

Research Article

Pattern of Solid Organ Injuries Following Blunt Abdominal Trauma: A Hospital-Based Observational Study

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ABSTRACT

Background: Blunt abdominal trauma is a major cause of morbidity and mortality, particularly among young adults involved in road traffic accidents. Solid organs such as the spleen, liver, kidneys, and pancreas are commonly affected. Early diagnosis using appropriate imaging and timely management are essential for improving clinical outcomes. **Objectives:** To evaluate the pattern of solid organ injuries following blunt abdominal trauma, assess the clinical profile of affected patients, evaluate diagnostic modalities, and analyze treatment outcomes. **Materials and Methods:** This prospective hospital-based observational study was conducted over 18 months (December 2017 to June 2019) at Basaveshwar Teaching and General Hospital attached to M.R. Medical College, Kalaburagi. Fifty patients with blunt abdominal trauma involving solid organs were included. Clinical assessment, laboratory investigations, FAST, ultrasonography, contrast-enhanced computed tomography (CECT), four-quadrant aspiration, and diagnostic

peritoneal lavage were performed as indicated. Patients were managed conservatively or operatively according to hemodynamic status, clinical findings, and imaging results. **Results:** Of the 50 patients, 41 (82%) were males and 9 (18%) were females. The majority (44%) belonged to the 21–30-year age group. Road traffic accidents accounted for 58% of injuries, followed by falls from height (24%) and assault (18%). Abdominal pain was the most common presenting symptom (90%). Ultrasonography detected splenic injuries in 40% and hepatic injuries in 38% of patients, while CECT identified splenic injuries in 24 patients and hepatic injuries in 22 patients. Overall, the spleen was the most commonly injured organ (48%), followed by the liver (44%), kidneys (16%), and pancreas (6%). Conservative management was successful in 62% of patients, whereas 38% required surgical intervention, with splenectomy being the most frequently performed procedure. The mean hospital stay was 16 days, and the overall mortality rate was 12%. **Conclusion:** Blunt abdominal

trauma predominantly affects young adult males, with road traffic accidents being the leading cause. The spleen is the most frequently injured solid organ. Early diagnosis using FAST and CECT, combined with appropriate selection for non-operative management, results in favorable outcomes in most hemodynamically stable patients, while timely surgical intervention remains crucial for unstable cases.

Keywords: Blunt abdominal trauma, solid organ injury, spleen, liver, non-operative management, FAST, computed tomography.

INTRODUCTION

Blunt abdominal trauma (BAT) is a major cause of trauma-related morbidity and mortality worldwide, particularly among young adults involved in road traffic accidents, falls from height, and assaults. Solid abdominal organs such as the spleen, liver, kidneys, and pancreas are especially vulnerable because of their rich vascularity and anatomical location. Delayed diagnosis may result in hemorrhagic shock, sepsis, prolonged hospitalization, and increased mortality, making early recognition and timely intervention essential for improving patient outcomes.^[1]

The management of blunt abdominal trauma has evolved considerably over the past two decades. The American Association for the Surgery of Trauma (AAST) Organ Injury Scale provides a standardized method for grading splenic, hepatic, and renal injuries, facilitating appropriate treatment decisions based on injury severity.^[2] Similarly, the World Society of Emergency Surgery (WSES) guidelines recommend that management should be guided primarily by the patient's hemodynamic status rather than injury grade alone, with non-operative management (NOM) being the preferred approach for hemodynamically stable patients with splenic injuries.^[3]

Advances in imaging, particularly focused assessment with sonography for trauma (FAST) and contrast-enhanced computed tomography (CECT), have significantly improved the diagnosis and management of blunt abdominal injuries. The EAST practice management guidelines support selective non-operative management of blunt hepatic injuries in stable patients, reducing unnecessary laparotomies while preserving organ function.^[4] Leppäniemi further highlighted that improvements in imaging, intensive care, and trauma protocols have established organ-preserving treatment as the standard of care for most stable patients with solid organ injuries.^[5]

Recent evidence has consistently demonstrated high success rates of non-operative management when combined with careful patient selection, serial clinical examination, and appropriate imaging. Kanlerd et al. concluded that conservative management is safe and effective for most blunt solid organ injuries, provided that patients remain hemodynamically stable and are closely monitored.^[6]

Despite these advances, blunt abdominal trauma continues to pose significant challenges, especially in developing countries where delayed presentation and limited resources may adversely affect outcomes.^[7] Therefore, the present hospital-based observational study was undertaken to evaluate the pattern of solid organ injuries following blunt abdominal trauma, assess clinical presentation, diagnostic modalities, management strategies, and treatment outcomes in patients presenting to a tertiary care teaching hospital.

MATERIALS AND METHODS

Study Design

The present study was conducted as a **prospective hospital-based observational study** to evaluate the pattern of solid organ injuries following

blunt abdominal trauma and their management.

Study Setting

The study was carried out in the Department of General Surgery at **Basaveshwar Teaching and General Hospital**, attached to **M.R. Medical College, Kalaburagi**, a tertiary care referral center receiving trauma patients from urban and rural areas.

