

Effective Management of Traumatic Duodenal Transection Using Primary Closure, Triple Tube Decompression, and Omental Patch: A Case Report

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Abstract: Duodenal injuries are rare, comprising approximately 3–5% of abdominal traumas, and are often accompanied by other organ injuries due to the duodenum's retroperitoneal location. Their diagnosis can be challenging, frequently resulting in delays that increase morbidity and mortality. A significant complication is anastomotic leakage post-repair, primarily due to the duodenum's exposure to substantial volumes of gastric, biliary, and pancreatic secretions. These factors necessitate prompt recognition and appropriate surgical intervention to improve patient outcomes [1]. Berne's duodenal diverticulization, introduced in 1968, is a surgical technique designed to manage complex duodenal and pancreatic injuries. It involves closure of the duodenal injury, gastric antrectomy with end-to-side Bill Roth II gastrojejunostomy, tube duodenostomy, and abdominal drainage to divert gastrointestinal contents and protect the repair site [2], Pyloric exclusion [3], reverse tube duodenostomies [4] as a protection for primary repair. In this case report, we present an isolated traumatic duodenal injury managed with primary repair, triple tube decompression, and an innovative omental patch technique. This approach effectively protected the duodenal suture line and facilitated healing. Similar strategies have been employed in paediatric cases, such as a 10-year-old boy with a complete duodenal transection, who underwent primary closure with omental reinforcement and triple tube decompression, resulting in an uneventful recovery.

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I. INTRODUCTION

A 19-year-old male presented to the emergency department 12 hours after sustaining blunt abdominal trauma in a road traffic accident. He was conscious, alert, and hemodynamically stable, with a Glasgow Coma Scale score of 15/15. The patient denied experiencing hematemesis or melena but reported vague upper abdominal pain. On physical examination, there was mild tenderness localized to the right hypochondrium, without signs of peritonitis or abdominal distension. No external bruising was noted, and bowel sounds were sluggish. Digital rectal examination yielded normal findings, and there were no abnormalities detected upon examination of the respiratory, cardiovascular, or central nervous systems.

➤ Investigations:

Focused Assessment with Sonography for Trauma (FAST) revealed mild free fluid in the peritoneal cavity, suggesting possible intra-abdominal injury. Erect abdominal X-ray showed no evidence of free gas under the diaphragm, indicating the absence of perforation into the peritoneal cavity. Contrast-enhanced computed tomography (CECT) of the abdomen with both oral and intravenous contrast agents identified a leak originating from the second part of the duodenum, accompanied by a moderate retroperitoneal fluid collection. The pancreas appeared normal, and no other significant abnormalities were noted.

