International Surgery Journal
Joshi V et al. Int Surg J. 2025 Aug;12(8):1269-1274
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20252275

Original Research Article

Patterns and management of traumatic bowel perforation: insights from a single-center experience

Varun Joshi, Ojas Patel*, Divyang Dave, Hardik Astik, Shraddha Patel, Nipun Bansal

Department of Surgery, Government Medical College, and New Civil Hospital Surat, Gujarat, India

Received: 21 May 2025
Revised: 02 July 2025
Accepted: 14 July 2025

***Correspondence:**
Dr. Ojas Patel,
E-mail: patelojas11@gmail.com

ABSTRACT

Background: Trauma is a major cause of morbidity and mortality globally, with abdominal trauma ranking third in prevalence after head and chest injuries. Bowel perforations due to blunt or penetrating trauma pose significant diagnostic and therapeutic challenges, particularly in resource-constrained settings.
Methods: This retrospective observational study was conducted at a tertiary care hospital in South Gujarat. Fifty patients with traumatic bowel perforations who underwent surgical management were included. Demographic data, mode and type of injury, clinical features, operative findings, and outcomes were analyzed.
Results: The mean age was 30.4 years, with a male predominance (96%). Penetrating trauma (64%) was more common than blunt trauma (36%). The most common cause was assault (62%), followed by road traffic accidents (RTA) (26%). The ileum was the most frequently injured bowel segment. Surgical interventions included primary repair, resection and anastomosis, and stoma formation. Morbidity was primarily due to wound infections and intra-abdominal abscesses. Mortality was noted in 4% of cases.
Conclusions: Early recognition and timely surgical intervention significantly reduce the morbidity and mortality associated with traumatic bowel perforations. A high index of suspicion and clinical acumen remain critical in the effective management of abdominal trauma.

Keywords: Traumatic bowel perforation, Abdominal trauma, Penetrating injury, Blunt injury, Laparotomy, Gastrointestinal perforation

INTRODUCTION

Trauma remains one of the most significant causes of death and disability worldwide, particularly affecting the younger population in their most productive years.[1] Within spectrum of traumatic injuries, abdominal trauma ranks 3rd after head and chest injuries.[2] Among various abdominal injuries, traumatic bowel perforation is especially concerning due to its often subtle clinical presentation, potential for rapid progression to sepsis, and high morbidity and mortality if not managed promptly.

The etiology of bowel perforation varies between blunt and penetrating injuries. Penetrating injuries, such as stab wounds or gunshot wounds, often result in immediate and overt symptoms that warrant urgent surgical intervention. In contrast, blunt trauma, commonly resulting from RTA, falls, or assaults, can cause mesenteric tears, ischemia, or delayed perforation, which may be missed during initial evaluation.[3] This diagnostic uncertainty in blunt trauma increases the risk of delayed surgical management and complications.

In resource-limited settings like many regions in India, the burden is further compounded by delayed presentation, lack of diagnostic tools such as CT scans, and limited access to trained trauma surgeons.[4] Previous studies have reported varied incidence rates and

outcomes for traumatic bowel injuries depending on the geographic location, mechanism of trauma and hospital infrastructure.[5]

Given the clinical complexity and potential for poor outcomes, it is critical to analyze regional data to better understand the patterns of injury, treatment strategies, and patient outcomes. This retrospective observational study was conducted to analyze the clinical profile, surgical management, and outcomes of patients presenting with traumatic bowel perforations at a tertiary care center in South Gujarat.

METHODS

This retrospective observational study was conducted at the department of general surgery, government medical college and new civil hospital, Surat, a tertiary care referral center serving large population in South Gujarat. Study duration was from June 2017 to May 2018.

We reviewed the hospital records of 50 consecutive patients who underwent surgical management for bowel perforation secondary to abdominal trauma. Patients of all ages and both genders were included, provided they had intraoperative confirmation of bowel perforation. Patients managed conservatively or with perforation due to non-traumatic causes were excluded.

