

Delayed presentation of blunt duodenal injuries in children. Case report and review of literature

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SUMMARY: Delayed presentation of blunt duodenal injuries in children. Case report and review of literature.

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Background. Duodenal injuries are rare in children and classically present following a fall over the handle bar. Retroperitoneal location of the duodenum may lead to delay in diagnosis, and missed injuries are associated with increased morbidity and mortality.

Case report. A 5-year-old child was admitted to the National Trauma Center, in Tirana (Albania), 28 hours after a Motor Vehicle Crash (MVC), complaining of mild abdominal pain. He was febrile

(39°C) and had a white blood cells count of 18,000 mm³. On physical exam he had mild tenderness. Plain abdominal X-rays and Focused Abdominal Sonography for Trauma (FAST) were negative for free air or free fluid. The CT scan of the abdomen demonstrated free air and fluid in the retroperitoneal space. At laparotomy, a perforation of the second portion of the duodenum was found. A single layer suture repair of the duodenum with wide drainage was performed. The patient was discharged from the hospital tolerating oral feeding 8 days later.

Conclusion. Duodenal injuries in children are rare. Most duodenal hematomas are managed non-operatively. This is a case of MCV with delayed presentation that was treated surgically for perforation successfully.

KEY WORDS: Duodenal injury - Motor vehicle crash - Retroperitoneal injuries - Children - Delayed presentation.

Introduction

The difficulty to diagnose in time, along with high morbidity and mortality associated with these injuries, make duodenal injuries an ongoing challenge for trauma surgeons. Trauma of the duodenum is not common due to its deep, central and retroperitoneal location. Duodenal injuries may follow penetrating or blunt abdomen trauma. Blunt duodenal injury occurred with a low incidence (about 0.2%) and was most often caused by motor vehicle accidents (1). However, blunt trauma is more common and usually results from car or bicycle accidents, child abuse, falls, and playground accidents (2).

Clinical findings following isolated, blunt duodenal trauma depend on the severity of the injury and the examination time. Such findings are, in general, often di-

screte. Initial symptoms and physical findings that included nausea, vomiting, abdominal pain, and tenderness were common but nonspecific in differentiating the type of duodenal injury (3). The diagnostic difficulty is due to the localization of duodenum. Therefore, a duodenal injury has to be considered in any patient presenting with a history of abdominal trauma.

Diagnostics in case of blunt abdominal trauma should include blood sampling, plain abdominal X-rays and abdominal ultrasound scan (USS). Laboratory findings can give rise to the level of leukocyte and pancreatic enzymes. The presence of free air in the plain abdominal X-rays and free liquid in the FAST are important data in the case of abdominal trauma. USS can assess duodenal integrity and associated injury, and is also useful in following hematoma resolution (4). Suspicion of duodenal injury necessitates an enhanced abdominal computed tomography (CT); it can exclude or confirm the presence of air or fluid in the retroperitoneal space. Diagnostic peritoneal lavage is unreliable in finding duodenal injury. It may be positive for blood, bile or bowel contents but, if negative, does not exclude duodenal injuries (5).

The treatment of duodenal trauma should be based on the classification of duodenal trauma, according to

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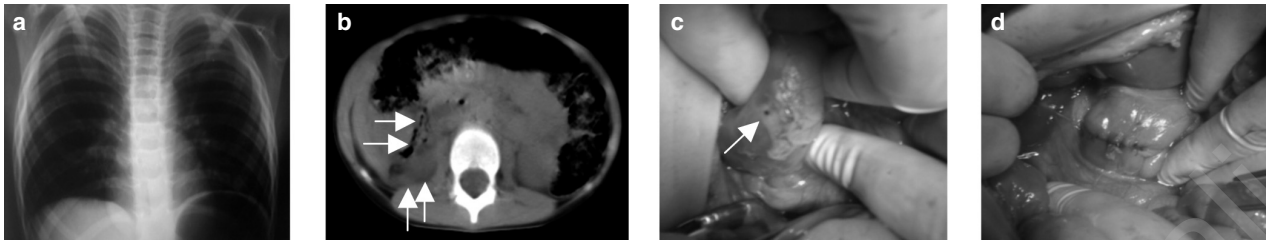


Fig. 1 (a, b, c, d) - a) Plain abdominal X-ray was negative for free air. b) CT scan shows free air and fluid in retroperitoneal space. c). Intraoperative finding: perforation of the duodenum. d) Single layer suture repair of duodenum.

