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Surgical Outcomes Following Gastrointestinal Injury Due to Blunt Abdominal Trauma

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ABSTRACT

Background: Gastrointestinal injuries following blunt abdominal trauma are relatively uncommon but may be associated with considerable postoperative morbidity and mortality. This study evaluated the pattern of gastrointestinal injury, operative management, and early surgical outcomes among affected patients. **Methods & Materials:** This prospective observational study was conducted in the Department of Surgery, Mymensingh Medical College Hospital, Mymensingh, Bangladesh, from March to August 2013. A total of 50 patients with gastrointestinal injury following blunt abdominal trauma who underwent laparotomy were included. Demographic and clinical characteristics, anatomical site and type of gastrointestinal injury, associated injuries, operative procedures, postoperative complications, mortality, and hospital stay were recorded. Data were analyzed descriptively using SPSS version 11.0. **Results:** The mean age was 32.22 years, and 44 patients (88.0%) were male. Motor vehicle accidents involving passengers were the most frequent mechanism of injury, accounting for 28 cases (56.0%). Isolated small-bowel injury occurred in 40 patients (80.0%), isolated large-bowel injury in 8 (16.0%), and combined small- and large-bowel injury in 2 (4.0%). Jejunal injury was the most frequent individual anatomical pattern, occurring in 24 patients (48.0%). Simple repair was performed in 38 patients (76.0%), while resection and anastomosis was required in 8 (16.0%). At least one postoperative complication occurred in 30 patients (60.0%). Wound infection and pulmonary infection were the most frequent complications, each affecting 10 patients (20.0% of the total cohort). Overall mortality was 3/50 (6.0%). Among the 47 survivors, 36 (76.6%) had a postoperative hospital stay of 7–10 days. **Conclusion:** Small-bowel injury, particularly jejunal involvement, predominated among surgically managed gastrointestinal injuries following blunt abdominal trauma. Simple repair was the most frequent operative procedure, while postoperative morbidity remained common despite relatively low observed mortality.

Keywords: *Blunt Abdominal Trauma; Gastrointestinal Injury; Hollow Viscus Injury; Bowel Injury; Surgical Outcomes*

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INTRODUCTION

Traumatic injury remains a major cause of premature mortality and disability, with road traffic injury contributing substantially to the burden in younger and economically active populations. In 2023, an estimated 50.9 million incident road injuries and 1.34 million associated deaths were recorded globally, and road injuries were identified as the leading cause of death among males aged 10–39 years [1]. A disproportionate burden has been observed in low-income settings, where road-injury mortality has remained markedly higher than in high-income countries. In Bangladesh, a road traffic crash mortality estimate of 15.3 per 100,000 population was reported in a national scoping review, together with substantial limitations in organized prehospital and hospital-based trauma care [2]. In rural Bangladesh, road traffic injury mortality and morbidity rates were found to be 6.8 per 100,000 population per year and 889 per 100,000 population over six months, respectively, with a clear predominance among males and working-age adults [3]. More recently, 7,507 road traffic injury cases were recorded across four public hospitals in Bangladesh, of whom approximately 71% required inpatient admission, demonstrating the continuing demand placed on hospital trauma services [4]. Blunt abdominal trauma represents an important component of this injury burden, particularly following road traffic collisions and falls. In recent South Asian hospital cohorts, road traffic accidents accounted for approximately 56%–57% of blunt abdominal trauma, while younger male patients consistently constituted the largest affected group [5,6]. Although solid-organ injuries are encountered more frequently, hollow-viscus and mesenteric injuries remain clinically important because of their potential for perforation, contamination, hemorrhage, ischemia, and sepsis. A prevalence of approximately 1% among blunt trauma patients has been cited in contemporary international guidance, although higher proportions have been reported in selected abdominal-trauma cohorts [7]. In a North Indian prospective series, hollow-viscus and mesenteric injuries were identified in 50 of 465 patients with blunt abdominal injury, and all affected patients required operative management. Similarly, hollow-viscus injury was identified in 35 of 607 patients with blunt abdominal trauma in a tertiary trauma-center cohort. Across these studies, small-bowel involvement, particularly jejunal and ileal injury, was reported frequently [8,9]. Diagnosis may remain difficult during the early period following injury because physical findings can initially be subtle, associated injuries may obscure abdominal signs, and bowel ischemia or perforation may evolve over time. Contemporary guidelines have therefore emphasized repeated clinical examination, appropriate use of contrast-enhanced computed tomography, and repeat imaging in selected patients with equivocal initial findings [7]. In a surgically treated cohort of 188 patients with blunt bowel and mesenteric injury, free intraperitoneal fluid was identified in

