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Non Operative Management of Splenic Injury Following Blunt Abdominal Trauma – Study of Rates and Complications

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Abstract

Background: Blunt abdominal trauma is a major cause of injury-related morbidity and mortality, with the spleen being the most commonly injured solid organ. While splenectomy was traditionally the standard treatment, advances in imaging, intensive care, and interventional radiology have shifted management toward non-operative management (NOM) in hemodynamically stable patients. This study assessed the incidence, management strategies, and outcomes of splenic injury following blunt abdominal trauma.

Methodology: This prospective observational study was conducted over 17 months in the surgical and trauma ICUs of a tertiary care hospital. Sixty patients with splenic injury following blunt abdominal trauma were included. Clinical evaluation, laboratory investigations, and contrast-enhanced CT (CECT) abdomen were performed. Management decisions were based on hemodynamic status, splenic injury grade, and clinical judgment.

Results: Among 4,010 trauma ICU admissions, 60 patients (1.49%) had splenic injury. The mean age was 33.46 years, with males accounting for 88.3% of cases. Road traffic accidents were the leading cause (58.3%). CECT graded injuries in 57 patients, with Grade II and III injuries being the most common. Overall, 70% of patients were successfully managed non-operatively, while all Grade IV and V injuries required surgery. Two deaths occurred, both in patients with polytrauma. Common complications included haemorrhage (11.6%), surgical site infection (10%), respiratory complications (6.6%), and renal dysfunction (6.6%).

Conclusion: Non-operative management is a safe and effective first-line treatment for hemodynamically stable patients with splenic injury following blunt abdominal trauma. Hemodynamic status and injury grade are key determinants of management, with NOM associated with high success rates, fewer complications, and shorter hospital stays.

Keywords: Blunt Abdominal Trauma, Splenic Injury, Non-Operative Management, Hemodynamic Stability.

Introduction

Blunt abdominal trauma (BAT) is a major cause of morbidity and mortality across all age groups and represents one of the most frequent injuries encountered following road traffic accidents (RTAs). Approximately 45–50% of abdominal trauma cases are attributed to blunt mechanisms, making BAT an important contributor to trauma-related hospital admissions and deaths worldwide.[1] Among the abdominal organs, the spleen is one of the most commonly injured solid organs because of its anatomical location, friable parenchyma, and rich vascular supply. Consequently, splenic injury following blunt abdominal trauma remains an important challenge for trauma surgeons due to its potential for life-threatening hemorrhage and associated complications.[2]

The spleen is a vital intra-abdominal organ with significant immunological functions. It plays an essential role in the proliferation of T and B lymphocytes and macrophages, contributes to erythrogenesis, and provides protection against infections caused by encapsulated organisms such as Streptococcus pneumoniae, Neisseria meningitidis, Haemophilus influenzae, and Streptococcus pyogenes.[3,4] Historically, splenic trauma carried a high mortality rate, with several studies reporting mortality rates of 13% or higher, largely due to associated injuries rather than isolated splenic damage.[5]

For several decades, splenectomy was considered the standard treatment for blunt splenic injuries. This approach was based on the belief that the adult spleen had limited physiological importance and that conservative treatment carried an unacceptable risk of delayed or catastrophic hemorrhage.[6] However, improved understanding of the spleen's immunological functions, recognition of overwhelming post-splenectomy infection (OPSI), and advances in trauma care have substantially altered the management strategy.[4,6]

Recent developments in trauma resuscitation protocols, high-resolution imaging techniques, intensive care monitoring, and interventional radiology, particularly angioembolization, have shifted the paradigm from routine operative management to non-operative management (NOM) in appropriately selected patients.[4,7] NOM has emerged as the preferred treatment strategy for hemodynamically stable or stabilized patients with splenic injuries, provided that adequate diagnostic facilities, intensive monitoring, and prompt surgical backup are available.[4,7]

The success of NOM has been well established, with reported success rates reaching as high as 93.8% in patients with blunt abdominal solid organ injuries.[8] This approach preserves splenic function, reduces unnecessary laparotomies, shortens recovery, and minimizes complications associated with splenectomy. Nevertheless, failure of NOM may occur due to delayed hemorrhage, missed associated injuries, vascular complications such as pseudoaneurysm, or hemodynamic deterioration, emphasizing the need for careful patient selection and vigilant monitoring.[4,8]

Several factors, including the grade of splenic injury, associated injuries, hemodynamic stability, transfusion requirements, and radiological findings, influence the healing process and outcome of patients undergoing NOM. Recent studies have also highlighted the importance of evaluating healing time, rates of successful conservative treatment, and complications during follow-up to optimize patient management and identify predictors of treatment failure.[1,2]

Despite the widespread acceptance of NOM, variations continue to exist regarding patient selection, monitoring protocols, and management of complications, particularly in resource-limited settings. Therefore, evaluating the rates of successful non-operative management and the associated complications in patients with splenic injury following blunt abdominal trauma is essential to strengthen existing evidence and improve trauma care outcomes. The present study was undertaken to assess the incidence, management strategies, and outcomes of splenic injury following blunt abdominal trauma.

