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Clinical Profile, Injury Pattern and Outcomes of Non-Solid Organ Injuries Following Penetrating Abdominal Trauma - A Prospective Observational Study

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Abstract

Background: Penetrating abdominal trauma is a surgical emergency that may result in significant bowel, omental, mesenteric, and vascular injuries. Early recognition and appropriate surgical management are essential to reduce morbidity and mortality.

Methods: A prospective observational study was conducted in the Department of General Surgery, Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta, Assam, from April 2023 to April 2024. Among 50 patients with penetrating abdominal trauma who underwent abdominal exploration, 38 patients with non-solid organ injuries were included in the present analysis. Demographic characteristics, mechanism of injury, clinical parameters, clinical stability, delay in presentation, evisceration pattern, complications, and outcomes were assessed using descriptive statistics.

Results: Of the 50 explored patients, 38 (76%) had non-solid organ injuries. The median age of the study population was 27 years, with 30 (79%) males and 8 (21%) females. Accidents/falls were the most common mechanism of injury (15, 40%), followed by animal horn injuries (10, 26%), stab injuries (8, 21%), and gunshot injuries (5, 13%). Omental injury was the most frequent non-solid organ injury (14, 36%), followed by bowel (10, 26%) and mesenteric injuries (10, 26%). Thirty-three (87%) patients had signs of peritonitis. Delayed presentation of more than one hour was observed in 30

(78%) patients. Omental evisceration occurred in 15 (39%), bowel evisceration in 10 (26%), and combined bowel and Omental evisceration in 13 (35%) patients. Eighteen (47%) patients survived with complications, 14 (36%) survived without complications, and 6 (17%) died. Renal failure was the most frequently reported complication (26%).

Conclusion: Penetrating abdominal trauma in this study predominantly affected young males and commonly involved Omental, bowel, and mesenteric structures. Delayed presentation and postoperative complications were frequent. Early clinical assessment, timely surgical intervention, and close postoperative monitoring are essential for improving outcomes.

Keywords: Penetrating abdominal trauma, Non - solid organ injury, Bowel injury, Omental injury, Mesenteric injury, Abdominal evisceration

Introduction

Penetrating abdominal trauma is an important surgical emergency that may result in injuries to the bowel, mesentery, Omentum, abdominal vessels, and solid organs. The severity of injury depends on the mechanism and trajectory of penetration, extent of tissue damage, blood loss, contamination, and associated injuries[1,2].

Historically, exploratory laparotomy was routinely performed for penetrating abdominal trauma. With advances in trauma assessment, imaging, and surgical management, selective operative and non-operative approaches are now used in appropriately selected patients. Hemodynamic instability and generalized peritonitis remain important indications for urgent operative exploration [1,3].

Non-solid organ injuries, particularly bowel, mesenteric, and omental injuries, are clinically important because they may result in contamination, hemorrhage, ischemia, sepsis, and postoperative complications. Traumatic bowel injuries can be difficult to diagnose, and delayed recognition may increase morbidity[4,5].Current guidelines emphasize systematic clinical assessment and timely diagnosis and management of bowel injuries following abdominal trauma [5].

Abdominal evisceration is another important manifestation of penetrating abdominal trauma. It may involve the bowel, Omentum, or both and indicates penetration of the abdominal wall and peritoneal cavity. However, evisceration should be interpreted along with the patient's hemodynamic status, abdominal examination, and associated injuries when determining the need for operative intervention [3,6].

The pattern of penetrating abdominal trauma varies according to geographical region, population, and mechanism of injury. Studies from India have reported a predominance of young male patients and have demonstrated a variable spectrum of penetrating abdominal injuries[7]. Local mechanisms, including animal-related injuries, may also contribute to the pattern of trauma in specific populations.

Postoperative complications following penetrating abdominal trauma may include surgical-site infection, respiratory complications, renal dysfunction, bowel anastomotic leakage, and the requirement for intestinal diversion. These complications may be influenced by the severity of injury, contamination, physiological status, delay in treatment, and extent of surgical intervention [4,8].

Therefore, the present study was undertaken to evaluate the demographic characteristics, mechanism of injury, clinical presentation, pattern of non-solid organ injuries, abdominal evisceration, delay in presentation, postoperative complications, and outcomes among

patients with penetrating abdominal trauma managed at a tertiary-care hospital in Assam.

Materials and Methods

Study Design and Setting

A prospective observational study was conducted in the Department of General Surgery, Fakhruddin Ali Ahmed Medical College and Hospital (FAAMCH), Barpeta, Assam. The study was conducted over a period of one year, from April 2023 to April 2024. A total of 38 patients with penetrating abdominal trauma associated with non-solid organ injuries were included in the study.

