Isolated Duodenal Injury in Blunt Abdominal Trauma in Children: A Series of Five Cases

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Abstract

Blunt abdominal trauma is one of the leading causes of trauma-related deaths in children. The commonly affected organs include the spleen, liver and kidneys, followed by uncommon ones such as the pancreas and intestine. Isolated duodenal injury is very rare and, at times, poses a diagnostic challenge due to the paucity of clinical symptoms and signs. Hence, delayed presentation is not uncommon. In this write-up, five such cases are presented with emphasis on their clinical presentation, diagnosis, management and outcome.

Keywords: Blunt abdominal trauma, feeding jejunostomy, handlebar injury, isolated duodenal injury, pneumoperitoneum, primary repair

Introduction

Blunt abdominal trauma accounts for more than 90% of trauma cases in paediatric patients.[1] Children are more prone to intra-abdominal injury (IAI) following blunt trauma abdomen (BTA) as compared to adults; first, because of their small size and relatively large surface area coming in contact and lesser anteroposterior diameter and second, due to poor protection offered by the thin abdominal wall and more compliant thoracic cage. Causes of injury include roadside accidents (RSA), falls, fights, animals, sports, child abuse and so on. Solid organ injury is more prevalent than hollow viscus. The spleen is the most common organ to get injured following BTA in children. Initial assessment involves the mode of injury, proper history and examination, including vitals. Some pointers towards IAI are seatbelt sign, handlebar imprint, abdominal distension and tenderness. In a hemodynamically stable child, focused abdominal sonography in trauma (FAST) with or without contrast-enhanced computed tomography (CECT) is sufficient enough to decide about the management, I,e., conservative versus laparotomy.

Duodenal injuries constitute about 3%–5% of all abdominal injuries.[2] The mechanism involves either a high-velocity trauma with concomitant surrounding organ injury or a typical seatbelt or bicycle handlebar injury leading to crush injury against the spine.[3] The clinical presentation is variable, with an earlier presentation in case of associated injuries and a bit delayed presentation in isolated duodenal trauma.[4] Thus, isolated duodenal injuries can even be missed. Such injuries need timely surgical intervention for favourable outcome. There are only case reports of isolated duodenal injury (IDI) in literature. We present five such cases managed over the last 5 years. Patient's consent for publication has been taken in all the cases.

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Case Reports

Case 1

A 5 year old boy presented to surgical emergency few hours after sustaining RSA. Attendants of the patient said that he was hit by a car. The child complained of abdominal pain and one episode of vomiting. On admission, the child was haemodynamically stable, with some abrasions on the abdomen and lower limbs. His abdomen was non-distended, with localised tenderness in the epigastric region. FAST revealed minimal free fluid in the pelvis with no solid organ injury. The child was initially managed conservatively and

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kept under observation. Due to deteriorating abdominal pain despite adequate analgesia, the child was subjected to CECT of the abdomen which revealed pneumoretroperitoneum with suspected rent in the duodenum. The child was taken up for laparotomy through right upper transverse abdominal incision. A laceration of about 2 cm in second part of the duodenum was noted with minimal peritoneal contamination. Primary repair was done with Vicryl 4-0 interrupted sutures. Wound was closed over an abdominal drain in the Morrison's pouch. The child had an uneventful recovery. Feeds were initiated on the 5th post-operative day (POD) and subsequently discharged on 8th POD after removal of drain.

Case 2

A 8-year-old boy had sustained fall from bicycle with handlebar injury to the abdomen. The child presented to surgical emergency after 2 days of sustaining trauma. He had been managed at a subdistrict hospital where an ultrasound examination revealed normal findings in the abdomen. The child remained haemodynamically stable and was discharged after a repeat ultrasound consistent with the previous scan was done. The next day child developed abdominal distension and one episode of bilious vomiting and reported it to us. The child was haemodynamically stable with tachycardia (heart rate [HR] of 148/min). The abdomen was distended with a rounded bruise mark due to the handlebar with diffuse tenderness. FAST, followed by CECT abdomen, showed free fluid in the peritoneal cavity with suspicion of hollow viscus injury. Exploratory laparotomy revealed transection of half circumference of second part of the duodenum with deep bile staining of adjacent tissues [Figure 1]. Primary repair was done using Vicryl 4-0 suture with feeding jejunostomy (FJ). Abdominal drain was kept in Morrison's pouch and wound was closed back in layers. Jejunostomy feeds were started on POD 2 and hiked gradually till full feeds were reached by POD 7. The child was given a trail of oral feeds after that which he tolerated well. Drain was removed on POD 10 and child was discharged on POD 12. FJ was removed on first follow-up after 2 weeks.