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71.3%, extraluminal air in 43.6%, and mesenteric infiltration in 23.4%; however, no single CT characteristic was considered sufficiently reliable for diagnosis [10]. Similar diagnostic limitations have been demonstrated with ultrasonography. An overall FAST sensitivity of only 33.3%, despite a specificity of 98.8%, was reported among 2,758 patients with blunt trauma [11]. In a meta-analysis of 4,336 patients, free peritoneal fluid on CT had a pooled sensitivity of 79.3% and specificity of 73.3% for surgically important traumatic bowel and mesenteric injury, indicating that this finding should not be interpreted independently [12]. Moreover, free intraperitoneal air is not invariably associated with significant bowel perforation, as a recent meta-analysis estimated that 34% of patients with CT-detected free air had no clinically significant perforation, although substantial heterogeneity was present [13]. Once clinically significant gastrointestinal injury is established, operative management remains central, although selected hemodynamically stable patients with only suspected bowel injury may be managed initially with close observation and selective surgery [14]. Considerable postoperative morbidity and mortality have nevertheless been reported following surgically managed blunt bowel and mesenteric injury [8,9,15]. Outcomes may be influenced by injury severity, associated injuries, physiological instability, contamination, diagnostic delay, and the operative procedure required. However, contemporary evidence describing the pattern of gastrointestinal injury, surgical procedures, and early postoperative outcomes remains limited in Bangladesh. Therefore, the present study was conducted to describe the clinical and operative characteristics and early surgical outcomes of patients undergoing surgery for gastrointestinal injury following blunt abdominal trauma.

METHODS & MATERIALS

This prospective observational study was conducted in the Department of Surgery, Mymensingh Medical College Hospital, Mymensingh, Bangladesh, from March to August 2013. A total of 50 patients with gastrointestinal injury following blunt abdominal trauma who underwent laparotomy were included. Patients with blunt abdominal trauma without gastrointestinal injury and those who required referral to a specialized center following surgery were excluded. After admission, relevant demographic and clinical information was obtained through detailed history and physical examination, with particular attention to the mechanism of injury, interval between injury and hospital admission, hemodynamic status, abdominal findings, and associated injuries. Investigations were performed according to clinical indication and availability and included plain abdominal and chest radiography, ultrasonography of the abdomen, computed tomography in selected patients, hemoglobin estimation, blood grouping and cross-matching, and other laboratory tests where feasible. Initial resuscitation and preoperative management were provided as clinically required. Operative findings, anatomical site and type of gastrointestinal injury, associated intra-abdominal injuries, and surgical procedures performed were recorded at laparotomy. Patients were subsequently followed during hospitalization for early postoperative complications, mortality, and duration of postoperative hospital stay. Data were collected using a predesigned data collection sheet and analyzed using SPSS version 11.0. Categorical variables were summarized as frequencies and percentages, while available continuous variables were reported using the summary measures documented in the study. Ethical approval was obtained from the Ethical Committee of Mymensingh Medical College Hospital, and written informed consent was obtained from the patients before surgical intervention; confidentiality of study information was maintained.

RESULTS

A total of 50 patients with gastrointestinal injury following blunt abdominal trauma underwent surgical management during the study period. The mean age was 32.22 years, with the largest proportion of patients aged 31–40 years. Male patients constituted the majority of the study population. Motor vehicle accidents were the predominant mechanism of injury, and most patients presented within the earlier time intervals following trauma. Among the 50 patients, 17 (34.0%) were aged 31–40 years and 13 (26.0%) were aged 21–30 years; 44 (88.0%) were male. Motor vehicle accidents involving passengers accounted for 28 (56.0%) injuries. Admission occurred within the two earliest reported time categories, about 1 hour or 1–6 hours, in 39 (78.0%) patients, while the mean interval from injury to admission was 5.79 hours. At presentation, abdominal pain was reported in 40 (80.0%) patients, shock in 10 (20.0%), urinary retention in 6 (12.0%), respiratory distress in 5 (10.0%), vomiting in 4 (8.0%), and unconsciousness in 2 (4.0%). Abdominal tenderness was present in 45 (90.0%), rigidity in 35 (70.0%), hypotension in 30 (60.0%), and absent bowel sounds in 27 (54.0%). Features of peritonitis were documented in 42 (84.0%) patients. Extra-abdominal injuries were present in 18 (36.0%), most commonly pelvic fracture in 8 (16.0%), followed by long-bone fracture in 4 (8.0%). Associated intra-abdominal visceral injuries were present in 16 (32.0%) patients, with liver injury being the most frequent, occurring in 8 (16.0%) (*Table I*).