American Association Trauma Surgery and the factors determining the gravity of these injuries, which include size and location of the injury, the time interval between the injury and intervention, and injury of the hepatic bile duct.

Complications after duodenal injuries are frequent (20% overall), and are significantly increased when the diagnosis is delayed (1). An operative delay of more than 24 h is reported to increase the complication rate from 29% to 43%, and mortality from 11% to 40% (6).

Case report

A 5-year-old boy, with no medical history, was involved in a motor vehicle crash (MVC) and initially treated in a rural hospital in Albania. The patient complained about gradually worsening upper abdomen pain. Initial diagnostics, comprising of blood sampling, FAST, plain abdominal and chest x-ray revealed no pathology. The patient was hospitalized for observation. On the following day, he presented worsening upper abdominal condition, with a body temperature of 39°C.

Consequently, 28 hours after MVC the patient was transferred to our National Trauma Center for further diagnostics and treatment. At admission the boy complained about worsening epigastric condition. His vital signs were; pulse rate; 135/min, Blood Pressure; 70-110 mm Hg, respiratory rate; 35/min. Initial examination revealed 39°C body temperature, mild defense in the upper abdomen and 18.000 mm³ leukocytes. Chest X-rays (Fig. 1, a) and plain abdominal x-rays were normal. Although USS showed no signs of free intraabdominal fluids, the consequent abdominal enhanced computer tomography showed free air and liquid in the retroperitoneal space (Fig. 1, b).

At emergency laparotomy, the Kocher-maneuver revealed a perforation of the second portion of the duodenum (Fig. 1, c). No other injuries were found. We performed single layer suture repair of the duodenum with wide drainage, the abdomen was washed with two liters of warm saline solution (Fig. 1, d). The patient was treated with broad-spectrum antibiotics for 7 days. Cultures taken from the abdomen after prophylactic intravenous antimicrobial therapy remained negative. The nasogastric tube was removed five days after the operation. Complete oral feeding commenced five days postoperatively. No complications were recorded and the patient was released from hospital 8 days after surgery.

Discussion

The treatment of duodenal injuries is conditioned on the level of damage and possibility of post-operati-

ve complications. Approximately around 72% to 80% of duodenal injuries can be repaired with primary suture and 20-28% need complex procedure (3, 6). Primary repair of the duodenum is a viable option for the management of limited to moderately severe duodenal injuries. Although more complex and invasive procedures are warranted for management of severe delayed or duodenal disruption.

If the duodenal injuries were classified starting from total destruction or not of the duodenal wall, then there would be the duodenal hematoma without perforation, duodenal laceration and duodenal transection. Based on that division and the factors determining the gravity of duodenal injuries, we can then determine the proper treatment.

The mechanism of trauma in duodenal injuries is explained as having potentially developed from shearing forces or from simultaneous closure of the pylorus and the fourth portion of the duodenum, resulting in increased intraluminal pressure and a “blowout”. In literature, 50% of cases of duodenal hematomas in children were attributed to motor vehicle crashes (3, 7). However, based on the above, we have found injuries of the duodenum in adults as well. Almost one in three patients show signs of obstruction as a result of a duodenal hematoma. In general, the treatment of duodenal hematoma is conservative (89 to 94%) and resolved with nasogastric decompression and parenteral nutrition (3, 6). This damage can be diagnosed by (USS) and CT scan with contrast. USS can assess duodenal integrity and associated injury, and is also useful in following hematoma absorption (4).

Caution must be taken to exclude other associated injuries, because in 20% of cases, the duodenal injuries are associated with damage to the pancreas (8). Czyrko C. et al. (11) recommend that based on radiologic documentation of persistent high-grade obstruction, as well as the clinical course, patients whose obstructions do not resolve by 10 to 14 days ought to be further investigated and operative intervention considered.

If a hematoma is found during the laparotomy, it must be inspected to exclude a possible perforation. In this case, a Kocherization of duodenum is necessary for the check up to be complete.

The most common surgical technique in the treatment of duodenal laceration is primary suture (3, 6). Light damages can be treated by covering affected areas with omentum, or “jejunal patch”. Another option is primary suture of the defect with the diversion of gastric contents, which consists in pyloric exclusion and gastroenterostomy. This technique is applied in cases of serious duodenal injuries or in cases of delayed diagnosis. Depending on the case, the additional procedure of gastric diversion can be duodenostomy and a jejunal feeding tube for post-operative enteral (4).