The collected data included demographic information (age and sex), mode and mechanism of injury (blunt vs. penetrating), time of presentation to the hospital, presenting symptoms and signs, imaging investigations, and intraoperative findings. Operative details such as the site and number of bowel perforations, degree of contamination, associated visceral injuries, and the type of surgical procedure performed were recorded. Surgical interventions were tailored according to the location and extent of bowel injury, hemodynamic stability, and degree of contamination. Primary repair was attempted in isolated, small perforations with minimal contamination. Segmental resection with end-to-end anastomosis was performed for multiple or devitalized injuries. Stoma formation was considered in patients with delayed presentation, gross contamination, or hemodynamic instability.

Postoperative data were collected regarding complications such as wound infection, intra-abdominal abscess, burst abdomen, and mortality. The length of hospital stays, time to return of bowel function, and any re-interventions were also recorded. Data were analyzed using descriptive statistics.

RESULTS

Out of the 50 patients studied, the majority (46%) were between 21 and 30 years of age. The mean age was 30.4 years. A significant male predominance was observed, with 48 males (96%) and 2 females (4%).

Penetrating trauma accounted for 64% (32 cases), while 36% (18 cases) had sustained blunt trauma. The most common cause of injury was assault (62%), followed by RTA (26%) and accidental falls (12%).

In terms of anatomical distribution, the ileum was the most commonly injured bowel segment, followed by the jejunum and colon. Most patients presented within 6-12 hours of injury; however, a subset presented after 24 hours, often with signs of generalized peritonitis.

Intraoperatively, single perforations were noted in 66% of cases, while remaining had multiple bowel perforations. Associated injuries included mesenteric tears, solid organ injuries (spleen and liver), and bladder rupture. The surgical procedures performed included primary closure in 52% of cases, resection and anastomosis in 28% and loop ileostomy or colostomy in 20%.

The most frequent postoperative complication was surgical site infection, followed by wound dehiscence and intra-abdominal abscess. Two patients (4%) succumbed to sepsis and multi-organ failure. Mean hospital stay was 8.6 days. Most patients recovered without long-term morbidity and those with stomas scheduled for reversal.

Figure 1: Contusion over the umbilical region resulting from blunt abdominal trauma.

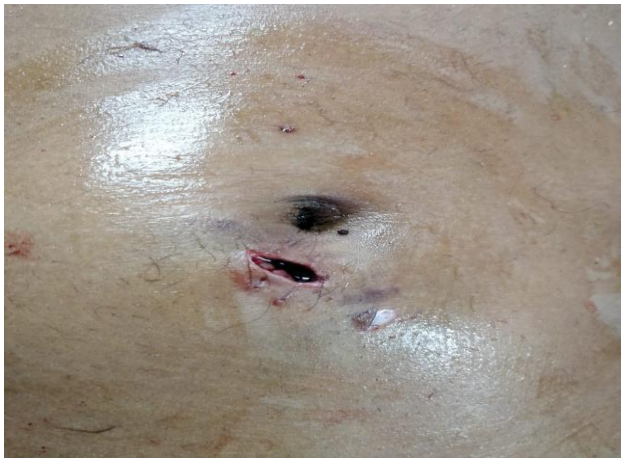

Figure 2: Stab entry wound over right side infraumbilical region.

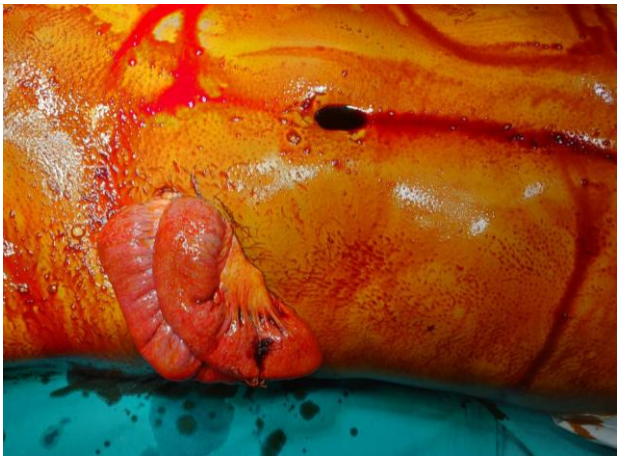

Figure 3: Protrusion of bowel loop from a penetrating wound over the left lumbar region.