Methodology

This was a single-centre, prospective observational study conducted at a tertiary health care centre over a period of 17 months (February 2024 to June 2025). The study included 60 adult patients with splenic injury following blunt abdominal trauma that fulfilled the inclusion criteria. Universal sampling was adopted, and all eligible patients admitted during the study period were enrolled. Patients who were unwilling to participate in the study and those who were brought dead to the casualty were excluded.

The study was conducted on patients admitted to the Trauma Intensive Care Unit (ICU) or surgical wards of the tertiary health care centre. During the study period, 60 patients were enrolled after obtaining written informed consent. All patients were informed about the nature and objectives of the study before enrolment. The decision regarding operative management or non-operative management (NOM) was made by the treating surgeon based on the patient's clinical condition and institutional management protocols.

Patients managed conservatively were monitored closely with continuous assessment of vital signs, urine output, and general clinical condition. Blood transfusions were administered to patients presenting with pallor and low haemoglobin levels whenever indicated. Patients who underwent operative management received standard preoperative antibiotic prophylaxis and adequate analgesia as per institutional protocol. All patients were discharged once they were haemodynamically stable, tolerating a full diet, and considered fit for discharge by the treating team.

After obtaining informed consent, detailed demographic and clinical information was collected from all participants. A comprehensive clinical history, general physical examination, and relevant laboratory investigations were performed. Routine investigations included complete blood count, renal function tests, blood sugar levels, and prothrombin time/international normalized ratio (PT/INR).

The primary outcome measure was the type of management (operative or non-operative). Secondary outcome measures included haemorrhage, pain assessed using the Visual Analogue Scale (VAS), surgical site infections, respiratory complications, renal function, other complications, and duration of hospital stay. Patients were evaluated on the day of admission (Day 0), during which they were admitted to the surgical ward and managed with continuous vital monitoring and nil

per oral (NBM) status as indicated. Follow-up assessments were conducted on Day 7, Day 14, and at 30 days from admission during an outpatient department (OPD) visit. The collected data were entered into Microsoft Excel and analyzed using SPSS version 22.0

Results

A total of 60 patients with splenic injury following blunt abdominal trauma were analysed over 17 months. Among 357 patients with blunt abdominal trauma admitted out of 4,010 Trauma ICU admissions**,** the incidence of splenic injury was 16.8%**,** including both isolated splenic injuries and those occurring as part of polytrauma.

The study included 60 patients with blunt abdominal trauma and splenic injury. The mean age was 33.46 years, with an age range of 15–53 years. Males constituted the majority (53; 88.3%), while females accounted for 7 (11.7%) patients. Road traffic accidents were the commonest mechanism of injury (35; 58.3%), followed by assault (18; 30.0%) and fall from height (7; 11.7%) (Table 1).

On admission, the mean pulse rate was 102.46 ± 16.91 beats/min (range: 76–140) and the mean systolic blood pressure was 113.96 mmHg (range: 90–140 mmHg). The mean haemoglobin level was 11.63 ± 1.60 g/dL, WBC count 10,908.33 ± 4,148.93/mm³, platelet count 2.01 ± 0.45 lakh/mm³, random blood sugar 131.95 ± 12.91 mg/dL, blood urea nitrogen 18.01 ± 7.15 mg/dL, serum creatinine 1.12 ± 0.16 mg/dL, and prothrombin time 16.67 ± 2.63 seconds, reflecting the baseline clinical and laboratory profile of the study population (Table 2).

CECT grading showed that Grade 2 and Grade 3 splenic injuries were the most common, each accounting for 21 (35.0%) patients, followed by Grade 4 (8; 13.3%), Grade 1 (6; 10.0%), Grade 5 (1; 1.7%), while CECT was not performed in 3 (5.0%) patients. Liver injury (10; 16.7%) and rib fractures (9; 15.0%) were the commonest associated injuries, followed by pelvic fractures and skull fractures (8; 13.3% each), facial bone fractures (7; 11.7%), renal injuries (6; 10.0%), subdural hematoma and upper limb fractures (5; 8.3% each), extradural hematoma (4; 6.7%), rib fractures with pneumothorax (3; 5.0%), and rib fractures with hemothorax and lower limb fractures (2; 3.3% each). Overall, 42 (70.0%) patients were managed non-operatively, while 18 (30.0%) underwent operative management (Table 3).