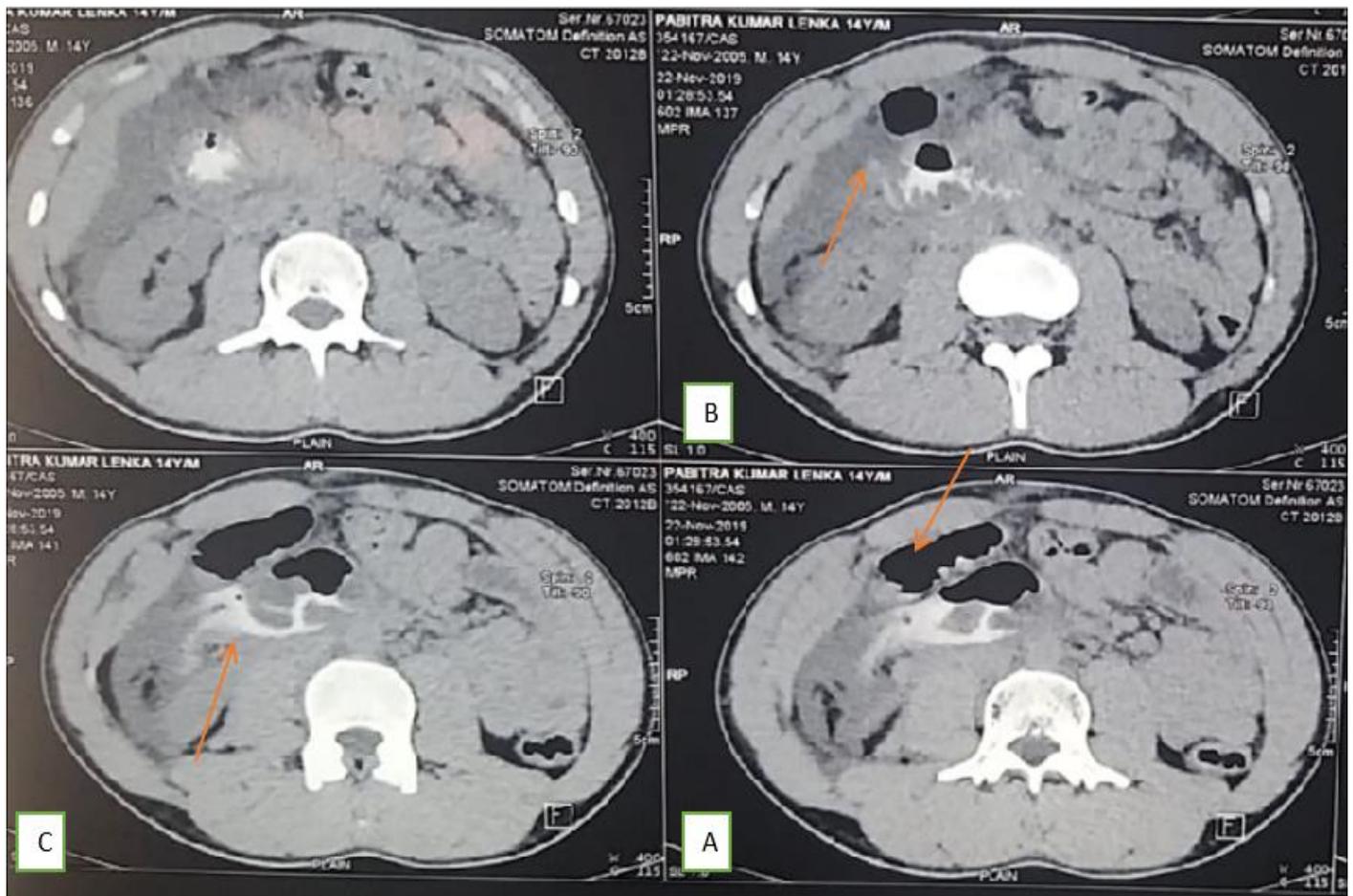


Fig 1 A) Initial plain CT with oral Contrast Showing Normal 1st part Duodenum with uptake of contrast (Notice Contrast with in the lumen of bowel). B) Collection in Retroperitoneal fascial planes. C) Contrast leak from Second part of Duodenum (Notice, no contrast within bowel lumen)

➤ *Operative Findings:*

Upon performing an exploratory laparotomy, we observed a greenish discoloration in the right paracolic gutter, indicative of bile-stained fluid, and a hematoma within the transverse mesocolon. The lesser sac was entered to assess

the pancreas, which appeared normal. The second part of the duodenum exhibited approximately 80% transection, with the pancreatic side remaining intact. The remainder of the bowel and solid abdominal organs were unremarkable.

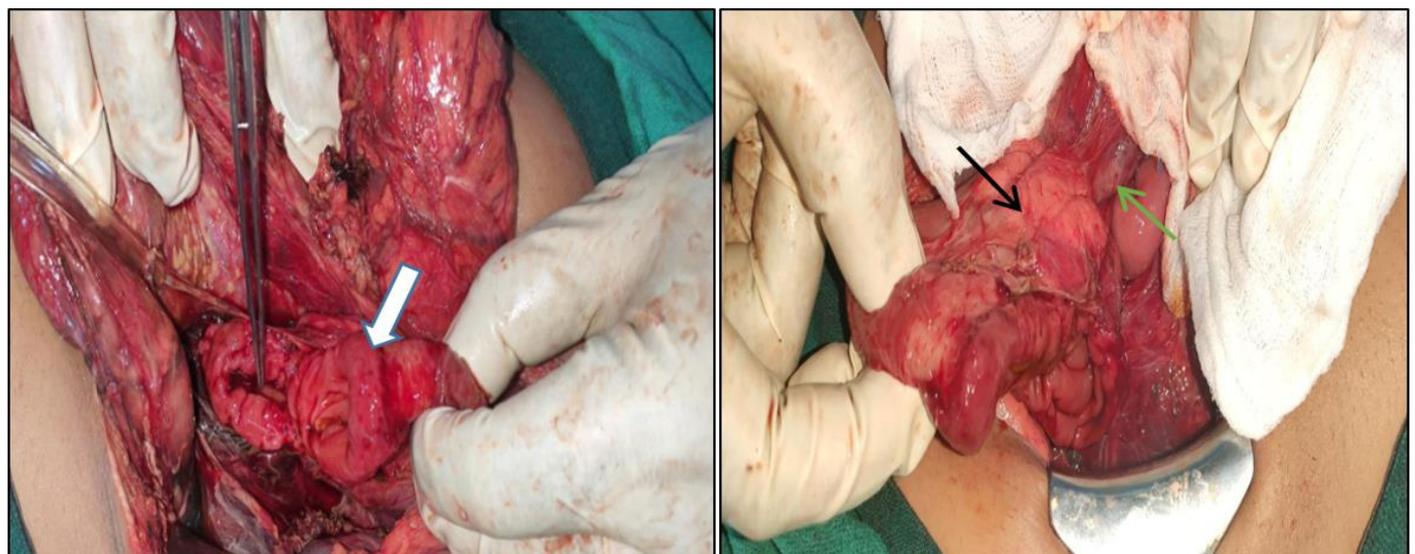


Fig 2 Transected second part of the Duodenum with Edematous Margins (white arrow), Adjacent Pancreas (black arrow), and Superior Mesenteric vein (green arrow), following Cattell-Braasch Maneuver and Kocherization.