Figure 4: Multiple through and through small bowel perforations.

Table 1: Age and sex distribution.

Age (in years)	Sex (male)	Sex (female)	Total
01-10	1	0	1
11-20	5	0	5
21-30	22	1	23
31-40	14	1	15
41-50	5	0	5
51-60	1	0	1
Total	48 (96%)	2 (4%)	50

Table 2: Mode of injury.

Mode of injury	Blunt	Penetrating	N	Percentage (%)
RTA	13	0	13	26
Assault	2	29	31	62
Fall down	3	0	3	6
Suicidal injuries	0	2	2	4
Accidental trauma	0	1	1	2
Total	18	32	50	100

Table 3: Site of perforation.

Site of perforation	Blunt	Penetrating	N	Percentage (%)
Stomach	1	3	4	8
Jejunum	9	8	17	34
Ileum	4	8	12	24
Appendix	1	0	1	2
AC	0	2	2	4
TC	0	3	3	6
DC	0	1	1	2
SC	1	1	2	4
Rectum	0	1	1	2
Jejunum + ileum + TC	1	0	1	2
SC + rectum	1	0	1	2
Jejunum + DC	0	1	1	2
Jejunum + ileum	0	3	3	6
Stomach + GB	0	1	1	2
Total			50	100

Table 4: Operative procedure performed.

Operative procedure	Penetrating	Blunt	Total	Percentage (%)
RA	2	4	6	12
Primary repair	23	9	32	64
Stoma	1	1	2	4
Appendectomy	0	1	1	2
RA + stoma	2	0	2	4
RA + primary repair	1	0	1	2
RA+ primary repair + stoma	0	1	1	2
Primary repair + stoma	2	1	3	6
Primary repair + cholecystectomy	1	0	1	2
Primary repair with repair of urinary bladder	0	1	1	2
Total			50	100

Table 5: Post operative complications.

Post op complication	N
Surgical site infection	4
Wound dehiscence	4
Burst abdomen	2
Faecal fistula	1
Rebleed from liver laceration	1
Total	12

Table 6: Post operative stay.

Post op stays	Penetrating	Blunt	Total
<6 days	3	1	4
6 to 10 days	21	10	31
11 to 15 days	4	0	4
>15 days	3	6	9
Total	31	17	48

DISCUSSION

The findings of this study underscore the burden of traumatic bowel perforations in young males, consistent with the demographic profile of high-risk trauma victims globally. The predominance of penetrating trauma in our series contrasts with data from Western countries, where blunt trauma predominates due to higher motor vehicle accident rates. In India, interpersonal violence, including stab wounds, remains a significant cause, especially in urban regions.[6,7]

The choice of surgical procedure is determined by several factors, including the extent of bowel damage, presence of contamination, and patient stability. Primary repair is preferred when feasible, as it avoids stoma-related morbidity. However, in cases of delayed presentation or hemodynamic instability, fecal diversion is often lifesaving and reduces the risk of anastomotic leakage.[8]

Traumatic bowel perforation is a serious consequence of abdominal trauma, demanding prompt diagnosis and surgical intervention

In the present study, the predominant mode of injury was blunt abdominal trauma resulting from RTA accounting for 72.22% of cases. This finding is in concordance with the observations of Manoranjan et al (57.5%) and Mukhopadhyay et al (55.32%), where RTA was also the leading cause of blunt trauma.[9,10] In contrast, penetrating injuries in our series were predominantly due to assault (90.62%), a trend similarly reported by Salim et al (100%) and Affin et al (62.5%).[11,12] Falls contributed to 16.67% of blunt injuries in our study, comparable to Manoranjan et al (17.5%) and Mukhopadhyay et al (19.15%).[9,10]

