

Obstructing Intramural Duodenal Hematoma Following Relatively Minor Trauma in a Child: A Report of a Case Managed Surgically and Discussion of Relevant Treatment Options

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Citation

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Abstract

Injuries to the duodenum are uncommon due to its retroperitoneal location, although not rare. They represent approximately 3-5% of abdominal injuries. Duodenal injury secondary to blunt trauma continues to pose a diagnostic challenge. We report a case of a 13-year-old female with duodenal hematoma and we review the literature to evaluate the cause, radiologic findings and operative versus non-operative management.

A 13-year-old female presented to the emergency department referred from an outside clinic. The child ran into a chain-link fence 2 days prior. She developed abdominal pain, nausea and vomiting which persisted. A CT scan showed a large hematoma in the third portion of her duodenum. She was started on bowel rest and nasogastric suctioning. But even after 2 hours, her nasogastric output continued to be high and there was no resolution of the symptoms or size of the hematoma. She underwent a diagnostic laparoscopy which was converted to an exploratory laparotomy with evacuation of duodenal hematoma, repair of duodenotomy and repair of SMV venotomy. Her recovery was unremarkable.

Prompt diagnosis and treatment of blunt duodenal injury (BDI) is crucial, with evidence suggesting that a delay in diagnosis and treatment of more than 24 hours after injury can increase mortality from 11% to 40%. Duodenal hematomas result from compression of the duodenum against the vertebral column, whereas perforations potentially develop from shearing forces or from simultaneous closure from the pylorus and the fourth part of the duodenum, resulting in increased intraluminal pressure and a blowout. In addition, associated intra-abdominal injuries (pancreas, spleen, liver, and kidney) are common and usually determine overall mortality and morbidity.

Treatment of BDI depends on the extent and severity of bowel injury and the presence or absence of perforation. The majority of duodenal hematomas can be managed non-operatively, evidence of duodenal perforation requires surgical exploration. The majority of perforations in children were managed with simple surgical techniques with 80% undergoing primary repair (duodenorrhaphy). The majority of injuries were secondary to motor vehicle collisions. Pancreatic injuries were commonly associated. Early diagnosis is critical as was demonstrated by Lucas and Ledgerwood in 1975. Mortality for BDI treated within 24 hours was 11%, compared with a rate of 40% if delayed for more than 24 hours. Interval from injury to operation is the most important risk factor determining the incidence of morbidity and mortality. Currently, computed tomography with intravenous contrast is the diagnostic test of choice in stable patients with blunt abdominal trauma. The presence of retroperitoneal extraluminal air on CT is an important sign of BDI requiring surgical repair. The use of the duodenal Organ Injury Scale will facilitate the surgical management of these injuries, and the development of protocols.

INTRODUCTION

Traumatic intramural duodenal hematoma (IDH) in children occurs in 2 to 3% of blunt abdominal trauma (1,2). Anatomic factors such as duodenal retroperitoneal fixation, position in front of the vertebral column, the rich submucosal and subserosal vascular plexus, and a weak muscular abdominal wall, are all contributory to the development of IDH. The

close duodenopancreatic relationship explains why traumatic pancreatitis is the most commonly associated intraabdominal injury in IDH. Jewett et al. (1), in a revision of 182 cases of IDH in children, found that 21% had associated pancreatitis.

The responsible blunt abdominal trauma is at times so trivial that in many occasions the child cannot remember it (3).

Handlebar trauma, road traffic injury and sports trauma are

the common etiologic factors (_{4,5}). In addition, child abuse should always be kept in mind, mainly in children under the age of 5 (_{6,7}). Clotting disorders represent an additional factor that can be a cause for the development of IDH even with minimal or endoscopic trauma (₈).

Presently, conservative measures are the first management choice in the great majority of cases. Different opinions still exist regarding diagnostic procedures and timing of surgery, if necessary.

There are few reports of operative management of duodenal injuries in children.