Study Duration

The study was conducted over a period of **18 months**, from **December 2017 to June 2019**.

Study Population

The study included patients admitted with **blunt abdominal trauma involving solid abdominal organs**, namely the spleen, liver, kidneys, and pancreas.

Sample Size

A total of **50 consecutive patients** fulfilling the eligibility criteria were included in the study.

Inclusion Criteria

- Patients of any age and either sex.
- History of blunt abdominal trauma due to road traffic accidents, falls from height, or assault with blunt objects.
- Patients with radiological or operative evidence of injury involving the liver, spleen, kidneys, or pancreas.

Exclusion Criteria

- Penetrating abdominal injuries such as stab or gunshot wounds.
- Pregnant women with blunt abdominal trauma.
- Patients with associated severe head injuries or thoracic injuries.

Data Collection Procedure

After admission, a detailed history was obtained directly from the patient or accompanying relatives. Clinical examination was performed after initial resuscitation. Demographic information including age, sex, occupation, mechanism of injury, and time elapsed since trauma was recorded. Findings from physical examination, laboratory investigations,

imaging studies, operative findings, treatment received, postoperative complications, duration of hospital stay, and mortality were documented using a structured proforma.

Diagnostic Evaluation

Following hemodynamic stabilization, patients underwent appropriate investigations including:

- Hemoglobin estimation
- Hematocrit
- Urine microscopy
- Plain erect abdominal radiography
- Four-quadrant aspiration (when indicated)
- Diagnostic peritoneal lavage using the semi-open infraumbilical technique in selected patients
- FAST examination in all patients
- Ultrasonography of the abdomen in all patients
- Contrast-enhanced CT abdomen in hemodynamically stable patients whenever feasible

Treatment Protocol

Management was individualized according to hemodynamic status, clinical examination findings, and imaging results. Patients selected for **non-operative management** were treated with strict bed rest, serial abdominal examinations, hourly monitoring of pulse rate, blood pressure and respiratory rate, repeated ultrasonography when indicated, and supportive medical management.

Patients with persistent hemodynamic instability, worsening clinical signs, or radiological evidence requiring surgery underwent **emergency exploratory laparotomy**, with procedures including splenectomy, splenorrhaphy, hepatorrhaphy, or distal pancreatectomy based on intraoperative findings.

Outcome Measures

The primary outcome was the pattern of solid organ injuries. Secondary outcomes included demographic characteristics, mechanism of injury, clinical presentation, diagnostic accuracy of imaging modalities, type of treatment, operative procedures,

postoperative complications, duration of hospital stay, and in-hospital mortality.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistical methods. Continuous variables were summarized as mean or range where appropriate, while categorical variables were expressed as frequencies and percentages. Results were presented using tables and graphs.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was

obtained from all patients or their legally authorized representatives before enrollment, and confidentiality of patient information was maintained throughout the study.

RESULTS

A total of 50 patients with blunt abdominal trauma involving solid abdominal organs were included in the study during the 18-month study period. The demographic profile, mechanism of injury, clinical presentation, radiological findings, management, complications, and outcomes were analyzed.

Table 1. Demographic characteristics and mechanism of injury (n = 50)

Variable	Number (n)	Percentage (%)
Gender		
Male	41	82.0
Female	9	18.0
Age group (years)		
11–20	2	4.0
21–30	22	44.0
31–40	15	30.0
41–50	5	10.0
51–60	4	8.0
61–70	1	2.0
71–80	1	2.0
Mode of injury		
Road traffic accident	29	58.0
Fall from height	12	24.0
Assault with blunt object	9	18.0

Among the 50 patients studied, 82% were males, indicating a marked male predominance. The 21–30-year age group constituted the largest proportion (44%), followed by the 31–40-year age group (30%), demonstrating that blunt abdominal

trauma predominantly affected young adults. Road traffic accidents were the leading cause of injury (58%), while falls from height (24%) and assault with blunt objects (18%) accounted for the remaining cases.

Table 2. Clinical presentation and diagnostic evaluation

Variable	Number (n)	Percentage (%)
Clinical presentation		
Abdominal pain	45	90.0
Abdominal distension	27	54.0
Abdominal guarding/rigidity	19	38.0
Shock	12	24.0
Haematuria	7	14.0
Presentation after injury		
0–6 hours	16	32.0

7–12 hours	21	42.0
13–18 hours	6	12.0
19–24 hours	4	8.0
>24 hours	1	2.0
Not known	1	2.0
FAST/USG detected organ injury		
Spleen	20	40.0
Liver	19	38.0
Kidney	6	12.0
Pancreas	2	4.0

Abdominal pain was the commonest presenting symptom, occurring in **90%** of patients, followed by abdominal distension (54%). Nearly one-fourth (24%) presented in shock. Most patients (**42%**) reached the

hospital within **7–12 hours** after injury. Ultrasonography demonstrated splenic injury in 40% and hepatic injury in 38% of patients, confirming these as the predominant solid organ injuries

Table 3. Pattern of organ injury and management

Variable	Number (n)	Percentage (%)
Organ injured		
Spleen	24	48.0
Liver	22	44.0
Kidney	8	16.0
Pancreas	3	6.0
Treatment		
Conservative	31	62.0
Operative	19	38.0
Operative procedures (n=19)		
Splenectomy	8	42.1
Hepatorrhaphy	5	26.3
Splenorrhaphy	2	10.5
Distal pancreatectomy	1	5.3
Other procedures*	3	15.8

*Patients with combined injuries or additional operative procedures.