The small bowel was the most frequently injured organ in our series (78%), which aligns well with Manoranjan et al (80%), Mukhopadhyay et al (93.61%) and Affin et al (77.78%).[9,10,12] This reaffirms the vulnerability of the small bowel to both blunt and penetrating trauma due to its mobility and mesenteric attachments. The incidence of large bowel injuries in the present study was 26%, higher than that reported by Manoranjan et al (7.5%) and Affin et al (11.11%) but comparable to Salim et al (39.3%).[9,11,12] Stomach injuries were seen in 10% of cases

in our study, which is lower than that reported by Rajendran et al (25%) and Affin et al (22.22%).[12,13]

Associated intra-abdominal injuries were common. Liver injuries were noted in 10% of cases, comparable to Manoranjan et al (10%) and Mukhopadhyay et al (8.5%).[9,10] Mesenteric injuries were seen in 18% of our cases, slightly higher than Manoranjan et al (15%) and Mukhopadhyay et al (14.9%).[9,10] Serosal injuries (4%) were significantly lower in our study compared to Manoranjan et al (30%) and Mukhopadhyay et al (25.53%).[9,10] Extra-abdominal injuries included chest trauma (10%) and head injuries (8%), frequencies that are in line with Rajendran et al and Salim et al who reported chest injuries in 25% and 19.1%, and head injuries in 15% and 2.2% respectively.[11,13]

The postoperative complication profile in the present study was acceptable. Surgical site infection (SSI) was observed in 8% of cases, comparable to Salim et al (8%) and Affin et al (6.25%).[11,12] Wound dehiscence was noted in 8%, consistent with Affin et al (9.78%).[12] The incidence of burst abdomen (4%) and faecal fistula (2%) was lower compared to Manoranjan et al (6.8% and 6.8% respectively) and Mukhopadhyay et al (4.25% and 10.63%).[9,10] This could reflect early intervention, meticulous surgical technique, and improved postoperative care in our series.

The overall survival rate in the present study was 96%, which is higher than that reported by Manoranjan et al (93.62%), Mukhopadhyay et al (93.62%) and Rajendran et al (86%) and comparable to Salim et al (97.8%) and Affin et al (100%).[9-13] Morbidity was noted in 24% of cases, a rate that falls between the figures reported by Manoranjan et al (29.54%) and Mukhopadhyay et al (14.89%).[9,10] Mortality in the present study was 4%, lower than Manoranjan et al (6.38%), Mukhopadhyay et al (6.38%) and Rajendran et al (14%) but slightly higher than Salim et al (2.2%).[9-11] The lower mortality rate in our series may be attributed to early diagnosis, prompt surgical intervention, and aggressive perioperative management.

The present study's findings are largely consistent with the published literature, with minor variations that could be explained by differences in trauma patterns, referral practices, and institutional protocols. The predominance of small bowel injuries, the high incidence of RTAs in blunt trauma, and acceptable complication and mortality rates underscore the importance of early surgical intervention and comprehensive trauma care in improving outcomes

CONCLUSION

Traumatic bowel perforation is a life-threatening emergency requiring high clinical vigilance and prompt surgical intervention. In our single-center experience, early diagnosis, timely laparotomy, and individualized surgical planning resulted in favorable outcomes in the majority of cases.

Given the regional burden and varying mechanisms of injury, local data is essential for optimizing trauma care systems. Improvements in prehospital care, rapid transport, and surgical capacity in tertiary centers can further reduce the morbidity and mortality associated with traumatic bowel injuries.

Strengthening trauma systems, continuous training of healthcare personnel, and public awareness about early presentation are crucial in achieving better outcomes. Future prospective multicentric studies are warranted to validate these findings and standardize management guidelines for traumatic bowel perforation in diverse healthcare settings.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Joshi V, Patel O, Dave D, Astik H, Patel S, Bansal N. Patterns and management of traumatic bowel perforation: insights from a single-center experience. Int Surg J 2025;12:1269-74.