The treatment of duodenal injuries is based on the mechanism, severity of injury, associated injuries to intra- and extra-abdominal organ systems, and duration of delay in diagnosis (₉). Complications, such as fistula formation, are more common after the repair of duodenal injuries (2%-14%) than in the operative repair of stomach, small intestine, or colon injuries. Thus, techniques such as the serosal patch, transverse primary repair, duodenal diverticularization, pyloric exclusion, and duodenojejunostomy have been used to circumvent this morbid complication (_{10,11}). As mortality and morbidity have improved with advances in patient resuscitation and the availability of contemporary diagnostic technology, the use of more extensive operative techniques such as pyloric exclusion with gastrojejunostomy have been questioned (₁₂).

CASE REPORT

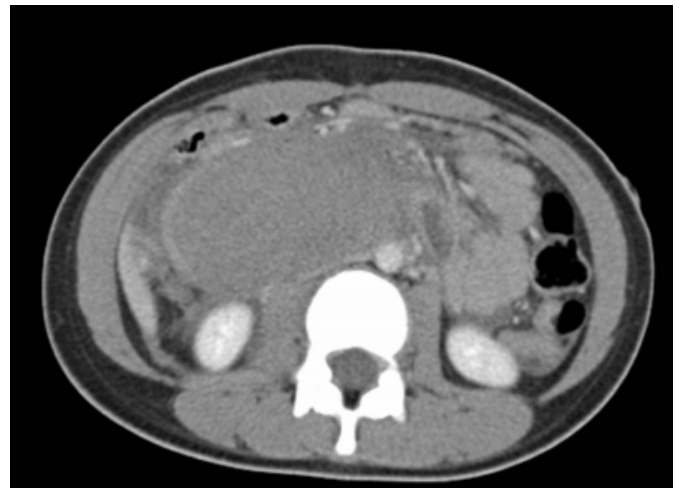
A 13-year-old female was admitted in an outside hospital after she ran into a chain-link either fence or chain on Halloween and presented with acute abdominal pain, sharp and crampy in nature, mostly distributed in the epigastric and right upper quadrant. She developed nausea and vomiting later in that evening, initially clear, gradually progressing to bilious in nature. Her initial scan in an outside hospital showed a large hematoma in the third portion of her duodenum

She was transferred to Santa Clara Valley Medical Center for subsequent management. On admission, she was clinically stable and in no obvious discomfort. Her abdomen was soft, but slightly tender on deep palpation. She was afebrile with vitals within normal range with a WBC of 11.7. Her Hgb/Hct were stable at 11.3/33.9. Her LFTs were within normal limits with lipase slightly elevated at 190. Amylase was reported as 79.

On admission, helical CT was performed from the level of the diaphragm to the pubic symphysis with axial images of 5mm slice thickness obtained at 5mm intervals.

Figure 1

Figure 1: CT scan on hospital day 1 showing large hematoma in the third part of the duodenum measuring 11 x 5cm. There is a moderate amount of free fluid in the pelvis and paracolic gutters which may be secondary to bowel injury. Head and uncinate process of the pancreas are displaced, but no apparent injury or fracture is noted. No visceral solid organ injury is identified and no free air.



She was treated with bowel rest, I.V. fluids and nasogastric decompression. A decision was made to manage the patient conservatively and carefully monitor the vitals and lab results for any deterioration. Although the patient remained stable and her abdomen soft, she continued to have significant NG output. She was started on parenteral nutrition.

In spite of conservative treatment for 2 weeks subsequent to the initial injury, there was only marginal improvement in the child's condition. She continued to have increased NG output. A repeat CT showed the hematoma was completely obstructing her duodenum and the NG tube placed for the ensuing two weeks to see if the hematoma resolved spontaneously. After two weeks, there was no resolution of the symptoms or size of the hematoma. The decision was made to proceed with surgery.

