Spectrum of Splenic Injuries in Blunt Abdominal Trauma and Their Surgical Outcomes

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Received Date: 01/03/2026 Accepted: 01/04/2026
Published Date:08/05/2026

ABSTRACT

Background: Splenic injury is the most common solid organ injury following blunt abdominal trauma and remains an important cause of morbidity and mortality. Recent advances in imaging and trauma care have enabled selective non-operative management in hemodynamically stable patients, while surgery continues to play a vital role in unstable cases. **Objectives:** To evaluate the spectrum of splenic injuries following blunt abdominal trauma and assess their surgical outcomes with respect to management strategy, operative procedures, complications, hospital stay, and mortality. **Materials and Methods:** A 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 organ injuries were included. Clinical evaluation, laboratory investigations, FAST, ultrasonography, contrast-enhanced computed tomography (CT), and diagnostic peritoneal lavage were performed as indicated. Splenic injuries were identified by imaging or operative findings and managed conservatively or surgically according to hemodynamic status and clinical condition. **Results:** Splenic injury was identified in **24 patients (48%)**, making it the most frequently injured abdominal solid organ. The majority of patients were young males, with road traffic accidents being the predominant mechanism of injury. Ultrasonography detected splenic injury in **20 patients (40%)**, while CT identified **24 cases**. Conservative management was successful in **14 patients (58.3%)**, whereas **10 patients (41.7%)** required operative intervention. Among surgically managed patients, **splenectomy was the most common procedure (80%)**, followed by splenorrhaphy (20%). Respiratory complications were more frequent after surgery, and the mean hospital stay was **16 days**. Overall mortality among patients with splenic injury was **16.7%**. **Conclusion:** Splenic injury is the commonest solid organ injury following blunt abdominal trauma. Selective non-operative management is effective in most hemodynamically stable patients, while splenectomy remains the standard treatment for unstable patients with severe splenic trauma. Early diagnosis, appropriate

imaging, vigilant monitoring, and timely surgical intervention are essential for improving clinical outcomes.
Keywords: Blunt abdominal trauma, splenic injury, splenectomy, splenorrhaphy, non-operative management, surgical outcomes.

INTRODUCTION

Splenic injury is the most common solid organ injury following blunt abdominal trauma and remains an important cause of morbidity and mortality in trauma patients. Advances in trauma imaging, intensive care, and resuscitation have resulted in a major shift from routine splenectomy to **selective non-operative management (NOM)** for hemodynamically stable patients. Ibrahim et al. demonstrated that non-operative management is safe and effective in adults with blunt splenic injuries when patients are carefully selected and closely monitored, resulting in high splenic salvage rates and favorable outcomes.[1]

The **World Society of Emergency Surgery (WSES)** subsequently developed evidence-based classification and management guidelines for splenic trauma, emphasizing that treatment should primarily be guided by the patient's hemodynamic status rather than the anatomical severity of injury.[2] Earlier, Peitzman et al., in a multicenter study, reported excellent outcomes with selective non-operative management and identified the spleen as the most frequently injured abdominal organ after blunt trauma.[3]

Further evidence supporting conservative treatment has been provided by Teuben et al., who demonstrated that associated injuries do not necessarily compromise the success of non-operative management provided that patients remain physiologically stable.[4] Similarly, Sartorelli et al. reported successful non-operative treatment of splenic injuries even in adults with multiple injuries, reinforcing that careful monitoring allows safe avoidance of unnecessary laparotomy.[5]

Giannopoulos et al. confirmed that selective non-operative management can be safely implemented even in district general hospitals equipped with appropriate imaging and monitoring facilities.[6] The Eastern Association for the Surgery of Trauma (EAST) practice management guidelines further recommend non-operative management as the standard of care for hemodynamically stable splenic injuries, reserving operative intervention for patients with persistent instability or failed conservative treatment.[7] Leppäniemi also highlighted the evolution of splenic trauma management from mandatory surgery to evidence-based selective non-operative treatment, supported by advances in computed tomography and critical care.[8]

Therefore, the present study was undertaken to evaluate the spectrum of splenic injuries following blunt abdominal trauma and their surgical outcomes, with particular emphasis on management strategies, operative procedures, complications, and clinical outcomes.

MATERIALS AND METHODS

Study Design

This prospective hospital-based observational study was conducted to evaluate the spectrum of splenic injuries and their surgical outcomes following blunt abdominal trauma.

Study Setting

The study was carried out in the Department of General Surgery, Basaveshwar Teaching and General Hospital attached to M.R. Medical College, Kalaburagi.

Study Duration

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

Study Population

Patients admitted with blunt abdominal trauma involving splenic injury, either isolated or associated with other solid organ injuries, were included.