Study Population

Patients presenting to the emergency department with penetrating abdominal trauma were assessed and subsequently evaluated for the presence and pattern of intra-abdominal injury. During the study period, 50 patients with penetrating abdominal trauma underwent abdominal exploration. Of these, 38 patients had non-solid organ injuries, 11 had solid organ or combined solid and non-solid organ injuries, and 1 patient had no solid or non-solid organ injury. The present study included only the 38 patients with non-solid organ injuries.

Inclusion Criteria

Patients presenting to the emergency department with penetrating abdominal trauma were included in the study.

Exclusion Criteria

Patients were excluded if they had blunt trauma to the abdomen, penetrating trauma associated with solid organ injury identified intraoperatively, or other associated injuries such as thoracic or head injuries requiring specialist referral and immediate operative intervention.

Clinical Assessment

The included patients were assessed for clinical parameters including blood pressure, pulse rate, urine output, and the presence or absence of signs of peritonitis. Patients were categorised according to clinical stability as stable or unstable. The presence and pattern of abdominal organ evisceration were also documented.

Assessment of Injury Pattern

The pattern of non-solid organ injury was documented, including bowel, Omental, mesenteric, and abdominal vascular injuries. The mode of penetrating injury was also recorded and categorised as gunshot, stab injury, animal horn injury, or accident/fall. Delay in presentation to the emergency department was categorised as less than one hour or more than one hour.

Outcome Assessment

Patient outcomes were assessed in terms of survival, survival with complications, survival without complications, and death. Post-traumatic complications documented in the study included stoma formation, acute respiratory distress syndrome (ARDS), renal failure, surgical site infection, and leakage from bowel anastomotic/repair.

Data Analysis

The collected observations were presented using descriptive statistics. Categorical variables were expressed as numbers and percentages. The results were summarised in tables according to demographic characteristics, mode of injury, clinical parameters, injury pattern, evisceration pattern, complications, and outcome.

Results and Observation

A total of 50 patients with penetrating abdominal trauma underwent exploration during the study period. Among

these, 38 (76%) had non-solid organ injuries, 11 (22%) had solid organ or combined solid and non-solid organ injuries, and 1 (2%) had no solid or non-solid organ injury. The present analysis included the 38 patients with non-solid organ injuries.

Table 1: Distribution of Patients According to Exploration Findings

Penetrating abdominal trauma	Number of patients	Percentage
Non-solid organ injury	38	76%
Solid organ/solid + non-solid organ injury	11	22%
No injury	1	2%
Total	50	100%

Among the 38 patients with non-solid organ injuries, Omental injury was the most frequently documented injury (14, 36%), followed by bowel injury (10, 26%) and mesenteric injury (10, 26%). Abdominal vascular vessel injury was observed in 4 (12%) patients.

Table 2: Pattern of Non-Solid Organ Injury

Non-solid organ injury	Number of patients	Percentage
Bowel	10	26%
Omentum	14	36%
Mesentery	10	26%
Abdominal vascular vessel injury	4	12%
Total	38	100%

The median age of the patients was reported as 27 years. The majority of patients belonged to the 21–30-year age group. There were 30 male and 8 female patients, giving a male-to-female ratio of approximately 3:1.

Table 3: Age and Sex Distribution

Age group	Number of patients
<21 years	10
21–30 years	15
31–40 years	7
41–50 years	5
51–60 years	1
Total	38
Sex	Number of patients
Male	30
Female	8
Total	38

Accidents/falls constituted the most frequently reported mode of injury, accounting for 15 (40%) patients, followed by animal horn injuries in 10 (26%), stab injuries in 8 (21%), and gunshot injuries in 5 (13%) patients.

Table 4: Distribution According to Mode of Injury

Mode of injury	Number of patients	Percentage
Gunshot	5	13%
Stab	8	21%
Animal horn	10	26%
Accidents/falls	15	40%
Total	38	100%

Among the 38 patients, 30 had normal blood pressure and 8 were in shock. Similarly, 30 patients had a normal pulse rate while 8 had a feeble pulse. Normal urine output was documented in 34 patients, whereas 4 had decreased urine output. Signs of peritonitis were present in 33 patients and absent in 5 patients.

Table 5: Assessment of Clinical Parameters

Parameter	Category	Number of patients
Blood pressure	Normal	30
	Shock	8
Pulse rate	Normal	30
	Feeble	8
Urine output	Normal	34

	Decreased	4
Signs of peritonitis	Yes	33
	No	5

Of the 38 patients, 33 were clinically stable and 5 were clinically unstable at presentation.