OPERATIVE DETAILS

We decided to start with diagnostic laparoscopy. The 5mm step device was used to introduce a trocar and a 5mm 30 degree scope was advanced. Three additional ports were placed, two in the right upper quadrant and one in the left upper quadrant.

Initial attempts involved dividing the gastrocolic ligament allowing visualization of the area of hematoma. A needle was inserted to retrieve old blood. Eventually it seemed like there was way too much blood to be explained by an old hematoma and 5mm clips were placed to stop the bleeding.

A decision was made to proceed with exploratory laparotomy. Once inside, we were able to see that in fact the area that we had placed the clips on was probably more medial than the actual hematoma was. Upon further inspection, it appeared to be a venous structure. We were able to localize the injury to a very small 2mm long venotomy. We placed a curved vascular clamp to isolate that small injury and then closed the venotomy with a figure-of-eight suture of #5-0 Prolene. There was no further leak from that venotomy and the bowel appeared completely healthy without any sign of engorgement or ischemia.

The most difficult part of the dissection was freeing up enough duodenum to safely identify where the hematoma could be evacuated. Ultimately, a Kocher maneuver proved impossible to do due to the degree of inflammation associated with the hematoma. Eventually, we freed up enough of the duodenum to follow the first and second portions of the duodenum in a way that we could safely choose an area to enter the hematoma. Once again, we used a needle to localize the hematoma and ensure that we were in the right spot. Then we opened the area and were able to manually evacuate the formed clot that was in the hematoma.

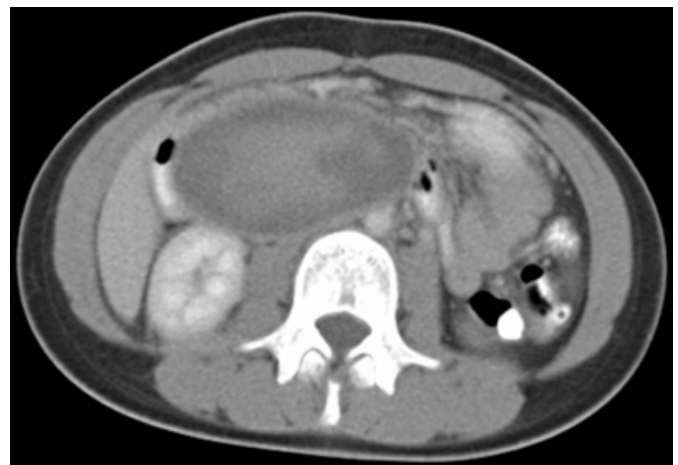
There was no bile leaking from this area so we assumed that the mucosa remained intact through this maneuver. In the course of performing the dissection, a small duodenotomy was created in the first portion of the duodenum. We closed it primarily using interrupted sutures of #3-0 Vicryl. We then reinforced our repair with some inflammatory peel that had been over the area. We secured that peel to the duodenum using interrupted sutures of #3-0 silk. We also placed an omental patch over that area again, securing the omentum to that area using a #3-0 silk suture. We closed the colonic mesentery where it had been opened a bit using a running suture of #3-0 silk. We then placed a 10mm flat Jackson-Pratt drain through one of the trocar sites and secured it at the exit site with a #4-0 nylon suture. We placed the JP drain in the area overlying the omental patch and just adjacent to the area where the duodenal hematoma had been evacuated.

The abdomen was irrigated and meticulous hemostasis

secured. The patient tolerated the procedure well. At the end of the case, the patient was stable hemodynamically and she was transferred to the intensive care unit for continued monitoring.

Figure 2

Figure 2: CT scan on hospital day 13 showing an approximately 9.0 x 5.4 x 6.1cm heterogeneous mass involving the third portion of the duodenum which is stable in size and slightly more heterogeneous than on the previous examination. When compared to the previous examination (figure 1) the center of this mass is slightly lower in attenuation and may represent liquefying or evolving hematoma. A small amount of contrast is seen distal to the hematoma. No evidence of contrast extravasation or free air.



