

Evaluation and surgical repair of retroperitoneal duodenal perforation following blunt trauma: A case report

Rashmi Ranjan Sahoo, Abhinav Voona, Nalini Naik, Jyotirmay Jena

Authors Affiliation:

Department of Surgery, Institute of Medical Sciences and SUM Hospital, Siksha O Anusandhan University, Bhubaneswar-751003, Odisha, India

Correspondence:

Rashmi Ranjan Sahoo
drashmi1278@gmail.com

Submitted: April 2024

Accepted: October 2024

Published: February 2025

Citation: Sahoo et al Evaluation and surgical repair of retroperitoneal duodenal perforation following blunt trauma: A case report. *South Sudan Medical Journal*, 2025;18(1):28-32 © 2025 The Author(s) **License:** This is an open access article under [CC BY-NC](https://creativecommons.org/licenses/by-nc/4.0/) DOI: <https://dx.doi.org/10.4314/ssmj.v18i1.6>

ABSTRACT

Isolated horizontal duodenal injuries resulting from blunt abdominal trauma are exceedingly rare, primarily due to the retroperitoneal location of the duodenum. This anatomical characteristic often leads to delayed diagnoses. A 61-year-old man presented to the emergency room following an assault by a bull. He complained of severe abdominal pain, vomiting, and fever. Imaging revealed a perforation on the anterior wall of the third part of the duodenum. However, during the laparotomy after Kocherisation (a way of exposing the duodenum to get better access), an additional posterior wall perforation at the same duodenal site was identified. Tension-free transverse primary repair was performed for the anterior and posterior wall perforations, with duodenal decompression procedures. Drains were placed accordingly. The patient recovered well, with gradual resumption of feeding and subsequent removal of drains. He was discharged after 15 days, demonstrating successful recovery without complications.

Keywords: horizontal duodenal perforation, surgical repair, bull attack, India

Introduction

Isolated horizontal duodenal injuries resulting from blunt abdominal trauma are exceedingly rare, primarily due to the retroperitoneal location of the duodenum. This anatomical characteristic often leads to delayed diagnoses.

We present a case report on the surgical repair of retroperitoneal duodenal perforation following blunt trauma.

Case Presentation

A 61-year-old male, having been attacked by a bull, presented four days later to our emergency department. Following the incident, he developed sudden and progressively worsening abdominal pain radiating to his back. He also had multiple episodes of bilious vomiting for two days followed by intermittent feverishness without chills or rigors.

On general examination, the patient appeared sick with the heart rate of 98 beats/min, blood pressure 108/75 mm of Hg, temperature 37.6°C, and respiratory

rate 14 breaths/min, were normal. There was abdominal distension and generalized tenderness and guarding, particularly in the right iliac fossa. Bowel sounds were absent on auscultation. A FAST (Focused Assessment with Sonography in Trauma) examination revealed the presence of free fluid collection in the right iliac fossa and dilated small bowel loops. The working provisional diagnosis was a haemoperitoneum.

Blood investigations were normal and showed the following: Hb: 11.8gm/dL, WBC: $6.74 \times 10^3/\mu\text{l}$. Serum amylase: 66 IU/L, serum lipase: 40.1 IU/L). A chest x-ray was normal. An erect abdominal x-ray revealed dilated small bowel loops without air under the diaphragm. Since the patient was haemodynamically stable, a contrast-enhanced CT (CECT) scan of the abdomen and pelvis was planned. This showed a 12mm perforation on the anterior wall of the third segment of the duodenum, with a peripherally enhancing air mixed collection measuring 7.6 x 7.2 cm causing compression of the right upper ureter. These findings indicated a post-traumatic retroperitoneal duodenal perforation. An emergency laparotomy was arranged. At operation, around 750 ml of bilious fluid was present in the peritoneal cavity and a perforation of size 2cm on the anterior wall of the third segment of the duodenum (Figure 1).