Table 6: Clinical Stability

Clinical stability	Number of patients
Stable	33
Unstable	5
Total	38

Most patients, 30 (78%), presented more than one hour after injury, whereas 8 (22%) presented within one hour.

Table 7: Delay in Presentation to the Emergency Department

Time delay	Number of patients	Percentage
>1 hour	30	78%
<1 hour	8	22%
Total	38	100%

Bowel and Omental evisceration were documented among the study participants. Omentum was the most frequent isolated eviscerated organ, occurring in 15 (39%) patients, followed by bowel in 10 (26%) patients. Combined bowel and Omental evisceration was observed in 13 (35%) patients.

Table 8: Abdominal Organ Evisceration Pattern

Abdominal organ evisceration	Number of patients	Percentage
Bowel	10	26%
Omentum	15	39%
Bowel and Omentum	13	35%
Total	38	100%

Among the 38 patients, 18 (47%) survived with complications, 14 (36%) survived without complications, and 6 (17%) patients died.

Table 9: Mortality and Complication Rates

Outcome	Complication	Number of patients	Percentage
Survived	Yes	18	47%
Survived	No	14	36%
Deceased	—	6	17%
Total		38	100%

The reported complications included renal failure in 10 patients (26%), ARDS in 8 (21%), surgical site infection in 8 (21%), leakage from bowel anastomosis/repair in 7 (18%), and stoma formation in 5 (13%).

Table 10: Complications Observed

Complication	Number of patients	Percentage
Stoma	5	13%
ARDS	8	21%
Renal failure	10	26%
Surgical site infection	8	21%
Leakage from bowel anastomosis/ repair	7	18%
Total	38	100%

Discussion

The present study included 38 patients with non-solid organ injuries among 50 patients who underwent abdominal exploration for penetrating abdominal trauma. Non-solid organ injuries constituted 76% of the explored cases, while 22% had solid-organ or combined solid- and non-solid-organ injuries and 2% had no identified injury. Penetrating abdominal trauma may produce injuries to multiple intra-abdominal structures depending on the trajectory and mechanism of penetration [1,2].

In the present study, Omental injury was the most frequently documented non-solid organ injury, occurring in 14 (36%) patients, followed by bowel and mesenteric injuries, each observed in 10 (26%) patients. Abdominal vascular injury was identified in 4 (12%) patients. Bowel and mesenteric injuries are clinically significant because they may result in contamination, haemorrhage, ischemia, and intra-abdominal infection [4,5]. The WSES guidelines specifically emphasise careful assessment for bowel injury following abdominal trauma and timely surgical management when significant injury is identified [5].

The study population was predominantly young, with a median age of 27 years. The largest proportion belonged to the 21–30-year age group. There were 30 male and 8 female patients, giving a male-to-female ratio of approximately 3:1. A predominance of young males has also been reported in an Indian institutional study of penetrating abdominal trauma [7].

Regarding the mechanism of injury, accidents/falls constituted the largest category, accounting for 15 (40%) patients, followed by animal horn injuries in 10 (26%), stab injuries in 8 (21%), and gunshot injuries in 5 (13%). The relatively high proportion of animal horn injuries is noteworthy and may reflect the regional characteristics of the study population. The mechanism of penetrating trauma can vary considerably between geographical areas and populations [2,7].

Clinical assessment showed that 30 patients had normal blood pressure, whereas 8 were in shock. Similarly, 8 patients had a feeble pulse and 4 had decreased urine output. Signs of peritonitis were present in 33 (87%) patients. Hemodynamic instability and diffuse abdominal tenderness or peritonitis are recognized indications for urgent laparotomy in penetrating abdominal trauma [1,3].

In the present series, 33 patients were classified as clinically stable and 5 as clinically unstable. This distinction is important because management strategies differ according to physiological status. Current trauma guidelines support urgent operative management in unstable patients or those with diffuse peritoneal signs, while selected stable patients may undergo further diagnostic evaluation and selective non-operative management [1,3].

A major finding was the delay in presentation. Thirty patients (78%) presented more than one hour after injury, whereas only 8 (22%) presented within one hour. Delayed presentation may permit progression of bleeding, contamination, bowel ischemia, and systemic deterioration. Previous literature on traumatic bowel injury has emphasized the importance of early diagnosis because delayed recognition can increase morbidity [4,5].

Abdominal evisceration was frequent in the present study. Omental evisceration was present in 15 (39%) patients, bowel evisceration in 10 (26%), and combined bowel and Omental evisceration in 13 (35%). Evisceration indicates penetration of the abdominal wall and peritoneal cavity and warrants careful assessment for underlying visceral injury. However, contemporary management emphasizes integrating evisceration with the overall clinical examination and physiological status rather than considering it in isolation [3,6].