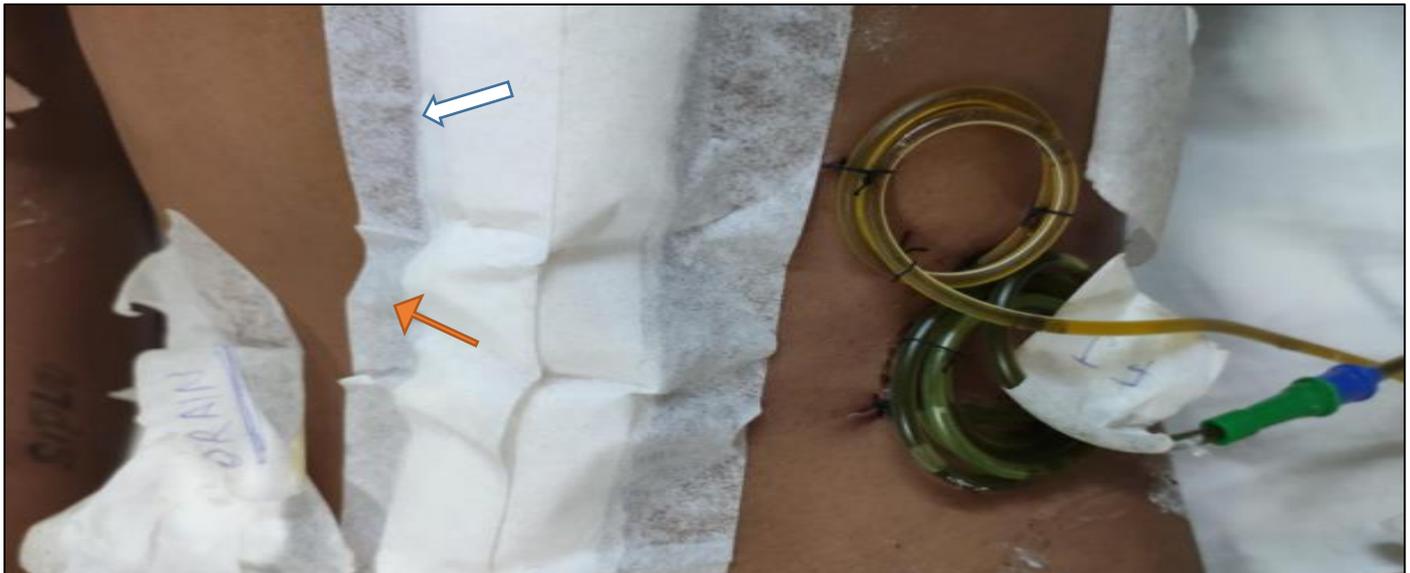


Fig 3 Postoperative Period Picture Showing Reverse Jejunostomy tube (white arrow) and feeding Jejunostomy tube (red arrow)

➤ *Operative procedure:*

Exploratory laparotomy was performed, during which the Cattell-Braasch maneuver was utilized to mobilize the right colon, cecum, and small intestine from the retroperitoneum, providing access to the superior mesenteric vein and facilitating visualization of the duodenum and pancreas. Subsequently, the Kocher maneuver was employed to medially mobilize the duodenum and pancreas, allowing for enhanced exposure of the posterior duodenum and adjacent structures.

Upon inspection, an isolated transection of the second part of the duodenum was identified, accompanied by bile accumulation within the retroperitoneal fascial planes. The transected duodenal margins were edematous; therefore, they were debrided, and a single-layer continuous primary closure was performed using 3-0 PDS sutures. An omental patch was then placed over the anastomosis site to reinforce the repair and mitigate the risk of leakage.

To ensure adequate decompression and protect the anastomosis, a triple-tube decompression strategy was employed. This included the placement of a retrograde jejunostomy tube (12 Fr) extending from the proximal jejunum to the anastomotic site for bile drainage, a feeding jejunostomy tube distal to the anastomosis for nutritional support, and a nasogastric tube for gastric decompression.

➤ *Postoperative Management:*

Postoperatively, the patient was closely monitored for signs of infection, anastomotic leak, and electrolyte imbalances. Nutritional support was initiated via the feeding jejunostomy tube, and enteral feeding was progressively advanced as tolerated. The patient remained hemodynamically stable throughout the recovery period. The postoperative course was uneventful, and the patient was discharged on postoperative day 12 with all tubes in situ. At the one-month follow-up, the patient was tolerating oral intake without complications.