Sample Size

A total of **50 patients** with blunt abdominal solid organ injuries were evaluated, among whom **24 patients had splenic injuries**.

Inclusion Criteria

- Patients presenting with blunt abdominal trauma.
- Radiological or operative evidence of splenic injury.
- Patients managed either conservatively or surgically.

Exclusion Criteria

- Penetrating abdominal trauma.
- Hollow viscus injuries without splenic involvement.
- Patients with associated head or thoracic injuries.
- Patients unwilling to participate.

Clinical Assessment

Following initial resuscitation, all patients underwent detailed clinical examination including assessment of:

- Hemodynamic stability.
- Abdominal pain and tenderness.
- Guarding and rigidity.
- Presence of shock.
- Associated abdominal findings.

Diagnostic Evaluation

All patients underwent:

- FAST examination.
- Ultrasonography of the abdomen.
- Contrast-enhanced CT scan in hemodynamically stable patients.
- Diagnostic peritoneal lavage and four-quadrant aspiration when clinically indicated.

Splenic injury was confirmed by imaging findings or operative exploration.

Management Protocol

Patients who remained hemodynamically stable without signs of generalized peritonitis were managed conservatively with:

- Strict bed rest.
- Serial abdominal examination.
- Continuous monitoring of pulse, blood pressure, and respiratory rate.
- Repeat ultrasonography when indicated.

Patients with persistent hemodynamic instability, ongoing hemorrhage, or failed conservative management underwent emergency laparotomy. Operative procedures included splenectomy or splenic repair depending on intraoperative findings.

Outcome Measures

Primary Outcome

- Pattern and spectrum of splenic injuries.

Secondary Outcomes

- Surgical procedures performed.
- Postoperative complications.
- Duration of hospital stay.
- Mortality.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed descriptively. Continuous variables were expressed as mean or range, while categorical variables were summarized as frequencies and percentages. Statistical significance was considered at **p <0.05** where applicable.

Ethical Considerations

Institutional Ethics Committee approval was obtained before commencement of the study. Written informed consent was obtained from all patients or their legal guardians, and patient confidentiality was maintained throughout the study.

RESULTS

A total of 50 patients with blunt abdominal trauma were included in the study. Among these, 24 patients (48%) sustained splenic injuries, making the spleen the most frequently injured solid abdominal organ. Clinical presentation, imaging findings, management strategies, operative procedures, postoperative complications, and surgical outcomes of splenic injuries were analyzed.

Table 1. Demographic profile and clinical characteristics of patients with splenic injury (n=24)

Variable	Number	Percentage (%)	p value
Gender			
Male	20	83.3	
Female	4	16.7	0.001*
Age group (years)			
11–20	1	4.2	
21–30	11	45.8	
31–40	7	29.2	
>40	5	20.8	0.038*
Mode of injury			
Road traffic accident	15	62.5	
Fall from height	6	25.0	
Assault	3	12.5	0.041*
Clinical presentation			
Abdominal pain	22	91.7	
Abdominal distension	13	54.2	
Guarding/rigidity	11	45.8	
Shock	8	33.3	0.019*

*Statistically significant ($p<0.05$).

Among patients with splenic injuries, 83.3% were males, indicating a significant male predominance (p=0.001). The highest incidence occurred in the 21–30-year age group (45.8%) (p=0.038). Road traffic accidents accounted for 62.5% of splenic injuries and represented the commonest mechanism of trauma (p=0.041). Abdominal pain was the most frequent presenting symptom (91.7%), while one-third of patients presented with shock, highlighting the severity of splenic trauma (p=0.019).

Table 2. Imaging findings and management of splenic injuries (n=24)

Variable	Number	Percentage (%)	p value
Splenic injury detected on FAST/USG	20	83.3	
Splenic injury detected on CT scan	24	100.0	**0.021***
Conservative management	14	58.3	
Operative management	10	41.7	0.118
Operative procedure (n=10)			
Splenectomy	8	80.0	
Splenorrhaphy	2	20.0	**0.004***

*Statistically significant ($p<0.05$).

FAST/ultrasonography detected splenic injury in 83.3% of patients, whereas CT identified all documented splenic injuries, demonstrating superior diagnostic capability (p=0.021). Conservative management was successful in 58.3% of splenic injuries, while 41.7% required surgery. Among operated patients, splenectomy accounted for 80% of procedures and was performed significantly more frequently than splenic repair (p=0.004).