In case of complete duodenal transection, primary suture can be performed in the following circumstances: if there is little tissue loss, in cases when the ampulla of Vater is not involved and if the lips of duodenal mucosa may be updated, and closure of the damage can be made without tension. If adequate mobilization for tension-free repair is impossible or if the damage is very close ampules and the mobilization can result in damage to the common hepatic duct, a reasonable option is primary suture with Roux-en-Y anastomosis with or without duodenostomy (7). Duodenopancreatectomy is the only option in cases when duodenal injury is associated with uncontrollable bleeding from pancreas or when duodenal injury is combined with the damage of the distal part to common hepatic duct, or pancreatic duct.

Nowadays, laparoscopic surgery is another option for surgeons in treatment of this injury. Tytgat SH, et al. (12) have describing the successful laparoscopic treatment of a duodenal rupture. It may be particularly beneficial for

hemodynamically stable patients that sustained a focal abdominal trauma.

Morbidity after duodenal injuries ranges to 20% (overall) and operative delay of more than 24 h is reported to increase the complication rate from 29% to 43%. (1,9). However only a third of cases is directly related with morbidity duodenal injuries. Exclusion techniques had fewer complications (0% vs 57%) when compared with primary repair (7).

Historically, duodenal injuries were associated with high mortality rates. Mortality in patients with duodenal injuries reported 8.3% to 19% (7,10). The mortality directly related to the duodenal injury is generally lower, and is the result of duodenal dehiscence, uncontrolled sepsis, and multiple organ dysfunction syndrome. The wide variation of mortality and morbidity is explicable via associated injuries, the injury level, the time interval between the injury and surgical intervention, and the surgical experience in the treatment of these injuries

Conclusion

The clinical signs of duodenal injuries are often discrete. Diagnosis is often delayed which causes the aforementioned injuries to be accompanied with high morbidity and mortality rates, especially when the damage is related to other associated injuries. The choice between surgical technique and conservative therapy depends on the degree of damage and the factors determining the level of injuries.

References

1. Allen GS, Moore FA, Cox CS Jr, Mehall JR, Duke JH. Delayed diagnosis of blunt duodenal injury: an avoidable complication. *J Am Coll Surg* 1998;187(4): 393-9.
2. Huntimer CM, Muret-Wagstaff S, Leland NL. Can falls on stairs result in small intestine perforations? *Pediatrics* 2000 Aug;106(2 Pt 1):301-5.
3. Desai KM, Dorward IG, Minkes RK, Dillon PA. Blunt duodenal injuries in children. *J Trauma* 2003;54(4):640-6.
4. Chien JH, Ho TY, Shih-Peng L, Lee CL, Ou SF. Acquired Duodenal Obstruction in Children. *Pediatr Neonatol* 2008;49(5):193-6.
5. Donald KJ, Doherty SR, Shun A. Duodenal perforation: an interesting case report. *Emerg Med Australas* 2005;17(1):46-8.
6. Clendenon JN, Meyers RL, Nance ML, Scaife ER. Management of duodenal injuries in children. *J Pediatr Surg* 2004; 39(6):964-8.
7. Ladd AP, West KW, Rouse TM, Scherer LR 3rd, Rescorla FJ, Engum SA, et al. Surgical management of duodenal injuries in children. *Surgery* 2002;132(4):748-53.
8. Megremis S, Segkos N, Andrianaki A, et al. Sonographic diagnosis and monitoring of an obstructing duodenal hematoma after blunt trauma: correlation with computed tomographic and surgical findings. *J Ultrasound Med* 2004;23:1679.
9. Osuka A, Idoguchi K, Muguruma T, Ishikawa K, Mizushima Y, Matsuoka T. Duodenal disruption diagnosed 5 days after blunt trauma in a 2-year-old child: report of a case. *Surg Today* 2007;37(11):984-8.
10. Chirdan LB, Uba AF, Yiltok SJ, Ramyil VM. Paediatric blunt abdominal trauma: challenges of management in a developing country. *Eur J Pediatr Surg* 2007;17(2):90-5.
11. Czyrko C, Weltz CR, Markowitz RJ, et al. Blunt abdominal trauma resulting in intestinal obstruction: when to operate? *J Trauma* 1990;30(12):1567-71.
12. Tytgat SH, Zwaveling S, Kramer WL, et al. Laparoscopic treatment of gastric and duodenal perforation in children after blunt abdominal trauma. *Injury* 2012;43(9):1142-4.