After surgical Kocherisation, a posterior wall perforation of size 1.5cm of the third portion of the duodenum was also discovered (Figure 2). The remaining parts of the intestine

and visceral organs were normal. Tension-free transverse primary repair of both the anterior and posterior wall perforations was done in a double-layered fashion (Figure 3), followed by tube duodenostomy, which was placed proximal to the repaired site in a retrograde manner, and side by side gastrojejunostomy and feeding jejunostomy 15-20 cm distal to the gastrojejunostomy (Figure 4).

Two drains were placed in the subhepatic space and in the pelvis, respectively. A nasogastric tube was placed for gastric decompression. (Tube duodenostomy is to divert bile from the duodenum for better healing of the primary duodenorrhaphy and anastomosis site. Side by side gastrojejunostomy is to bypass the duodenum from gastric contents. Feeding jejunostomy is for early initiation of enteral healing (ERAS Protocol) for better healing of the primary repair and anastomosis. Drains in the subhepatic space and pelvis were to identify any intraperitoneal haemorrhage/leak from the anastomosis.)

On postoperative day (POD) 2, feeding through the feeding jejunostomy tube was started and changed to orally on POD 7. The pelvic drain was removed on POD 8, and the subhepatic drain was removed on POD 12. There was no evidence of any leak or collection and the patient was discharged on POD 15. Feeding jejunostomy and retrograde duodenostomy tubes were removed after two weeks post-discharge. The rest of the postoperative course was uneventful.