Regarding outcomes, 18 (47%) patients survived with complications, 14 (36%) survived without complications, and 6 (17%) patients died. Thus, 32 (84 %) patients survived and 6 (17%) died. Mortality in penetrating abdominal trauma is influenced by the severity and number of injuries, vascular involvement,

blood loss, contamination, physiological derangement, and associated injuries[2,8].

Among the documented complications, renal failure was the most frequently reported, occurring in 10 (26%) patients. ARDS and surgical-site infection were each observed in 8 (21%) patients. Leakage from bowel anastomosis/repair occurred in 7 (18%), while stoma formation was required in 5 (13%). These findings demonstrate that morbidity following penetrating abdominal trauma may involve both local abdominal complications and systemic organ dysfunction [4,8].

Bowel anastomotic or repair-site leakage occurred in 7 patients (18%) in the present study. Management of traumatic bowel injury depends on the location and extent of injury, tissue viability, degree of contamination, physiological status, and associated injuries. Depending on these factors, treatment may include primary repair, resection with anastomosis, or diversion [5,9].

The relatively high complication rate should be interpreted in the context of the study population. The present analysis specifically included patients with non-solid organ injuries who underwent abdominal exploration. Therefore, the findings should not be generalised directly to all patients with penetrating abdominal trauma, particularly patients managed successfully without surgery. Selective non-operative management may be appropriate in carefully selected stable patients without peritonitis or other indications for immediate exploration [1,3,10.]

Overall, the present study demonstrates a diverse spectrum of non-solid organ injuries among patients with penetrating abdominal trauma, with Omental, bowel, and mesenteric injuries being the major patterns. The high proportion of delayed presentation and postoperative complications emphasises the importance of early clinical assessment, prompt identification of hemodynamic instability and peritonitis, timely surgical intervention when indicated, and vigilant postoperative monitoring [1,5,8].

Conclusion

Penetrating abdominal trauma predominantly affected young males in this study, with Omental, bowel, and mesenteric injuries being the most common non-solid organ injuries. Delayed presentation and postoperative complications were frequent, with an overall mortality of 17%. Early assessment, prompt identification of instability and peritonitis, timely surgical management, and close postoperative monitoring are essential for improving outcomes.

References

1. Como JJ, Bokhari F, Chiu WC, Duane TM, Holevar MR, Tandoh MA, et al. Practice management guidelines for selective non operative management of penetrating abdominal trauma. J Trauma. 2010;68(3):721-733.

2. Demetriades D, Velmahos GC. Penetrating injuries of the abdomen: indications for operation. World J Surg. 2001; 25(1):13-16.

3. Biffl WL, Moore EE, Feliciano DV, Albrecht RA, Croce M, Karmy-Jones R, et al. Western Trauma Association critical decisions in trauma: management of abdominal stab wounds. J Trauma Acute Care Surg. 2018;85(6):1003-1007.

4. Coleman JJ, Zarzaur BL. Surgical management of abdominal trauma: hollow viscus injury.SurgClin North Am. 2017;97(5):1107-1117.

5. Smyth L, Bendinelli C, Lee N, Reeds MG, Loh EJ, Amico F, et al. WSES guidelines on blunt and penetrating bowel injury: diagnosis, investigations, and

treatment. World J Emerg Surg. 2022; 17 (1):13. Doi:10.1186/s13017-022-00418-y.

6. Moore EE, Cogbill TH, Jurkovich GJ, Shack ford SR, Malangoni MA, Champion HR. Organ injury scaling: spleen, liver, and kidney. J Trauma. 1995; 38 (3): 323-324.

7. Siddharth BR, Keerthi MSS, Naidu SB, Venkanna M. Penetrating injuries to the abdomen: a single institutional experience with review of literature. Indian J Surg. 2017;79(3):196-200. doi:10.1007/s12262-016-1459-0.

8. Demetriades D, Murray JA, Charalambides K, Alo K, Velmahos G, Rhee P, et al. Surgical challenges in penetrating abdominal trauma. World J Surg. 1999; 23 (8):839-844.

9. DuBose JJ, Inaba K, Teixeira PG, Shiflett A, Putty B, Green DJ, et al. Selective non-operative management of solid organ injury following penetrating abdominal trauma. Injury. 2007;38(9):1055-1060.

10. Eastern Association for the Surgery of Trauma. Penetrating abdominal trauma, selective non-operative management of: practice management guideline. EAST Practice Management Guidelines. 2010.