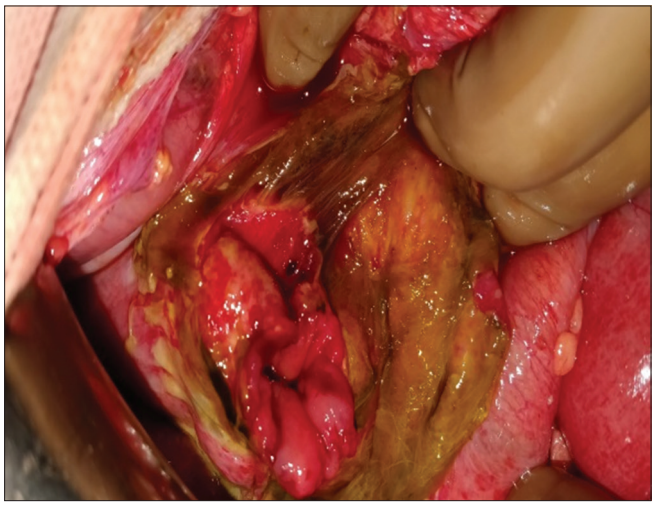


Figure 1: Laceration of second part of the duodenum with bile staining of adjacent area

Case 3

A 15–year-old, class 10th student, presented to us in surgical casualty with a history of fall from an apple tree 1 day back. Initially, he had concealed the history and was apparently well. The next day, the child went to school and complained of abdominal pain and vomiting. He was taken to a nearby health facility and received symptomatic treatment, due to which he improved a bit and went home. In the night, the child had multiple bouts of vomiting with 1 episode of coffee ground vomitus. He then revealed the actual history of trauma to the parents and came to surgical casualty in our hospital. On admission, he was in shock with blood pressure of 80/40 with HR of 160 and was febrile (Temperature 102°F). His abdomen was distended with diffuse tenderness. After fluid resuscitation and nasogastric tube insertion, FAST was done, which showed minimal free fluid in the Morrison's pouch and pelvis. A CECT abdomen was done, which showed duodenal perforation. Exploratory laparotomy was done and third part of the duodenum was found transected with localised contamination [Figure 2]. Primary repair was done using Vicryl 4-0 suture in interrupted fashion with FJ. Abdominal drain was placed in Morrison's pouch before closure. FJ feeds were started on POD 3; however, the child did not tolerate it for a couple of days. The patient developed high-grade fever with surgical site infection. Wound toilet was done after drainage of around 50 cc of pus from the laparotomy wound. The patient settled after that and tolerated FJ feeds on POD 7. Oral feeds were started on POD 12 and he was discharged on POD 17 along with abdominal drain, which was draining around 50 cc of seropurulent fluid over 24 h. Drain output decreased spontaneously at home and was removed on follow-up on POD 24.

Case 4

A 10-year-old child was brought to us by parents with a history of fall a few hours back. He had sustained BTA with

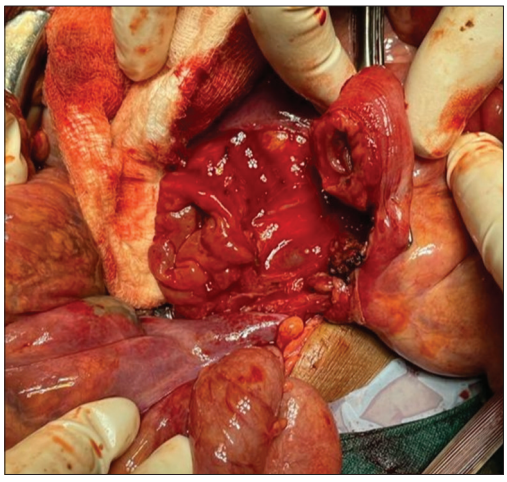


Figure 2: Total transection of third part of the duodenum with contamination

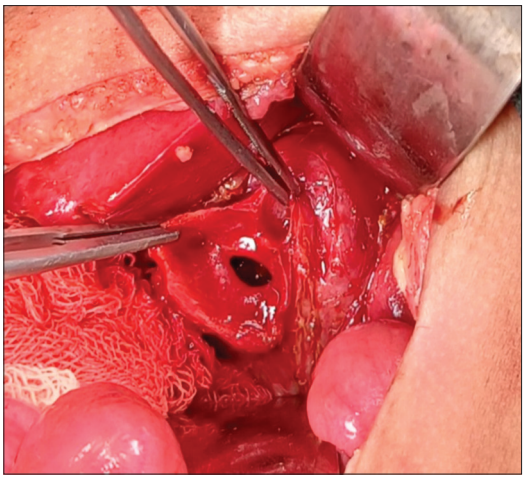


Figure 3: Freshened edges of laceration in second part of the duodenum

a handlebar bruise mark over his abdomen. The child was haemodynamically stable with non-distended abdomen with mild tenderness in the periumbilical region. FAST showed free fluid in the peritoneal cavity, which increased on repeat scans. CECT was done, which suggested a hollow viscus injury possibly jejunal injury. On exploration, there was a rent on the anterior wall of third part of the duodenum, which was repaired primarily using Vicryl 4-0 suture in an interrupted manner without an abdominal drain. The child had an uneventful post-operative period and was discharged on POD 5.

