours. In this case report, we aimed to present the clinical features, laboratory results, US and MRI findings of a pediatric patient who presented with hemorrhagic pancreatic pseudocyst after falling from a bicycle.

2. Case Report

A 10-year-old boy was admitted to the emergency department of our hospital with complaints of abdominal pain and difficulty in walking that started after falling off the bike one week ago and continued to increase. On examination, there was tenderness in the middle and lower quadrants of the abdomen on palpation. After the examination, the patient underwent blood tests, including complete blood count and biochemistry. On admission his hemoglobin (Hb) was 11.2 g/dL, hematocrit (Hct) was 32.5, and white blood cell count (WBC) was 9.83 10^9/L. Serum amylase was followed up with two-day intervals, and increased day by day: 561-671-1111 IU/L. Serum lipase was followed up with two-day intervals, and increased day by day: 1106-1275-1752 IU/L (Figure 1). (Reference values of Hb:13.2-16.6 g/dL; Hct:42-54; WBC: 3.80-8.70 10^9/L; amylase:28-100 IU/L; lipase: 13-60 IU/L).

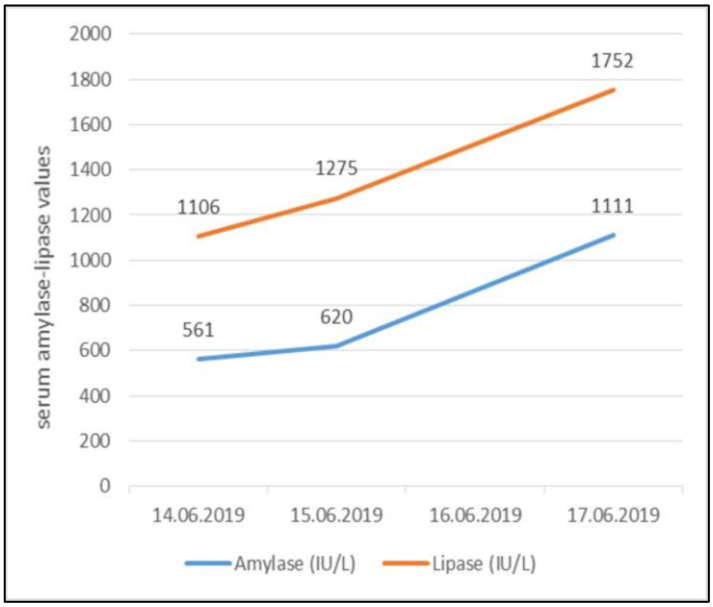

Figure 1. The graphic of the gradual rise in serum amylase- lipase values after the admission.

In abdominal ultrasonography, an enlargement of the anteroposterior diameter of the pancreas, stranding in the peripancreatic adipose tissue, and unclear borders of the pancreas were revealed. In addition, free fluid with dense content, reaching 5 cm in its deepest part, was detected in the perihepatic, perisplenic areas, and lower abdominal quadrants. Bilobular thick-walled fluid collections of approximately 9x5 cm and 4x3 cm with internal low-level echoes in the dependent portion were observed in the pancreatic parenchyma and peripancreatic location (Figure 2). Then abdominal MRI was requested for pseudocyst or hematoma.

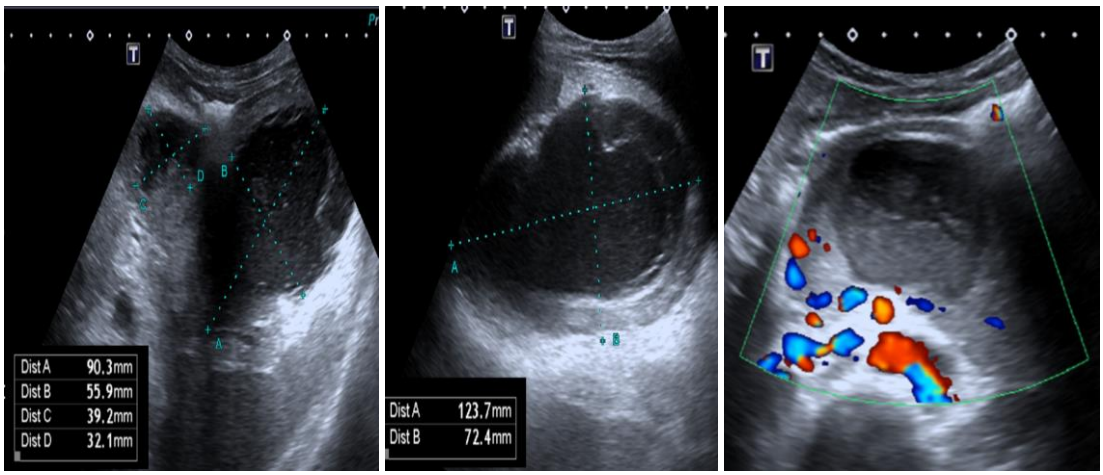

Figure 2. a, b, c. The ultrasound (US) images (a, b) show two thick-walled hemorrhagic pancreatic pseudocysts containing multiple echogenic materials in the pancreatic parenchyma and peripancreatic location. In Color Doppler US (c) no vascularization was seen in the lesions.

