**Laparoscopic management of Jejunal perforation following steering wheel injury**

**Abstract**

Jejunal perforation, a tear in the jejunum, can occur as a result of blunt abdominal trauma (BAT), such as impact from a steering wheel during a car or truck accident. This injury typically results from the sudden compression of the abdomen against the steering wheel, leading to a rapid rise in intraluminal pressure and causing a “blow-out” perforation. The jejunum, particularly near the ligament of Treitz, is prone to injury due to its relatively fixed position and proximity to the vertebral column. During blunt trauma, this segment can be compressed against the spine, resulting in perforation, commonly along the antimesenteric border, which is more vulnerable due to its thinner wall and less vascular support. Early recognition, prompt diagnosis, and timely surgical intervention are critical for improving outcomes in such cases. Both open and laparoscopic approaches are effective, though laparoscopic management has emerged as a safe and feasible option in hemodynamically stable patients, offering faster recovery and reduced morbidity. We present a case of 45-year-old truck driver who sustained blunt abdominal trauma in a road traffic accident and was found to have a jejunal perforation. The patient was successfully managed with laparoscopic surgery. Laparoscopic surgery is preferred in hemodynamically stable patients and offers the advantage of being both diagnostic and therapeutic. The perforation can be repaired using either intracorporeal or extracorporeal suturing techniques. Compared to traditional open surgery, laparoscopy is associated with less postoperative pain, faster recovery, shorter hospital stays, and potentially lower morbidity.

**Key words:** Jejunal perforation, Laparoscopic management, steering wheel injury, blunt abdominal trauma (BAT)

**Introduction**

Small bowel perforation is the third most common injury associated with blunt abdominal trauma (BAT), though it occurs in less than 1% of such cases. Isolated "blow-out" perforations of the jejunum are exceedingly rare, reported in only about 0.3% of BAT cases. The first case of intestinal perforation following blunt trauma was documented by Samuel Annan in 1937. [1,2,3]. Complications resulting from nonspecific small bowel ulcers have been reported previously, including intermittent small bowel obstruction, blood loss and acute abdomen. As the diagnosis can only be established after the exclusion of all other possible causes of small bowel ulcer, in case of acute abdomen, the diagnosis is seldom made preoperatively. For perforative peritonitis, regardless of the cause, laparotomy has historically represented the gold standard treatment (Al-Ozaibi et al., 2016).

Jejunal perforations typically occur along the antimesenteric border, a site more vulnerable due to its thinner wall and relative avascularity. These injuries are thought to result from a sudden increase in intraluminal pressure within a fluid- or air-filled bowel loop. The primary mechanisms involved in small bowel injury following blunt trauma include: Shearing forces due to differential motion between fixed and mobile bowel segments. Compression of the bowel between the anterior abdominal wall and the vertebral column. Burst or “blow-out” injury, caused by a sudden increase in intraluminal pressure. [9,10]

A “seat belt sign” on the abdomen is a clinical marker associated with a higher risk of underlying small bowel injury. Clinically, patients may present with abdominal pain, tenderness, guarding, and rigidity. [4,5,6]. The diagnosis can be notoriously difficult, especially in patients with multiple injuries, head trauma with impaired consciousness or in patient with minimal or slowly emerging clinical signs of peritonitis or hemoperitoneum. In such cases the diagnostic can be challenging and the treatment delayed for several hours or days. In developed countries these diagnostic problems seem to be solved by the use of unenhanced computed tomography to visualize hollow visceral and/or mesenteric injury after blunt abdominal trauma (Anzoua et al., 2022).

**Diagnostic Imaging:**

* Radiographic evidence of free air (pneumoperitoneum) on plain abdominal or chest X-rays may suggest a perforation.
* CT scan is the gold standard in the evaluation of bowel injuries and can detect perforations, mesenteric tears, and other intra-abdominal pathologies with high sensitivity.
* Focused Assessment with Sonography for Trauma (FAST) is useful for detecting free fluid in the abdomen but is less sensitive than CT in identifying bowel and mesenteric injuries. [1,2,3,4]