Figure 1. Anterior wall perforation

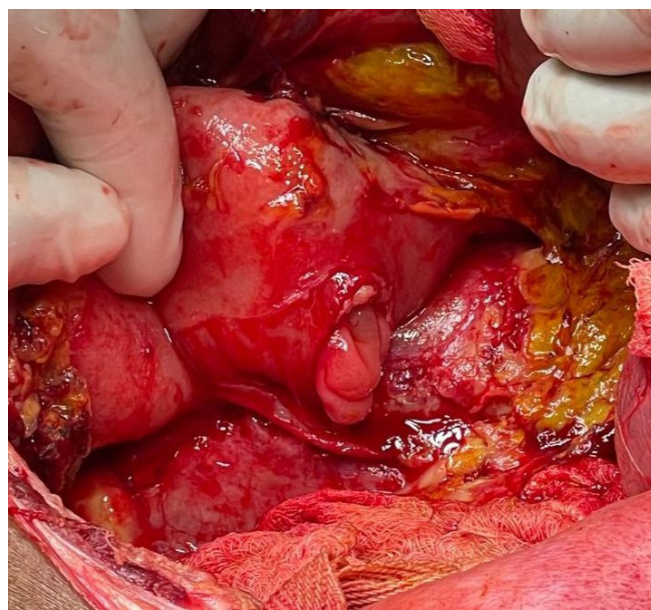


Figure 2. Posterior wall perforation of third segment of the duodenum

Case Report

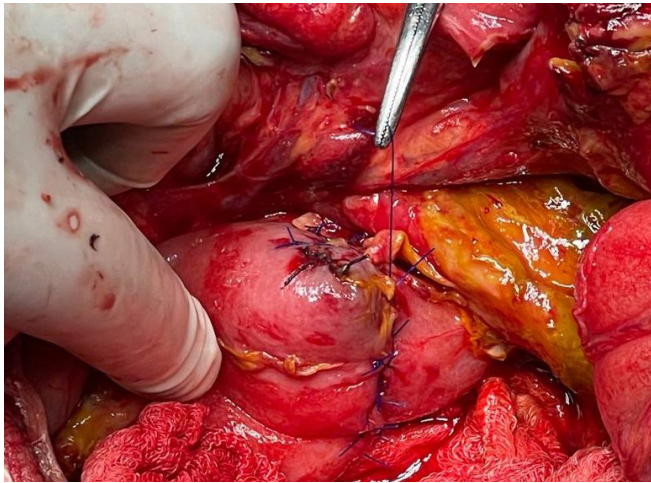


Figure 3. Primary closure of the perforation

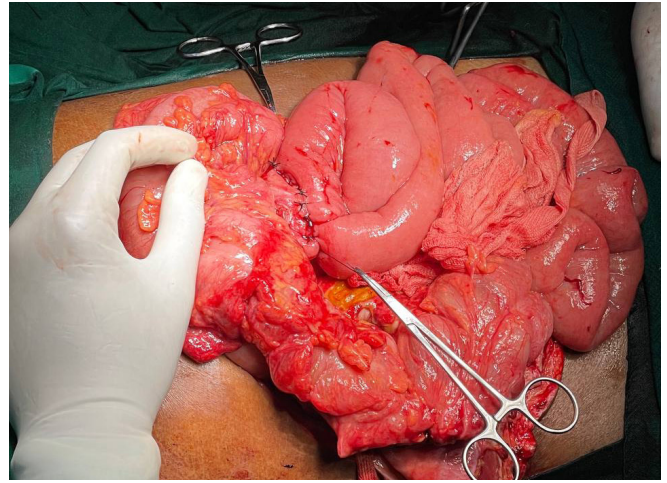


Figure 4. Gastrojejunostomy

Discussion

Injuries to the duodenum are uncommon after abdominal injury, representing 2-3% of all abdominal injuries. Blunt injury constitutes 22% of all duodenal injuries.^[1] Perforations in the second and third parts of the duodenum are mainly involved during blunt injuries.^[1] Blunt injury can directly compress the duodenum against the thoracic vertebrae or sudden closure of the pylorus and duodeno-jejunal flexure, simultaneously making it a closed bowel loop, sharply increasing pressure within it, leading to perforation.^[2] The duodenum is closely related to the pancreas, major blood vessels, and other visceral organs all of which may be injured at the same time. Isolated duodenal injuries are uncommon, accounting for less than 30%.^[3] Duodenal injury may not cause noticeable symptoms, especially in blunt trauma cases, making the diagnosis difficult.^[4] However, intra-abdominal injuries may be suggested by abdominal tenderness and other signs of peritoneal irritation, although these signs are not exclusive to duodenal injury.^[4]

FAST (Focused Assessment with Sonography in Trauma), Abdominal erect abdominal, and chest X-ray may help with diagnosis. A CT scan with both IV and oral contrast media is the most useful approach. Patients with haemodynamic instability and suspected internal injuries require immediate laparotomy, while a patient who is haemodynamically stable may undergo CT imaging.^[3] The CT imaging of our patient showed a perforation on the anterior wall of the third segment of the duodenum with a surrounding fluid collection. At operation a

separate posterior wall perforation was found.

The American Association for the Surgery of Trauma (AAST) has graded duodenal injuries to standardize local and regional disruptions, which aids in characterizing the damage and management strategy (Table 1).^[3] According to AAST grading our patient belongs to Grade 2 (Involving less than 50% of circumference).

A variety of techniques are used for the management of duodenal injuries, including primary repair with or without tube duodenostomy, resection, and anastomosis, duodenal diverticulization, gastrojejunostomy with or without pyloric exclusion and pancreatico-duodenectomy. These management techniques are planned according to the degree of duodenal injury and associated injuries. Our patient had perforations of the anterior and posterior walls of the third segment of the duodenum and underwent double-layered primary closure and retrograde tube duodenostomy placed proximal to the duodenorrhaphy, and gastrojejunostomy. There were no postoperative complications.

It is essential to be aware of the potential complications: leakage from the repaired or anastomosis site, intraperitoneal abscess formation, duodenal fistula formation, and bowel obstruction. The risk of duodenal leak varies depending on the severity of the injury and the segment of the duodenum affected. For example, the American Association for the Surgery of Trauma classification (AAST) Grade I wounds have a low risk of leakage at approximately 0%, AAST Grade II injuries have a chance of 1.6%, and AAST Grade III injuries have

