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# Management of Small Bowel and Colorectal Injuries in Trauma

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## Abstract:

### Background:

Traumatic injuries to the small bowel and colon are associated with significant morbidity and require timely surgical intervention. The determination of management decisions is contingent upon the mechanism of injury, the anatomical site, the contamination level, and hemodynamic stability.

### Discussion:

Small bowel injuries are typically managed with primary repair when less than 50% of the bowel circumference is involved and tissue viability is preserved. Segmental resection with primary anastomosis is the preferred surgical intervention in cases of devitalised bowel or multiple injuries. For colonic trauma, primary repair or resection with anastomosis is appropriate in stable patients with minimal contamination. In unstable patients or delayed presentations, resection with fecal diversion is often required. Management of rectal injuries is determined by location: intraperitoneal injuries are treated similarly to colon injuries, while extraperitoneal injuries often necessitate diversion, presacral drainage, and possibly distal rectal washout. Laparoscopy has been demonstrated to be a useful diagnostic and therapeutic tool in selected penetrating trauma cases. Postoperative

complications may include sepsis, abscess, and anastomotic leak, values the importance of early recognition and tailored surgical intervention.

### Conclusion:

The optimal management of small bowel and colorectal trauma is possible upon timely diagnosis, damage control when indicated, and individualised surgical strategy based on patient physiology and injury pattern. In selected cases, primary repair is a viable option; however, diversion remains imperative in scenarios where instability or contamination is present.

## Management of Small Bowel and Colorectal Injuries in Trauma

Traumatic injuries to the small bowel and colon are associated with significant morbidity and require timely surgical intervention. The management depends on the mechanism of injury, the anatomical site, the contamination level, and hemodynamic stability.

### Small Bowel Injury

During the initial evaluation, airway, breathing, and circulation (ABC) should be promptly assessed. For stable patients, imaging such as FAST (Focused Assessment

with Sonography in Trauma) or CT scan with intravenous contrast may be done. Common injuries include mesenteric, vascular, and multi-visceral trauma. Indications for operative exploration include hemodynamic instability or peritonitis, which necessitate immediate laparotomy; penetrating trauma with suspected hollow viscus injury; and blunt trauma with free intraperitoneal air, contrast extravasation, free fluid without solid organ injury, or mesenteric stranding or bowel wall thickening. Intraoperatively, a systematic inspection of the bowel from the ligament of Treitz to the ileocecal valve should be done.

Treatment strategies are summarized in Table 1.

**Table 1:** The treatment approach of small bowel injury

| <i>Injury type</i>                                                                  | <i>Preferred management</i>                                      |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Small (<50% circumference) laceration, viable tissue                                | Primary two-layer closure (absorbable inner, seromuscular outer) |
| Segmental devascularization, >50% circumference loss, or multiple adjacent injuries | Segmental resection and primary anastomosis                      |
| Severe contamination, massive transfusion, unstable patient                         | Resection with delayed anastomosis or stoma (damage control)     |

In cases of blunt abdominal trauma, a mesenteric hematoma may necessitate bowel resection—even if the serosa appears intact—due to the risk of delayed ischemia and necrosis. However, when multiple injuries are present or there is concern for short bowel syndrome, bowel preservation becomes a important. In such cases, stricturoplasty may be done as an alternative to resection. The basic principle of stricturoplasty is to incise the narrowed segment and reconstruct it in a way that widens the lumen while preserving intestinal length<sup>1</sup>.

Commonly used stricturoplasty techniques are:

- **Heineke–Mikulicz** – the most frequently performed, suitable for short strictures.
- **Finney** – used for longer strictures, creating a side-to-side configuration.
- **Jaboulay** – involves a side-to-side bypass without opening the strictured segment.

Postoperative care includes early enteral feeding as soon as bowel function returns normal. Broad-spectrum antibiotics should be administered for at least 24 hours after uncomplicated repair, and continued longer in cases

of contamination. Close monitoring is important to check anastomotic leak, intra-abdominal abscess, and short bowel syndrome. If the patient's condition deteriorates, repeat imaging or re-exploration should be done. A delayed diagnosis significantly increases the risk of complications such as abscess, sepsis, and fistula formation.

For hemodynamically unstable patients, damage control surgery is indicated. First of all rapid control of contamination and hemorrhage and followed by a planned second look operation after stabilization. In stable patients with equivocal findings or minimal contamination, laparoscopy may be an appropriate diagnostic and therapeutic tool<sup>2</sup>.

## Colon Injury

The management of colonic trauma begins with strict adherence to Advanced Trauma Life Support (ATLS) principles. Early resuscitation is important by careful evaluation for associated injuries involving the small bowel, solid organs, or major vascular structures, which commonly coexist in abdominal trauma.