Table I
Demographic and trauma-related characteristics of the study patients, *n* = 50

Characteristic	n (%) or value
Age, years	
0–10	1 (2.0)
11–20	6 (12.0)
21–30	13 (26.0)
31–40	17 (34.0)
41–50	6 (12.0)
51–60	5 (10.0)
>60	2 (4.0)
Mean age, years	32.22
Sex	
Male	44 (88.0)
Female	6 (12.0)
Mechanism of injury	
Motor vehicle accident, passenger	28 (56.0)
Pedestrian struck	6 (12.0)
Fall from height	4 (8.0)
Assault	3 (6.0)
Compression injury	3 (6.0)
Motorcycle accident	2 (4.0)
Other	4 (8.0)
Time from injury to admission	
About 1 hour	11 (22.0)
1–6 hours	28 (56.0)
7–24 hours	8 (16.0)
25–48 hours	2 (4.0)
>48 hours	1 (2.0)
Mean time to admission, hours	5.79

Note. Percentages are based on n = 50.

At laparotomy, isolated small-bowel involvement was identified in 40 (80.0%) patients, isolated large-bowel involvement in 8 (16.0%), and combined small- and large-bowel injury in 2 (4.0%). Jejunal injury was the most frequent individual anatomical pattern, affecting 24 (48.0%) patients. Among the 42 patients with small-intestinal injury, single perforation was most frequent, occurring in 26 (61.9%), while 12 (28.6%) had multiple perforations. Among the 10 patients with large-intestinal injury, 8 (80.0%) had Grade 1 and 2 (20.0%) had Grade 2 injuries; no Grade 3 injury was reported. Radiological evidence of pneumoperitoneum was identified in 20 (40.0%) patients. Ultrasonography was performed in 40 patients, of whom 24 (60.0%) had free peritoneal fluid. Computed tomography of the abdomen was performed in 9 (18.0%) patients. The mean interval from admission to laparotomy was approximately 6 hours (*Table II*).

Table II
Operative distribution and characteristics of gastrointestinal injuries.

Injury characteristic	n (%)
Anatomical distribution, N = 50	
Jejunum	24 (48.0)
Ileum	8 (16.0)
Both jejunum and ileum	5 (10.0)
Right colon	5 (10.0)
Duodenum	3 (6.0)
Left colon	3 (6.0)
Both small and large bowel	2 (4.0)
Overall bowel involvement, N = 50	
Small bowel only	40 (80.0)
Large bowel only	8 (16.0)
Both small and large bowel	2 (4.0)
Type of small-intestinal injury, n = 42	
Single perforation	26 (61.9)
Multiple perforations	12 (28.6)
Laceration	4 (9.5)
Large-intestinal injury grade, n = 10	
Grade 1	8 (80.0)
Grade 2	2 (20.0)
Grade 3	0 (0.0)

Note. Small-intestinal injury was present in 42 patients, including those with combined small- and large-bowel injury. Large-intestinal injury was present in 10 patients. Large-bowel injury was categorized according to the Flint Colon Injury Severity classification used in the source study.

Regarding operative management, simple repair was performed in 38 (76.0%) patients and was the predominant surgical procedure. Resection and anastomosis was required in 8 (16.0%), mesenteric repair in 6 (12.0%), and exteriorization of the bowel in 5 (10.0%). Additional procedures for associated injuries included urinary bladder repair in 3 (6.0%), splenorrhaphy in 1 (2.0%), and repair with intercostal drainage in 1 (2.0%) (*Table III*).

Table III
Operative procedures performed, *n* = 50.