On MRI, a hemorrhagic pseudocyst, approximately 6x4 cm in size was detected in the pancreatic parenchyma. In MRI sequences, the central of this pseudocyst was heterogeneously hypointense on T1 weighted (W) and heterogeneously hyperintense on T2W. The periphery of the pseudocyst was hyperintense on T1W images and hypointense on T2W images consistent with subacute hemorrhage. Additionally, a collection compatible with a pseudocyst, approximately 7x5 cm in size, was observed in the extraparenchymal area. No contrast enhancement was observed in bilobular pseudocysts on post-contrast coronal T1A-weighted images (Figure 3,4).

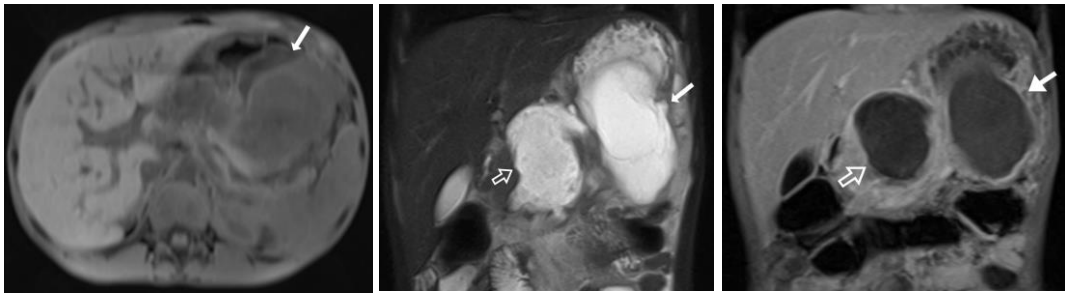

Figure 3. a, b, c. Magnetic resonance imaging (MRI) shows bilobular pseudocyst that is heterogeneously hypointense on axial T1-weighted (W) images (a), heterogeneously hyperintense on coronal T2W images (b), non-enhancing on post-contrast coronal T1A-weighted images (c) (arrows).

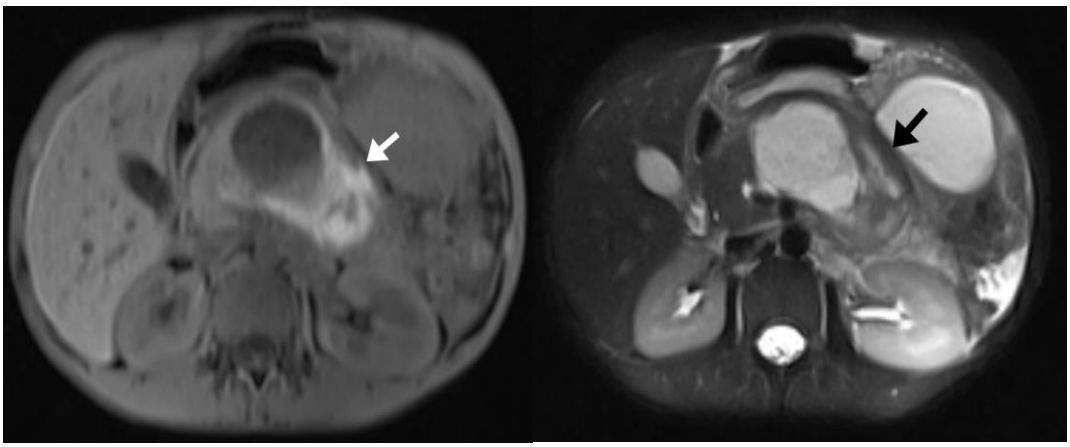

Figure 4. a, b. MRI of hemorrhagic pancreatic pseudocyst in the pancreatic parenchyma. The periphery of the pseudocyst was hyperintense on T1W images (a) and hypointense on T2W images (b) consistent with subacute hemorrhage (arrows).

The operation was planned by the pediatric surgeon. In the surgery, the pseudocysts were treated by cysto-gastrostomy. The intrapancreatic cyst was drained into the pylorus of the stomach, and the extrapancreatic cyst was drained into the stomach fundus. Its pathology has been reported as bleeding and mildly inflamed fibroadipose tissue.