In hemodynamically stable patients, CT with intravenous contrast is the preferred imaging tool. CT findings suggestive of colonic or associated bowel injury include pneumoperitoneum, contrast extravasation, mesenteric hematoma or stranding, bowel wall thickening, or unexplained free intraperitoneal fluid, particularly in the absence of solid organ injury.

Indications for operative exploration include hemodynamic instability or signs of peritonitis, both of them needs urgent laparotomy. Also penetrating abdominal trauma with suspected hollow viscus injury warrants surgical intervention. In cases of blunt trauma, the presence of free intraperitoneal air, extraluminal contrast, or isolated free fluid without solid organ injury on CT should also precise operative exploration. Early recognition and timely surgical decision-making is important to preventing sepsis, leakage, and other complications associated with delayed diagnosis of colonic injuries<sup>3</sup>.

During exploration for suspected colon injury, assessment of the entire colon is important. The bowel should be “run” from the ligament of Treitz to the ileocecal valve, ensuring that no injuries are missed. Mesentery must be carefully inspected for hematoma, tearing, or devascularization, as these findings may show colon viability even when the serosa appears intact. Early recognition of mesenteric ischemia is important to decide the need for resection, repair, or bowel-preserving strategies<sup>4</sup>.

Postoperative management focuses on early recovery and prevention of complications. Enteral feeding should be initiated as soon as bowel function returns, provided it is clinically feasible. Broad-spectrum antibiotic therapy is recommended for at least 24 hours after uncomplicated repair and extended in cases of contamination or sepsis. Empiric regimens should include agents active against gram-negative organisms, such as meropenem, imipenem-cilastatin, doripenem, or piperacillin-tazobactam as single agents, or combination therapies such as ciprofloxacin, levofloxacin, ceftazidime, or cefepime each paired with metronidazole.

Patients should be closely monitored for anastomotic leakage, intra-abdominal abscess. Any clinical deterioration warrants repeat imaging or re-exploration. A delayed diagnosis significantly increases the risk of sepsis, abscess formation, and enterocutaneous fistula.

**Table 2:** The treatment approach of colonic injury

| <i>Injury Type</i>                                                                  | <i>Preferred management</i>                                      |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Small (<50% circumference) laceration, viable tissue                                | Primary two layer closure (absorbable inner, seromuscular outer) |
| Segmental devascularization, >50% circumference loss, or multiple adjacent injuries | Segmental resection and primary anastomosis                      |
| Severe contamination, massive transfusion, unstable patient                         | Resection with delayed anastomosis or stoma (damage control)     |

In hemodynamically unstable patients, a damage control surgery approach is recommended—to control of contamination and hemorrhage, followed by definitive repair. For stable patients with equivocal findings or minimal contamination, laparoscopy may serve as both a diagnostic and therapeutic modality, reducing unnecessary laparotomies and postoperative morbidity<sup>2</sup> (Table 2).

### Rectal Injury

The management of rectal trauma begins with adherence to ATLS principles. A detailed assessment of the mechanism of injury is essential, as it guides both diagnostic evaluation and operative planning. Penetrating trauma, such as gunshot or stab wounds, represents the most common cause of rectal injury, whereas blunt trauma is relatively rare and often associated with pelvic fractures. Iatrogenic injuries, resulting from endoscopic or surgical instrumentation, should also be considered in the differential diagnosis.

An evaluation for associated pelvic, vascular, and urologic injuries is mandatory. In hemodynamically stable patients, CT with rectal contrast or rigid proctoscopy can aid in localizing and characterizing the injury. Anatomic, the rectum is divided into two major segments: the intraperitoneal rectum, corresponding to the superior third within the peritoneal reflection, which behaves similarly to the sigmoid colon; and the extraperitoneal rectum, corresponding to the middle and lower thirds located in the retroperitoneal and pelvic regions. The latter poses greater challenges due to limited exposure and an increased risk of pelvic sepsis. It necessitates tailored strategies for source control and fecal diversion when indicated<sup>5</sup>.

Indications for operative exploration include hemodynamic instability or clinical signs of peritonitis, both of them mandate immediate laparotomy. Surgical intervention is also indicated when imaging or proctoscopic evaluation demonstrates a full-thickness rectal injury, or when there is gross rectal bleeding in the setting of pelvic fractures, which raises strong suspicion for an underlying rectal perforation<sup>6</sup>.

Intraperitoneal rectal injuries, involving the superior third of the rectum, are treated similarly to colonic injuries. Primary repair is appropriate when there is less than 50% circumferential wall loss and the tissue is viable. Segmental resection with primary anastomosis should be considered for greater than 50% wall involvement or devascularized segments, while fecal diversion is reserved for cases of severe contamination **or** unstable physiology<sup>7</sup>.

Extraperitoneal rectal injuries—typically involving the middle and lower thirds—pose greater technical challenges and a higher risk of pelvic sepsis. The traditional approach, particularly for penetrating trauma, includes fecal diversion (usually via loop colostomy) to prevent pelvic contamination, along with presacral drainage (using a Penrose or sump drain) in destructive or high-risk injuries.