Surgical repair is the definitive treatment for small bowel perforation. Depending on the extent of the injury, procedures may include primary repair, resection of the damaged segment, and anastomosis. Both open and laparoscopic approaches are used, with laparoscopy being a feasible and effective option in hemodynamically stable patients. In some cases, delayed perforation may occur days or even weeks after the initial trauma. This may result from mesenteric ischemia, compression necrosis, or stricture formation, leading to late rupture. [4,5,6]

Jejunal perforation caused by steering wheel impact is a serious but potentially manageable condition when diagnosed early. In stable patients, laparoscopic surgery offers a minimally invasive and effective approach to managing these injuries, contributing to quicker recovery and reduced postoperative complications. [1,7,8]

**Case Presentation**

A 45-year-old male presented to our center on 20/10/2022 with complaints of severe abdominal pain following a road traffic accident 3 days back. The patient reported blunt abdominal trauma sustained during a head-on collision with another truck, in which his abdomen struck the steering wheel.

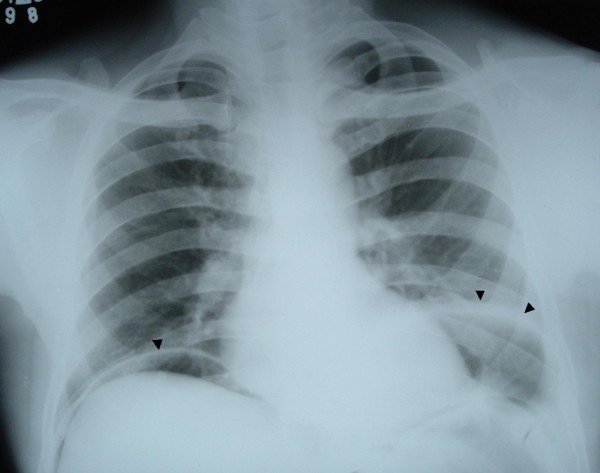
Clinical Examination and Investigations: On arrival, the patient was conscious, alert, and oriented. He exhibited a distended abdomen with marked tenderness, guarding, and rigidity. Vital signs revealed tachycardia with a pulse rate of 110/min and blood pressure of 130/90 mmHg.

Laboratory findings showed: Hemoglobin: 12.5 g/dL, total leukocyte count: 17,500/mm³ (with 82% polymorphonuclear cells) and renal function tests: within normal limits.

Imaging studies revealed: X-ray abdomen (erect view): Free air under the right dome of the diaphragm. Ultrasonography: Free fluid in Morrison’s pouch and pelvis, with no injury to solid organs (liver and spleen were normal). Diagnosis: Pneumoperitoneum suggestive of hollow viscus perforation

An emergency diagnostic laparoscopy was performed under general anesthesia using endotracheal intubation. Pneumoperitoneum was established with a Veress needle through an infraumbilical 10 mm trocar, maintaining intra-abdominal pressure at 12 mmHg. Two additional 5 mm trocars were inserted in the right and left iliac fossae.

A 30-degree laparoscope revealed approximately 1.5 liters of bilious fluid in the right subphrenic space, Morrison’s pouch, and pelvic cavity. Multiple pus flakes were noted throughout the abdomen and among the bowel loops. The bilious fluid was thoroughly aspirated using a suction cannula, and copious lavage was done with warm normal saline. Inspection identified an isolated 1 cm × 1 cm perforation on the antimesenteric border of the proximal jejunum, located approximately 5 cm distal to the ligament of Treitz. The surrounding jejunal loop was edematous. The perforation site was irrigated and cleaned. Intracorporeal two-layer closure of the jejunal perforation was performed using 2-0 Vicryl with a round body needle. A subhepatic drain was placed, which was removed on postoperative day 3. The patient had an uneventful recovery and was discharged on the 5th postoperative day in stable condition**.(Fig 1-8)**



**Fig-2. Ultrasonography revealed Ultrasonography: Free fluid in Morrison’s pouch and pelvis**

**Fig-1. X-ray revealed free air under the right dome of the diaphragm, suggestive perforation**

**Fig-4 Laparoscopic image shows a 1 cm × 1 cm perforation on the antimesenteric border of the proximal jejunum**

**Fig-3 Laparoscopic image shows approximately 1.5 liters of bilious fluid accumulated in the right subphrenic space, Morrison’s pouch, and pelvic cavity.**