The **spleen was the most frequently injured organ (48%)**, closely followed by the liver (44%). Renal and pancreatic injuries were relatively uncommon. Nearly

two-thirds (**62%**) of patients were managed successfully by conservative treatment, whereas **38%** required emergency laparotomy. Among surgically treated patients, splenectomy was the most frequently performed operation (42.1%).

Table 4. Complications, hospital stay and outcome

Variable	Number (n)	Percentage (%)
Postoperative complications (n=19)		
Respiratory complications	6	31.6
Wound infection	4	21.1
Intra-abdominal abscess	2	10.5
Wound dehiscence	1	5.3
Complications during conservative management (n=31)		
Respiratory complications	3	9.7

Intra-abdominal abscess	3	9.7
Hospital stay		
1–10 days	20	40.0
11–20 days	20	40.0
21–30 days	5	10.0
31–40 days	2	4.0
41–50 days	2	4.0
>50 days	1	2.0
Mean hospital stay	16 days	—
Mortality		
Deaths	6	12.0
Survivors	44	88.0

Respiratory complications were the most common postoperative morbidity (31.6%), followed by wound infection (21.1%). Most patients (**80%**) were discharged within **20 days**, with a mean hospital stay of **16 days**. Overall mortality was **12%**, with four deaths occurring after operative management and two during conservative treatment.

DISCUSSION

The present study evaluated the pattern of solid organ injuries following blunt abdominal trauma and demonstrated that the spleen was the most frequently injured organ (48%), followed by the liver (44%), while road traffic accidents were the predominant mechanism of injury. Most patients were young males, and conservative management was successful in 62% of cases, reflecting the current trend toward selective non-operative treatment.

Malhotra et al. reported a major shift from routine operative intervention to selective non-operative management of blunt hepatic injuries, demonstrating excellent outcomes in hemodynamically stable patients. Their findings established that careful patient selection and close monitoring significantly reduce unnecessary laparotomies without compromising patient safety. The high proportion of patients managed conservatively in the present study is consistent with this evolving treatment approach.^[8]

Similarly, Velmahos et al. evaluated non-operative management of blunt hepatic trauma and reported a high success rate among stable patients, emphasizing that most liver injuries can be treated safely without surgery when appropriate imaging and continuous monitoring are available. In our study, the majority of hepatic injuries were also managed successfully by conservative treatment, while operative intervention was reserved for unstable patients or those with ongoing hemorrhage.^[9]

Hashemzadeh et al. prospectively evaluated non-operative management of blunt abdominal solid organ injuries and observed a high success rate, with hemodynamic stability being the strongest predictor of successful conservative treatment. Their study also highlighted that failure of non-operative management was mainly associated with persistent hypotension and severe organ injury. These observations closely parallel the present study, where operative management was primarily required in hemodynamically unstable patients, while stable patients achieved favorable outcomes with conservative care.^[10]

Karachentsev reported successful implementation of non-operative management for blunt abdominal solid organ injuries in a rural hospital setting, demonstrating that satisfactory outcomes can be achieved even in resource-limited environments when careful clinical assessment and serial monitoring are

employed. Similar findings were observed in the present study, where nearly two-thirds of patients were managed conservatively with acceptable morbidity and mortality, emphasizing the effectiveness of structured monitoring protocols.^[11]

Mukharjee et al. prospectively evaluated CT-confirmed solid organ injuries following blunt abdominal trauma and concluded that contrast-enhanced computed tomography plays a central role in identifying injury severity, guiding treatment decisions, and improving the success of non-operative management. In the present study, CECT accurately identified splenic, hepatic, pancreatic, and renal injuries in hemodynamically stable patients, while unstable patients underwent immediate exploratory laparotomy without delay.^[12]

Singh et al. evaluated surgical experience in a Level I trauma centre and reported that young males involved in road traffic accidents constituted the majority of patients with blunt abdominal trauma, with splenic and hepatic injuries being the most common solid organ injuries. They emphasized that prompt diagnosis using FAST and CT imaging, along with timely operative or conservative management based on hemodynamic status, significantly improves patient outcomes. The demographic profile, injury pattern, predominance of splenic injuries, and successful use of selective non-operative management observed in the present study are in close agreement with these findings.^[13]

CONCLUSION

Blunt abdominal trauma predominantly affects young adult males, with road traffic accidents being the leading cause of injury. The spleen was the most commonly injured solid organ, followed by the liver. Early diagnosis using FAST, ultrasonography, and contrast-enhanced CT, together with appropriate selection of patients for conservative management,

resulted in successful outcomes in the majority of hemodynamically stable patients. Operative intervention remained essential for unstable patients, while overall morbidity and mortality were acceptable, supporting the effectiveness of a selective management approach for blunt solid organ injuries.

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