Operative procedure	n (%)
Simple repair	38 (76.0)
Resection and anastomosis	8 (16.0)
Mesenteric repair	6 (12.0)
Exteriorization of gut	5 (10.0)
Urinary bladder repair	3 (6.0)
Splenorrhaphy	1 (2.0)
Repair with intercostal drainage	1 (2.0)

Note. More than one operative procedure could be performed in the same patient; therefore, 62 procedures were recorded among 50 patients and percentages do not sum to 100%.

Overall, postoperative complications were reported in 30 (60.0%) patients. Wound infection and pulmonary infection were the most frequently recorded complications, each affecting 10 of the 30 patients with complications (33.3%), followed by paralytic ileus in 8 (26.7%). Overall mortality was 3/50 (6.0%), comprising one intraoperative and two early postoperative deaths. Mortality was 1/40 (2.5%) among patients with isolated small-bowel injury and 2/8 (25.0%) among those with isolated large-bowel injury; no death occurred among the two patients with combined small- and large-bowel involvement (*Table IV*).

Table IV
Early postoperative complications and mortality.

Outcome	n (%)
Postoperative complication status, N = 50	
At least one postoperative complication	30 (60.0)
No significant postoperative complication reported	20 (40.0)
Specific complications among affected patients, n = 30	
Wound infection	10 (33.3)
Pulmonary infection	10 (33.3)
Paralytic ileus	8 (26.7)
Wound dehiscence	6 (20.0)
Septicemia	6 (20.0)
Diarrhea	5 (16.7)
Anastomotic leakage	2 (6.7)
Mortality, N = 50	
Overall mortality	3 (6.0)
Timing of death, n = 3	
Intraoperative	1 (33.3)
Early postoperative	2 (66.7)
Mortality according to bowel involvement	
Small bowel only, n = 40	1 (2.5)
Large bowel only, n = 8	2 (25.0)
Both small and large bowel, n = 2	0 (0.0)

Note. Individual postoperative complications were not mutually exclusive; 47 complication events were recorded among 30 affected patients. Percentages for specific complications are calculated using the 30 patients with postoperative complications as the denominator. Percentages for timing of mortality are based on the three deaths.

Among the 47 surviving patients, 36 (76.6%) had a postoperative hospital stay of 7–10 days, while 6 (12.8%) remained hospitalized for 11–15 days and 5 (10.6%) for more than 21 days. Thus, more than three-quarters of survivors were discharged within the 7–10-day category (*Table V*).

Table V
Postoperative hospital-stay among surviving patients, *n* = 47.

Duration of hospital stay	n (%)
7–10 days	36 (76.6)
11–15 days	6 (12.8)
>21 days	5 (10.6)
Total	47 (100.0)

Note. Hospital-stay data were reported for the 47 surviving patients. Percentages were recalculated using n = 47 as the denominator.