Case 5

A 6-year-old child had sustained handlebar injury after a fall from bicycle some 5 days back. The child was initially taken to a surgical facility at a district hospital, where he remained admitted for 2 days. FAST was done, which was normal on two occasions. The child was discharged and reported to us after 3 days, i.e., 5 days after sustaining trauma with complaints of recurrent non-bilious vomiting. On admission, he was haemodynamically stable with a swelling on the right hypochondrium, which was tender. The rest of the abdomen was normal. Ultrasound of the abdomen showed sealed hollow viscus perforation. CECT abdomen was done, which was consistent with sonographic findings. Exploration was done through the right upper transverse abdominal incision. There was a collection of bile-stained fluid near second part of the duodenum of size 5 cm × 4 cm (approx.), causing compression over the duodenum. The collection was drained and a sealed rent could be seen. The edges of rent were freshened [Figure 3] and primary repair was done using interrupted Vicryl 4-0 sutures. Wound was closed with an abdominal drain in place. The child tolerated orals on POD 5 and drain was removed on POD 6 and was discharged on POD 7.

Discussion

Duodenal injury constitutes around 3%–5% of all abdominal organ injuries in children. Penetrating injury is more common than blunt injury (3:1).[5] IDI is rare after paediatric BTA because of its retroperitoneal location, where it is seated deep and safe. In order to sustain injury, the trauma has to be high velocity one or a targeted one wherein the duodenum gets crushed between the spine and the object of impact like in handlebar injury. Another mechanism is due to shearing force in acceleration–deceleration injury. After the mechanism of injury, the clinical examination of the child is very important and is to be done with a suspicion of duodenal injury in mind. Most of the times, abdominal signs are inconspicuous and go unnoticed. Diagnostic delay can delay the treatment, which has a bearing on the outcome. A delay beyond 24 h has been found to increase mortality from 11% to 40%.[5] Three out of five patients had delayed diagnosis in our series. However, there was no major complication or mortality in our series.

The diagnostic workup in IDI is the same as in any case of blunt abdominal trauma. FAST is usually the first imaging study done in a blunt abdominal trauma patient; however, it has a low sensitivity for duodenal injuries.[6] Three of our patients presented late, with two of them having normal ultrasounds done from district or subdistrict hospitals, so the expertise of the performer in these two cases could not be verified. In our hospital, FAST was done by an experienced consultant radiologist in all the cases. In our series, FAST was positive in four and negative in one patient. Characterisation of the nature of injury was possible in none of the patients on sonography in our series. Persistent symptoms in the form of abdominal pain, vomiting and fever prompt a surgeon to subject the patient to more extensive studies like CECT abdomen. CECT abdomen was done in all of the cases in our series. The diagnostic value of computed tomography (CT) is very high in traumatic duodenal injury. All five patients in our series underwent surgical exploration after confirmation of injury by CECT. Operative findings corresponded to radiological findings in all the patients except in one patient in which CT showed jejunal injury.

Although IDI is very rarely reported in literature, the principles of surgical repair remain the same. Primary repair of the laceration was done in all the cases. The decision for FJ was made based on the individual surgeon's preference. Two out of five patients underwent peroperative FJ that helped in the early initiation of feeds in the post-operative period. Abdominal drain was placed in four out of five cases and was removed well before discharge in all but one patient. In case three, the patient had surgical site infection with prolonged drainage, which required daily dressings. Since the patient was from a nearby place, he was discharged along with the drain with the advice to follow daily for dressings. There was one surgical site infection and one minor leak that settled with conservative means. The hospital stay was prolonged in cases (Cases 2 and 3) where surgical exploration was delayed due to late diagnosis. However, one patient of a delayed diagnosis (Case 5) had uneventful and fast recovery. This was due to the fact that the perforation had sealed with a contained collection. In fact, this patient had obstructive

symptoms due to extrinsic compression of the collection over the duodenum.

Conclusion

IDI is very rare in BTA and diagnosis is facilitated by taking into account the exact mode of trauma and meticulous clinical examination. Besides this, persistent clinical symptoms are sufficient to raise a suspicion of duodenal injury and abdominal CECT should not be delayed even if FAST is not suggestive of significant IAI. A meticulous primary repair suffices in most of the cases; however, a consideration of FJ is a good option for starting early enteral feeds in the post-operative period.

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Conflicts of interest

There are no conflicts of interest.

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