Emerging evidence supports selective nonoperative management in hemodynamically stable patients with small, low-energy extraperitoneal injuries and minimal contamination. These cases may be managed without diversion, unless there is close clinical observation, serial examinations, and follow-up imaging to ensure healing. Coordination with urology is essential when concurrent urethral or bladder injuries are present. In cases complicated by pelvic packing or fixation, surgical exposure

may be limited, and damage control principles should guide management. A delayed presentation (beyond 12–24 hours) significantly increases the risk of sepsis and anastomotic leakage, favoring a more conservative approach with diversion.

Postoperative care should include broad-spectrum antibiotic coverage against gram-negative and anaerobic organisms, administered for at least 24 hours and extended if contamination is present. Patients must be closely monitored for pelvic sepsis, abscess formation, or fistula development. Stoma reversal is typically considered 8–12 weeks postoperatively, following confirmation of healing through imaging or endoscopic evaluation.

In summary, intraperitoneal rectal injuries can generally be treated using standard colonic repair principles. Extraperitoneal injuries remain high-risk and often

require fecal diversion in cases of instability or destructive trauma. A high index of suspicion is important, as missed rectal injuries can result in catastrophic septic complications and poor outcomes.

We must exercise extreme caution during rectal foreign body removal, as these cases carry significant risk of mucosal injury, perforation, and bleeding. In this instance, the foreign bodies identified are a mug and a soda bottle, both of which present unique challenges due to their rigid structure, large size, and potential for negative pressure suction during extraction (Figure 1a-b-c-d).

### Conclusion:

- Small bowel injuries are typically managed with primary repair when less than 50% of the bowel circumference is involved and tissue viability is preserved. Segmental resection with primary anastomosis

**Figure 1a-b-c-d:** Foreign bodies in colon and rectum

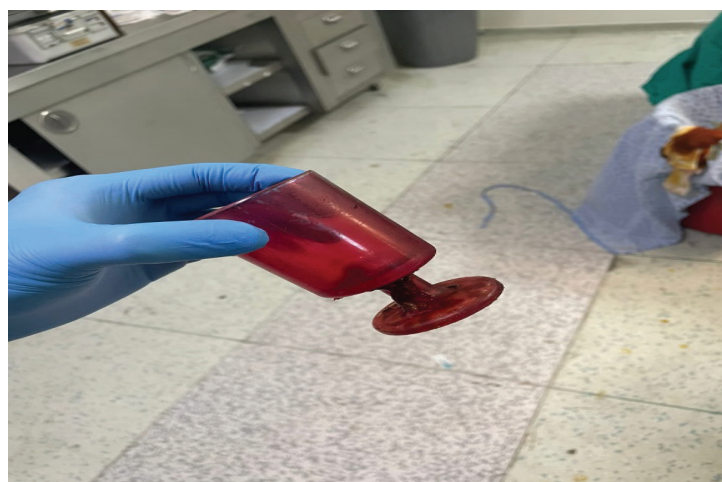


**Table 3:** Management of Small Bowel and Colorectal Injuries in Trauma

| Injury Type              | Management                     | Diversion Needed? |
|--------------------------|--------------------------------|-------------------|
| Small bowel <50%         | Primary repair                 | No                |
| Small bowel devitalized  | Resection + anastomosis        | Rarely            |
| Colon, stable patient    | Primary repair or anastomosis  | Usually not       |
| Colon, unstable patient  | Resection + stoma              | Yes               |
| Rectal (extraperitoneal) | Diversion ± drainage ± washout | Often yes         |

is the preferred surgical intervention in cases of devitalised bowel or multiple injuries.

- For colonic trauma, primary repair or resection with anastomosis is appropriate in stable patients with minimal contamination. In unstable patients or delayed presentations, resection with fecal diversion is often required.
- Management of rectal injuries is dictated by location: intraperitoneal injuries are treated similarly to colon injuries, while extraperitoneal injuries often necessitate diversion, presacral drainage, and possibly distal rectal washout.
- Laparoscopy has been demonstrated to be a useful diagnostic and therapeutic modality in selected penetrating trauma cases.
- Postoperative complications may include sepsis, abscess, and anastomotic leak, showing the importance of early recognition and tailored surgical intervention
- The critical role of early resuscitation and intensive care support are often decisive for patient outcomes alongside surgical intervention. A multidisciplinary and timely approach is crucial for the importance of comprehensive trauma care.

The optimal management of small bowel and colorectal trauma depends on timely diagnosis, damage control when indicated, and individualised surgical strategy based on patient physiology and injury pattern. In selected cases, primary repair is an option; however, diversion remains constant in cases where instability or contamination is present (Table 3).

Ethical considerations in trauma care—particularly the complexities of obtaining informed consent in unstable patients—are important. We propose future research areas and potential improvements in clinical protocols for trauma management.

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