**Fig-5** **Laparoscopic image demonstrates irrigation and cleansing of the perforation site.**

**Fig-6 Laparoscopic image shows intracorporeal suturing with 2-0 Vicryl sutures.**

**Fig-7 Laparoscopic image shows intracorporeal two-layer closure of the jejunal perforation using 2-0 Vicryl sutures.**

**Fig-8 Laparoscopic image shows a subhepatic drain was placed.**

**Discussion**

**Pathophysiology:**

Jejunal perforation resulting from blunt abdominal trauma, though relatively rare, can occur through multiple mechanisms and leads to serious intra-abdominal complications. The primary underlying cause is a sudden increase in intraluminal pressure within the jejunum, most commonly associated with deceleration injuries. When the bowel is compressed between an external force and the vertebral column—as in road traffic accidents—the resulting force can cause contusion, hematoma, and eventual perforation. [1,2,3,4]

**Mechanisms of Injury:**

* **Crushing Injury:**  
  Direct impact compresses the jejunum between the anterior abdominal wall and the posterior structures like the spine, resulting in tissue damage and potential perforation.
* **Shearing Forces:**  
  Acceleration-deceleration trauma produces shear forces at fixed points such as the ligament of Treitz. This can lead to near tears or complete perforation due to stretching or tearing of the bowel wall.
* **Increased Intraluminal Pressure:**  
  A rapid rise in pressure within a fluid- or gas-filled loop of jejunum—especially during forceful impact—can lead to rupture of the bowel wall, most commonly along the antimesenteric border. This “blow-out” type perforation is often sudden and severe.
* **Delayed Perforation:**  
  In some cases, perforation may not be immediate. Delayed perforation can occur days or even weeks after the injury due to ischemia, mesenteric injury, or compression necrosis. These cases may present later with signs of peritonitis or sepsis. [4,5,6]

**Surgical Management:**

Management depends on the patient's hemodynamic stability and the extent of intra-abdominal injury.

**1. Open Surgery:**

Open laparotomy is the preferred approach in patients who are hemodynamically unstable, show signs of widespread intra-abdominal injury, or have multiple bowel perforations. A midline laparotomy incision is used to gain access to the abdominal cavity. The surgeon evaluates the jejunum to assess the extent of injury and checks for associated damage, such as mesenteric tears or other hollow viscus injuries.

Simple perforations are repaired in two layers using 2-0 Vicryl sutures. In cases of extensive damage, resection of the affected bowel segment followed by primary anastomosis is performed. Drains are placed near the repair site to manage potential postoperative collections. Antibiotic therapy and close postoperative monitoring are essential for recovery. [1,2,3]

**2. Laparoscopic Surgery:**

Laparoscopic management is a safe and effective alternative in hemodynamically stable patients. It serves both diagnostic and therapeutic purposes, helping avoid unnecessary laparotomies.   
Ideal for isolated perforations in stable patients, especially when diagnostic uncertainty exists. Laparoscopy enables direct visualization of the injury and offers a minimally invasive method of repair.  
 The perforation can be repaired by intracorporeal suturing or extracorporeal suturing in two layers using 2-0 Vicryl. In cases where the perforation is extensive, laparoscopic resection and anastomosis can be performed, sometimes with the assistance of endostaplers. Less postoperative pain, shorter hospital stays, faster recovery, better cosmetic outcomes and Lower risk of wound-related complications

Laparoscopy also provides excellent visualization of the abdominal cavity, allowing precise identification and management of the site and extent of injury. [5,6,7,8]

**Conclusion**

Jejunal perforation resulting from a steering wheel injury is a rare but serious consequence of blunt abdominal trauma. The mechanism typically involves a “blow-out” perforation of the jejunum due to a sudden increase in intraluminal pressure. Surgical intervention is required, with both open laparotomy and laparoscopic approaches being viable options.

Laparoscopic surgery is preferred in hemodynamically stable patients and offers the advantage of being both diagnostic and therapeutic. The perforation can be repaired using either intracorporeal or extracorporeal suturing techniques. Compared to traditional open surgery, laparoscopy is associated with less postoperative pain, faster recovery, shorter hospital stays, and potentially lower morbidity.

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