This case underscores the efficacy of combining primary duodenal repair with triple-tube decompression and omental patch reinforcement in managing isolated blunt duodenal injuries. Such an approach provides adequate decompression, protects the anastomotic site, and facilitates optimal healing, thereby improving patient outcomes.

II. DISCUSSION

Duodenal injuries resulting from abdominal trauma are relatively uncommon, accounting for approximately 3% to 5% of such cases. These injuries are often accompanied by damage to adjacent organs due to the duodenum's anatomical proximity to major vessels and other visceral structures [5]. Isolated duodenal injuries, without concurrent pancreatic involvement, are particularly rare, occurring in about 0.6% of duodenal trauma cases [6].

In the case presented, the patient exhibited an isolated injury to the second part of the duodenum, with no evidence of pancreatic damage observed during both radiological assessment and intraoperative examination [7]. However, postoperative elevations in serum amylase and lipase levels—exceeding twice the normal values—suggest the possibility of an undetected minor pancreatic injury.

Diagnosing duodenal injuries can be challenging, as classic signs of peritonitis are often absent. Consequently, diagnosis frequently relies on imaging studies or becomes apparent only after pathophysiological changes have occurred. In this instance, the patient presented 12 hours post-injury with nonspecific upper abdominal tenderness and no peritoneal signs. A definitive diagnosis was achieved through an oral contrast-enhanced CT scan, which revealed a leak in the second portion of the duodenum. This case underscores the importance of maintaining a high index of suspicion for duodenal injuries in patients with blunt abdominal trauma, even when symptoms are minimal. Oral contrast-enhanced CT imaging proves valuable for early detection in hemodynamically stable patients.

To standardize the assessment of duodenal injuries, the American Association for the Surgery of Trauma (AAST) has developed an injury severity scale. This scale grades injuries

from I to V based on the extent of tissue damage, ranging from hematomas and partial-thickness lacerations to complete transections and devascularization [8].

Table 1 AAST Organ Injury Scale for Duodenum

| Grade | Type of injury | Description |
|-------|---------------------|---|
| I | Hematoma Laceration | Involving single portion of duodenum Partial thickness-No perforation |
| II | Hematoma Laceration | Involving more than one portion of duodenum Disruption by <50% of circumference |
| III | Laceration | Disruption by 50-75% of circumference of D2 or Disruption by 75-100% of circumference of D1/D3/D4 |
| IV | Laceration | Disruption by >75% of circumference , involving ampulla or distal common bile duct |
| V | Laceration Vascular | Massive destruction of duodenopancreatic complex Devascularization of duodenum |

Based on the American Association for the Surgery of Trauma (AAST) classification, our patient sustained a Grade III duodenal injury, characterized by a 75% transection of the second portion of the duodenum, with preservation of the ampulla and bile duct [9]. Management options for such injuries include primary repair, pyloric exclusion with gastrojejunostomy, serosal patching, Roux-en-Y duodenojejunostomy[4], and pancreaticoduodenectomy. These procedures are typically reserved for hemodynamically stable patients presenting early and with minimal contamination.

Recent studies suggest that primary repair alone may suffice for many duodenal injuries, including Grade III lesions, without the need for pyloric exclusion[10] or more complex procedures. In our case, considering the edematous and unhealthy margins of the transected duodenum[11], we opted for primary repair augmented by triple-tube decompression to protect the anastomosis and facilitate healing.

The triple-tube decompression technique involves the placement of a nasogastric tube for gastric decompression, a retrograde jejunal tube directed toward the duodenal repair site to divert bile, and a feeding jejunostomy distal to the anastomosis for enteral nutrition[12]. This approach has been shown to be effective, relatively simple, and beneficial in managing complex duodenal injuries[13].

While omental patching is a well-established technique in the repair of perforated peptic ulcers, its application in traumatic duodenal injuries is less documented[14]. In this case, we employed an omental patch over the anastomotic site, aiming to reinforce the repair and reduce the risk of leakage. Further studies are warranted to evaluate the efficacy of omental patching in traumatic duodenal injuries.

III. CONCLUSION

In cases of extensive isolated duodenal injuries with delayed presentation, primary repair augmented by triple-tube decompression remains a safe and effective surgical strategy. This approach facilitates adequate decompression and supports anastomotic healing, particularly in scenarios where tissue viability is compromised. Additionally, the incorporation of an omental patch over the repair site may offer further reinforcement, potentially reducing the risk of leakage in contaminated or inflamed operative fields. While

omental patching is well-established in the management of perforated peptic ulcers, its application in traumatic duodenal injuries warrants further investigation to substantiate its efficacy in this context.

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