DISCUSSION

Injuries to the duodenum are uncommon due to its retroperitoneal location, although not rare. They represent approximately 3-5 % of abdominal injuries. More than 70% of intramural duodenal hematomas in children are trauma related.

The first reported case of IDH in 1938 was believed to be a pseudoaneurysm between the mucosa and muscular layers (₁₃). Since then data have accumulated from isolated cases or small series (₁₄). It soon became apparent that when the duodenum is pressed against the lumbar spine by a traumatic agent, the resulting contusion and bleeding can generate a hematoma. This hematoma can increase and gradually obstruct the lumen. IDH has been diagnosed at all ages and in both sexes but the pediatric male is the most affected (₁₅). The diagnosis of IDH is based on signs and symptoms of high intestinal obstruction following trauma, supported by radiologic evidence of duodenal obstruction (₁₆). The best imaging tool is an enhanced CT, although ultrasound and barium meal are also useful. Endoscopic studies and

magnetic resonance imaging are performed in isolated cases when clinical data and conventional techniques are inconclusive (^{17,18,19}). MRI typically shows a three-layered ring sign (²⁰).

The principles of conservative management are based on nasogastric decompression and total parenteral nutrition. If pancreatitis is present, it should be addressed properly. Somatostatin should be used in cases of severe duodenopancreatic damage.

When severe duodenopancreatic damage is present, simple hematoma drainage is not enough. In these rare cases, duodenal repair with or without proximal decompression is an option (⁹). A recent report has cited an adult with IDH successfully treated by a CT-guided percutaneous procedure, following conservative treatment failure (²¹).

In most cases, hematoma resolution is completed after 2 weeks of treatment. Surgical exploration is considered if there is no clinical improvement and the hematoma does not regress within 2 weeks (¹⁷). Manipulation should be very gentle to avoid additional trauma to the explored organs. Pancreatic damage and the degree and extent of duodenal injury are evaluated (²²).

In most cases, a radial incision to evacuate the hematoma is all that is needed. Mucosal injury should be avoided to reduce the hazard of leakage. Experience has proven that clot drainage is easily achieved by an incision at the duodenojejunal junction, and not at a previously traumatized duodenal wall. The serosal incision is often left open to heal spontaneously. Some experts believe there is no need to look for the bleeding vessels since they are usually thrombosed.

The degree of duodenal injury and surgeon preference have often determined the type of technique used in repair. In addition to the method of pyloric exclusion, alternative techniques more recently applied to the treatment of duodenal perforation have shown promise, though each have been demonstrated in only small series. Duodenal decompression by a lateral duodenostomy tube or placement of a retrograde jejunostomy tube has been shown by Shilyansky et al. (²³) to reduce duodenal fistula rate and morbidity. Improvement in outcome from duodenal repair has also been described by Ginzburg et al (¹²) with pyloric exclusion and proximal tube decompression without gastrojejunostomy. However, pyloric exclusion with gastrojejunostomy has been advocated in adults and children

for the repair of more severe duodenal injuries despite its more invasive nature (^{11, 23, 24}).

CONCLUSION

Intramural duodenal hematoma has many clinical and therapeutic puzzling aspects. Bicycle handlebar, road accidents and sports trauma are the main etiologic factors in children, but child abuse should be kept in mind. Associated traumatic pancreatitis is common. Gastroduodenal endoscopy may be useful to clarify doubtful cases. Pediatric surgeons should increase awareness regarding IDH in order to reduce delay in diagnosis and the need for surgical decompression.

Prompt diagnosis and treatment of blunt duodenal injury is crucial, with evidence suggesting that a delay in diagnosis and treatment of more than 24 hours after injury can increase mortality from 11% to 40%. Conservative treatment of IDH is highly successful, mainly in early diagnosed cases. When surgery becomes imperative, clot drainage is simple to achieve and will suffice to relieve obstruction in the vast majority of patients.

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