3. Discussion

Pancreatic injury happens in less than 2% of patients with blunt abdominal trauma (Gupta et al., 2004). After blunt trauma, the pancreas is compressed anterior to the vertebral column. Penetrating traumas are the most common cause of pancreatic injury. Pancreatic trauma has high morbidity and mortality when the diagnosis is delayed. In pancreatic injuries mortality rates of patients range from 9% to 34% (Debi et al., 2013). Most of the deaths are due to acute hemorrhage due to vascular damage in the acute period, and sepsis and multi-organ failure in the late period (Debi et al., 2013; Gupta et al., 2004; Linsenmaier et al., 2008).

In the acute phase of pancreatic injuries (the first 48 hours), death is mostly due to acute hemorrhage from damage to the inferior vena cava, portal vein, or splenic vein (Bradley 3rd et al., 1998; Madiba & Mokoena, 1995). On the other hand, late-term morbidity and death are mainly caused by complications from pancreatic duct damage. Complications such as pseudocyst, fistula, pancreatitis, and abscess may arise as a result of duct damage. Hepatic (46.8% of cases), gastric (42.3%), major vascular (41.3%), spleen (28.0%), renal (23.4%), and duodenal (19.3%) injuries are the most frequent organ injuries that occur during pancreatic damage (Ilahi, Bochicchio, & Scalea, 2002; Madiba & Mokoena, 1995).

The three most common and typical clinical findings for pancreatic trauma are upper abdominal pain, increased leukocyte count, and elevated serum amylase levels. However these findings may not be observed in adults within the first 24 hours or even for several days (Linsenmaier et al., 2008; Meredith & Trunkey, 1988).

Most of the pancreatic injuries (two-thirds) are observed in the pancreatic body localization, while the rest occur equally in the head, neck and tail localizations (Madiba & Mokoena, 1995). Pancreatic injury usually occurs after motor vehicle accidents in adults and after bicycle handlebar injuries in children, like our patient (Sutherland et al., 2010).

The diagnosis of pancreatic injuries is difficult compared to other solid organ injuries. Ultrasound has many advantages such as ease of application, low cost, safety and no use of ionizing radiation, but it is difficult to diagnose pancreatic injuries by US examination (Jeffrey, Laing, & Wing, 1986). Ultrasound can detect localized enlargement of the pancreas secondary to trauma or diffuse enlargement indicating inflammatory pancreatitis. Peripancreatic fluids can be detected as a sign of pancreatic contusion and the post-traumatic pancreatic pseudocyst can be detected by the US and its size can be followed in serial ultrasounds (Lenhart & Balthazar, 2008).

Multidetector CT plays a major role in the early and accurate diagnosis of injuries to the pancreas and adjacent organs (Linsenmaier et al., 2008). It can be reported as normal in cross-sectional modalities taken in the early post-traumatic period. Therefore, in patients with a history of trauma and progressive increase in amylase and lipase, a contrast-enhanced CT scan should be performed at 24-48 hours. CT images are usually acquired in the portovenous phase 60-70 seconds after the administration of an intravenous (IV) contrast agent to evaluate signs of blunt abdominal trauma. A section thickness of 5 mm or less prevents misdiagnosis. Attention should be paid to the injuries of the liver left lobe, duodenum, stomach, and spleen, which can often accompany cross-sectional imaging. Pancreatic laceration, transection, and comminution are

obvious indicators of pancreatic damage. CT may indicate localized enlargement of the pancreas, inhomogeneous contrast enhancement, and peripancreatic fluid. In secondary findings, stranding in the surrounding fatty tissue, thickening of the pararenal fascia, and fluid in the surrounding tissues are observed. CT imaging can be performed on patient with suspected pancreatic and biliary tract injury by the US, and complications such as abscess, fistula, pancreatitis, pseudocyst, and hematoma can be demonstrated (Debi et al., 2013; Gupta et al., 2004; Linsenmaier et al., 2008).

CT can not directly show pancreatic duct injury, but according to the extent of parenchymal laceration, canal disruption may be suggested. MRCP provides direct visualization of the pancreatic duct and areas of disruption. Since the integrity of the pancreatic duct is the main prognostic factor, MRCP and ERCP are very important for guiding treatment. The advantages of MRCP over ERCP are that MRCP is non-invasive and can detect pathologies such as collection and hematoma. Injuries to the pancreatic duct can be detected with MRCP and ERCP can assist in stenting (Debi et al., 2013; Gupta et al., 2004; Linsenmaier et al., 2008).

Although the values of amylase in the acute phase of trauma have low sensitivity and specificity for pancreatic injury, it has been shown that the relationship between the increase in follow-up serum amylase values and the severity of the pancreatic injury has strong statistical significance (Jobst, Canty Sr, & Lynch, 1999). Aydoğdu et al. (Aydogdu et al., 2016) compared those who developed pseudocysts in patients with pancreatic damage to those who did not, and found that an increase in serum amylase level could be a good predictor of pancreatic pseudocyst development. In our presented patient, serum amylase and lipase levels gradually increased due to pancreatic pseudocyst, as in the literature.