Table 3. Surgical outcomes among patients with splenic injuries

Outcome	Conservative (n=14)	Operative (n=10)	p value
Respiratory complications	1 (7.1%)	4 (40.0%)	0.048*
Intra-abdominal abscess	1 (7.1%)	2 (20.0%)	0.551
Wound infection	0	3 (30.0%)	—
Wound dehiscence	0	1 (10.0%)	—
Mortality	1 (7.1%)	3 (30.0%)	0.149
Mean hospital stay	13 days	19 days	**0.032***

*Statistically significant (p<0.05).

Respiratory complications were significantly more common following operative management (40.0% vs. 7.1%; p=0.048). Wound infection (30.0%) and wound dehiscence (10.0%) occurred only in surgically managed patients. Although mortality was numerically higher after surgery (30.0% vs. 7.1%), the difference was not statistically significant (p=0.149). Operated patients had a significantly longer hospital stay than those managed conservatively (19 vs. 13 days; p=0.032).

Table 4. Overall spectrum and outcomes of splenic injuries (n=24)

Variable	Number	Percentage (%)	p value
Splenic injury among all blunt abdominal trauma	24	48.0	
Isolated splenic injury	22	91.7	
Splenic injury with renal injury	1	4.2	
Splenic injury with liver injury	1	4.2	
Successful conservative treatment	14	58.3	
Successful splenic preservation (splenorrhaphy)	2	8.3	
Splenectomy	8	33.3	
Overall survival	20	83.3	
Overall mortality	4	16.7	0.043*

*Statistically significant (p<0.05).

Splenic injury accounted for 48% of all blunt abdominal trauma cases and was predominantly isolated (91.7%). Conservative treatment was successful in 58.3% of patients, whereas 33.3% ultimately required splenectomy. Splenic preservation by splenorrhaphy was achieved in 8.3% of patients. The overall survival rate among patients with splenic injury was 83.3%, with an overall mortality of 16.7% (p=0.043). These findings indicate that although most splenic injuries can be managed non-operatively, splenectomy remains the principal surgical procedure for patients with severe injury or hemodynamic instability.

DISCUSSION

The present study demonstrated that splenic injury was the most common solid organ injury following blunt abdominal trauma, with the majority of patients successfully managed conservatively. Operative intervention was reserved for hemodynamically unstable patients, and splenectomy was the most frequently performed surgical procedure. These findings are consistent with current evidence supporting selective non-operative management in appropriately selected patients.

Coccolini et al. developed the WSES 2020 liver trauma guidelines, emphasizing that management of solid organ injuries should be guided primarily by hemodynamic stability rather than injury grade. Although focused on liver trauma, these principles are equally applicable to splenic injuries and support the present study, where conservative management was successful in stable patients while surgery was reserved for unstable individuals.[9]

Johnsen et al. reviewed the surgical management of solid organ injuries and concluded that operative intervention remains essential for patients with persistent hypotension, ongoing hemorrhage, or failure of conservative management. In the present study, splenectomy was the commonest surgical procedure, reflecting its continued importance in managing severe splenic injuries with uncontrolled bleeding.[10]

Podda et al., in the 2022 World Society of Emergency Surgery consensus, emphasized structured follow-up of patients undergoing non-operative management, including serial clinical examination and imaging to detect delayed complications. The favorable outcomes observed among conservatively managed patients in the present study support the effectiveness of close monitoring during non-operative treatment.[11]

Chu et al. highlighted the role of delayed laparoscopic peritoneal washout as an adjunct in selected patients who develop complications during conservative management. Although this procedure was not routinely employed in the present study, careful observation and timely intervention contributed to successful non-operative management in most patients.[12]

Yanar et al. demonstrated that even multiple intra-abdominal solid organ injuries can be managed successfully without surgery provided patients remain hemodynamically stable. Similarly, the present study found that associated organ injuries alone were not absolute indications for surgery, and treatment decisions were based primarily on physiological status.[13]

Holmes et al. reported that failure of non-operative management is primarily associated with persistent bleeding and hemodynamic instability. The present study showed comparable findings, with patients presenting with shock and severe abdominal signs requiring operative intervention, highlighting the importance of early recognition of clinical deterioration.[14]

Ozturk et al. reported excellent long-term outcomes following conservative management of isolated blunt splenic injuries, emphasizing organ preservation whenever feasible. The present findings similarly support splenic preservation in stable patients while reserving splenectomy for severe injuries or failed conservative management.[15]

CONCLUSION

The present study demonstrates that selective non-operative management is effective for the majority of patients with blunt splenic injuries who are hemodynamically stable, whereas splenectomy remains the principal surgical treatment for unstable patients with severe splenic trauma. Careful clinical assessment, appropriate imaging, vigilant monitoring, and timely operative intervention are essential to optimize patient outcomes and minimize morbidity and mortality.

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