Table 1. AAST Grading for duodenal injuries

Grades	Injury description
1	Haematoma: involving one part of the duodenum Laceration: partial thickness, no perforation.
2	Haematoma involving more than one part of the duodenum Laceration: <50% circumference disruption
3	Laceration: 50-75% circumference of D2 and/or 50-100% circumference of D1, D3, D4
4	Laceration >75% circumference of D2 Involvement of the ampulla or distal common bile duct
5	Laceration: complete rupture of the pancreatico-duodenal complex Blood vessels: decreased blood supply to the duodenum (devascularization)

a significantly higher risk of 66.7%. Furthermore, the risk of duodenal leak varies across different segments of the duodenum, with “First segment of duodenum (D1) having a chance of 32%, second segment (D2) at 12.5%, third segment (D3) at 38.5%, and fourth segment (D4) at 16%”.^[4]

A report by Nepal et al. described three cases of horizontal duodenal perforation due to various causes.^[5] These cases were managed variously with duodenojejunostomy, tube duodenostomy, tube gastrostomy, and feeding jejunostomy. However, two cases had anastomosis site leaks, one with pelvic abscess formation.

According to the Pan American Trauma Society, primary closure was considered the preferred management approach for duodenal injuries, regardless of the grade.^[4] Additionally, combining suppression of bile and pancreatic secretions, with a nasogastric tube or tube duodenoscopy, has been shown to improve outcomes by reducing the risk of leakage.^[4] Alternative surgical approaches may be needed, depending on the condition of the injured bowel and any associated injuries. Although CT scans are the preferred diagnostic tool, they can sometimes be inconclusive or miss specific pathologies, as demonstrated in our case. It is crucial to thoroughly expose the duodenum and examine other organs to ensure that associated pathologies are not overlooked. This comprehensive approach facilitates the

adoption of optimal management strategies, ultimately reducing morbidity and mortality rates.

Conclusion

Duodenal injuries are infrequent and pose diagnostic challenges due to the absence of specific clinical manifestations. Comprehensive intraoperative assessment, encompassing meticulous duodenal exposure, is imperative for identifying concomitant pathologies that may elude detection via imaging modalities in isolation. The management of duodenal injuries, employing primary closure augmented by decompression techniques and other interventions, has exhibited favourable outcomes, accompanied by a diminished incidence of postoperative complications. These findings underscore the criticality of a thorough clinical and investigative approach, ensuring optimal management and minimizing untoward sequelae in individuals with duodenal injuries.

References

1. Luo Y, He X, Geng L, Ouyang R, Xu Y, Liang Y, Wu J, Zhang H, Ye Z, Zou R, Wu Q, Chai C. Diagnosis and treatment of traumatic duodenal rupture in children. *BMC Gastroenterol* 2022;12;22(1):61.

Case Report

2. Linsenmaier U, Wirth S, Reiser M, Körner M. Diagnosis and classification of pancreatic and duodenal injuries in emergency radiology. *Radiographics* 2008;28(6):1591-602.
3. Miguel Aceves-Ayala J, Jacob Álvarez-Chávez D, Elizabeth Valdez-Cruz C, Felipe Montoya-Salazar C, Alfredo Bautista-López C, Alberto Ortiz-Orozco C, et al. Management of Duodenal Injuries [Internet]. *Topics in Trauma Surgery*. IntechOpen; 2023. <http://dx.doi.org/10.5772/intechopen.108135>
4. Nepal P, Maemura K, Mataka Y, Kurahara H, Kawasaki Y, Hiwatashi K, Iino S, Sakoda M, Arigami T, Ishigami S, Shinchi H, Natsugoe S. Management of horizontal duodenal perforation: a report of three cases and review of literature. *Surg Case Rep* 2017;1;3(1):119.
5. Balasubramanian G, Vijayakumar C, Anbarasu I, Sudharsanan S, Raj Kumar N, Baskaran D. Isolated rupture of duodenum following blunt trauma abdomen: report of a case of avulsion of pylorus. *Int Surg J* 2017;4:2845-7
6. Luther A, Mann C, Hart C, Khalil K. Duodenal rupture secondary to blunt trauma from a football. *J Surg Case Rep* 2013;2013(1):rjs041.