Posttraumatic pancreatic pseudocyst has also been reported in some studies in the literature (Aydogdu et al., 2016; Haider et al., 2017; Igwe et al., 2020). However, the patient that presented in our study, differently had a hemorrhagic component in the pancreatic pseudocyst and MRI findings of hemorrhagic pseudocysts were reported in our study. The superiority of MRI over CT is that it can show pancreatic duct injuries directly. Therefore, MR examination was preferred instead of CT in our case.

Pancreatic injuries caused by blunt trauma are more common in children than in adults since the children's diaphragm is flatter, the abdominal muscles are thinner, and the rib margins are higher (Jobst et al., 1999). The fact that our presented patient was a weak child, increased the possibility of trauma to the pancreas. For this reason, pancreatic injury and late complications should be kept in mind after blunt trauma to the abdomen, especially in pediatric patients. It has high mortality in case of late diagnosis or being overlooked.

4. Conclusion

The diagnosis of pancreatic injury due to blunt trauma and its complications are difficult but extremely important. Delayed diagnosis may cause high morbidity and mortality. Especially children should be carefully evaluated in terms of pancreatic injury that may occur after blunt trauma and complications like pseudocyst that may occur in the late period.

Conflicts of interest

None.

Funding Statement

This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Authorship

All authors provided final approval of the submitted manuscript, and; agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

Aydogdu, B., Arslan, S., Zeytun, H., Arslan, M. S., Basuguy, E., İçer, M., … Cıgdem, M. K. (2016). Predicting pseudocyst formation following pancreatic trauma in pediatric patients. *Pediatric Surgery International*, *32*(6), 559–563.

Bradley 3rd, E. L., Young Jr, P. R., Chang, M. C., Allen, J. E., Baker, C. C., Meredith, W., … Thomason, M. (1998). Diagnosis and initial management of blunt pancreatic trauma: guidelines from a

multiinstitutional review. *Annals of Surgery*, *227*(6), 861.

Debi, U., Kaur, R., Prasad, K. K., Sinha, S. K., Sinha, A., & Singh, K. (2013). Pancreatic trauma: a concise review. *World Journal of Gastroenterology: WJG*, *19*(47), 9003.

Gupta, A., Stuhlfaut, J. W., Fleming, K. W., Lucey, B. C., & Soto, J. A. (2004). Blunt trauma of the pancreas and biliary tract: a multimodality imaging approach to diagnosis. *Radiographics*, *24*(5), 1381–1395.

Haider, F., Al Awadhi, M. A., Abrar, E., Al Dossari, M., Isa, H., Nasser, H., … Al Arayedh, S. (2017). Pancreatic injury in children: a case report and review of the literature. *Journal of Medical Case Reports*, *11*(1), 1–5.

Igwe, P. O., Ray-Offor, E., Karibi, E. N., Okeke, U. F., Ugwa, O. C., & Jebbin, N. J. (2020). Giant pseudocyst of the pancreas: a report of three cases. *International Journal of Surgery Case Reports*, *77*, 284–297.

Ilahi, O., Bochicchio, G. V, & Scalea, T. M. (2002). Efficacy of computed tomography in the diagnosis of pancreatic injury in adult blunt trauma patients: a single-institutional study. *The American Surgeon*, *68*(8), 704–708.

Jeffrey, R. B., Laing, F. C., & Wing, V. W. (1986). Ultrasound in acute pancreatic trauma. *Gastrointestinal Radiology*, *11*, 44–46.

Jobst, M. A., Canty Sr, T. G., & Lynch, F. P. (1999). Management of pancreatic injury in pediatric blunt abdominal trauma. *Journal of Pediatric Surgery*, *34*(5), 818–824.

Lenhart, D. K., & Balthazar, E. J. (2008). MDCT of acute mild (nonnecrotizing) pancreatitis: abdominal complications and fate of fluid collections. *American Journal of Roentgenology*, *190*(3), 643–649.

Linsenmaier, U., Wirth, S., Reiser, M., & Körner, M. (2008). Diagnosis and classification of pancreatic and duodenal injuries in emergency radiology. *Radiographics*, *28*(6), 1591–1602.

Madiba, T. E., & Mokoena, T. R. (1995). Favourable prognosis after surgical drainage of gunshot, stab or blunt trauma of the pancreas. *British Journal of Surgery*, *82*(9), 1236–1239.

Meredith, J. W., & Trunkey, D. D. (1988). CT scanning in acute abdominal injuries. *The Surgical Clinics of North America*, *68*(2), 255–268.

Sutherland, I., Ledder, O., Crameri, J., Nydegger, A., Catto-Smith, A., Cain, T., & Oliver, M. (2010). Pancreatic trauma in children. *Pediatric Surgery International*, *26*, 1201–1206.