DISCUSSION

The present study described the operative profile and early outcomes of 50 patients with gastrointestinal injury following blunt abdominal trauma. The principal findings were the predominance of small-bowel injury, particularly jejunal involvement, frequent use of simple repair, a postoperative complication rate of 60.0%, overall mortality of 6.0%, and a postoperative hospital stay of 7–10 days in 76.6% of survivors. Although mortality appeared higher among patients with isolated large-bowel injury than among those with isolated small-bowel injury, this difference was based on a very small subgroup and was not subjected to inferential analysis. Small-bowel injury was the dominant anatomical pattern, occurring as an isolated injury in 80.0% of patients, while the jejunum was the most frequently involved individual site at 48.0%. A similar general pattern has been described in other operative series of blunt bowel injury. In the prospective study by Wadhwa et al., the small intestine represented the largest individual injury category, with jejunal and ileal injuries comprising a substantial proportion of cases [8]. In the Eastern Indian series by Jha et al., ileal injury was reported in 46.2% and jejunal injury in 44.5% of patients, showing the same predominance of distal and proximal small-bowel segments but with the ileum marginally more frequent than the jejunum [16]. Similarly, frequent ileal and jejunal involvement was documented in the tertiary-center cohort reported by Özpek et al [9]. These variations in the leading segment are plausible because blunt bowel injury depends on the direction and magnitude of force, compression against the vertebral column, deceleration at relatively fixed points, and associated mesenteric injury. Thus, the present jejunal predominance is consistent with the broader pattern of small-bowel vulnerability without implying that the jejunum is invariably the most frequently injured segment. Simple repair was performed in 76.0% of patients, whereas resection and anastomosis was required in 16.0%. A broadly similar preference for bowel preservation was reported in other series, although the proportions varied. Primary repair was performed in 54.0% of patients in the study by Wadhwa et al., while simple closure was undertaken in 66.5% in the study by Jha et al [8,16]. Resection and anastomosis accounted for 38.0% and 11.0%, respectively, in those studies. The higher repair rate in the present cohort may reflect differences in the extent of bowel disruption, multiplicity of perforation, tissue viability, contamination, and mesenteric vascular compromise. This interpretation is supported indirectly by the highly selected mesenteric-avulsion series reported by Sabuncuoglu et al., in which 69.2% required segmental resection with primary anastomosis [17]. That cohort represented a more severe devascularizing injury subtype and therefore should not be considered directly equivalent to the present population. Postoperative morbidity was substantial, with 30 of 50 patients, 60.0%, developing at least one complication. Wound infection and pulmonary infection were the most frequent, each affecting 10 patients, equivalent to 20.0% of the total cohort, followed by paralytic ileus in 16.0% and wound dehiscence in 12.0%. A comparable complication spectrum was observed in the study by Wadhwa et al., in which surgical-site infection and chest complications each occurred in 26.0%, while wound dehiscence occurred in 20.0% [8]. In the blunt colonic-injury cohort reported by Tan et al., ileus occurred in 26%, postoperative pneumonia in 19%, and wound sepsis in 6% [18]. The overall morbidity of 67.5% reported in the larger surgically proven blunt bowel and mesenteric injury cohort by Hsieh et al. was numerically close to the 60.0% observed in the present study [15]. However, direct comparison of overall morbidity percentages should be made cautiously because complication definitions and ascertainment differed substantially between studies. For example, minor wound and respiratory complications were not consistently included in all published morbidity measures. Overall mortality in the present study was 6.0%, with one intraoperative and two early postoperative deaths. This proportion was lower than the 22.0% mortality reported in the study by Wadhwa et al., 12.7% reported by Jha et al., 11.2% reported by Liao et al., 11.4% reported by Özpek et al., and 12.9% reported by Hsieh et al [8–10,15,16]. These differences should not be interpreted as evidence of superior treatment because the comparison cohorts differed in injury severity, associated injuries, referral pattern, physiological derangement, and definitions of bowel and mesenteric injury. In the present cohort, mortality was 25.0% among eight patients with isolated large-bowel injury compared with 2.5% among 40 patients with isolated small-bowel injury. Blunt colonic injury has been associated with substantial operative complexity and postoperative morbidity in the series reported by Tan et al., but the small size of the large-bowel subgroup in the present study prevents any conclusion that anatomical site independently influenced mortality [18]. Among the 47 survivors, 76.6% remained in hospital for 7–10 days. Longer central estimates of total hospital stay were reported in several comparison cohorts, including 19.02 days in the study by Wadhwa et al., 17.3 days in the study by Liao et al., and a median of 17 days in the cohort reported by Hsieh et al [8,10,15]. Nevertheless, postoperative stay in the present study was recorded in categories rather than as a mean or median, so formal numerical comparison is not appropriate. Taken together, the findings indicate that blunt gastrointestinal injury in this surgically managed cohort was characterized by predominant small-bowel involvement and frequent primary repair, but early postoperative morbidity remained common despite relatively low observed mortality.

LIMITATIONS

This study was conducted at a single center with a relatively small sample of 50 surgically managed patients, which limits the generalizability of the findings. The analysis was primarily descriptive, and the small numbers within some anatomical subgroups, particularly large-bowel and combined injuries, did not permit reliable assessment of factors independently associated with postoperative morbidity or mortality. Long-term outcomes after hospital discharge were not evaluated.

CONCLUSION

Gastrointestinal injury following blunt abdominal trauma predominantly involved the small bowel, with the jejunum being the most frequently affected individual segment. Simple repair was the most commonly performed operative procedure, although resection and anastomosis and other procedures were required according to the extent and pattern of injury. Postoperative complications were frequent, particularly wound and pulmonary infections and paralytic ileus, while overall mortality remained 6.0%. Mortality was descriptively higher among patients with isolated large-bowel injury than among those with isolated small-bowel injury, although the small subgroup size precludes any inferential conclusion. These findings highlight the importance of timely recognition, appropriate operative management, and close postoperative monitoring in patients with gastrointestinal injury following blunt abdominal trauma.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

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