A total of 18 patients underwent operative management for splenic injury. Completely shattered spleen with devascularization was the most common intraoperative finding, observed in 3 (16.7%) patients, followed by splenic laceration (3 cm depth) involving the hilum without active bleeding in 3 (16.7%) patients and multiple splenic lacerations involving hilar vessels with active bleeding and hematoma in 3 (16.7%) patients. Isolated cases (5.6% each) included shattered spleen associated with varying degrees of hemoperitoneum (500–700 cc), renal lacerations, active hilar bleeding with hilar hematoma, splenic lacerations with active spurting, ruptured subcapsular hematoma, and perihilar contained hematoma. Overall, the majority of patients had high-grade splenic injuries involving the splenic hilum, active hemorrhage, or devascularization, necessitating surgical intervention.**(**Fig. 1**).**

Haemorrhage was the most frequent complication, occurring in 7 (11.6%) patients, followed by surgical site infection in 6 (10.0%), while respiratory complications and renal dysfunction were each observed in 4 (6.6%) patients. Most patients had no pain (40; 66.6%), whereas 11 (18.3%) had mild, 5 (8.3%) had moderate, and 4

(6.6%) had severe pain. Overall, 58 (96.7%) patients were successfully discharged, while 2 (3.3%) died during treatment. The mean ICU stay was 2.2 days (range: 1–7 days) and the mean hospital stay was 5.3 days (range: 2–11 days) (Table 4).

Table 1: Demographic and Injury Characteristics of Study Participants (n = 60)

Variable	Category	Frequency (n) (%)
Age (years)	Mean ± SD	33.46 ± 16.67
	Range	15–53
Gender	Male	53(88.33%)
	Female	7(11.67%)
Mechanism of Injury	Road Traffic Accident	35(58.33%)
	Assault	18(30.00%)
	Fall from Height	7(11.67%)

Table 2: Clinical Profile and Laboratory Parameters on Admission (n = 60)

Variable	Mean	SD	Minimum	Maximum
Pulse rate (beats/min)	102.46	16.91	76	140
Systolic blood pressure (mmHg)	113.96	07.83	90	140
Haemoglobin (g/dL)	11.63	1.60	7.3	14
WBC count (/mm³)	10,908.33	4,148.93	5,300	29,000
Platelet count (lakh/mm³)	2.01	0.453	1.2	3.0
Random blood sugar (mg/dL)	131.95	12.91	102	168
Blood urea nitrogen (mg/dL)	18.01	7.15	4	58
Serum creatinine (mg/dL)	1.12	0.16	0.8	1.6
Prothrombin time (seconds)	16.67	2.63	11.2	27.7

Table 3: Injury Characteristics, Associated Injuries and Management (n = 60)

Variable	Category	Frequency (n) (%)
CECT Grade	Grade 1	6(10.00%)
	Grade 2	21(35.00%)
	Grade 3	21(35.00%)
	Grade 4	8(13.33%)
	Grade 5	1(01.67%)
	CECT Not Done	3(05.00%)
Associated Injuries	Liver injury	10(16.67%)
	Rib fractures	9(15.00%)
	Pelvic fractures	8(13.33%)

	Skull fractures	8(13.33%)
	Facial bone fractures	7(11.67%)
	Renal injuries	6(10.00%)
	Subdural hematoma	5(08.33%)
	Upper limb fractures	5(08.33%)
	Extradural hematoma	4(06.67%)
	Rib fractures with pneumothorax	3(05.00%)
	Rib fractures with hemothorax	2(03.33%)
	Lower limb fractures	2(03.33%)
Management	Non-operative	42(70.00%)
	Operative	18(30.00%)

Fig 1: Intra-operative findings

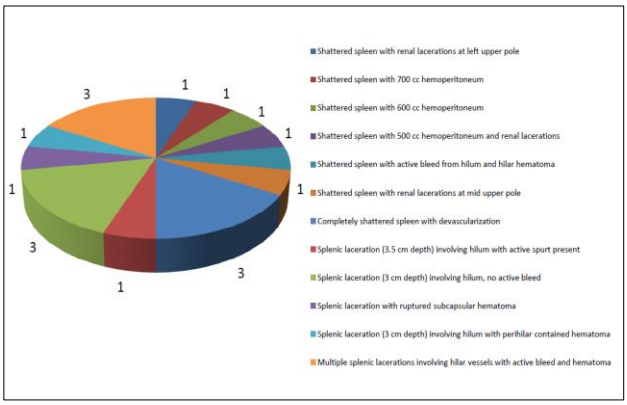

Table 4: Complications and Outcomes of Patients (n = 60)

Variable	Category	Frequency (n)(%)
Complications	Haemorrhage	7(11.66%)
	Surgical site infection	6(10.00%)
	Respiratory complications	4(06.66%)
	Renal dysfunction	4(06.66%)
Pain Severity	None	40(66.66%)
	Mild	11(18.33%)
	Moderate	5(08.33%)
	Severe	4(06.66%)
Outcome	Discharged	58(96.67%)
	Expired	2(03.33%)
Length of ICU Stay (days)	Mean (Range)	2.2 (1–7)
Length of Hospital Stay (days)	Mean (Range)	5.3 (2–11)

Discussion

This prospective observational study evaluated 60 patients with splenic injury following blunt abdominal trauma over 17 months. The mean age of the patients was 33.46 years**,** with a marked male predominance (88.3%), which is comparable to the findings of Peitzman et al.[9]**,** who also reported that young males constitute the majority of patients with splenic trauma due to greater exposure to road traffic accidents (RTAs) and occupational injuries. The incidence of splenic injury among patients with blunt abdominal trauma in the present study was 16.8%**,** which was higher than that reported by Al Busaidi et al.[10] from Oman. This higher incidence may be attributed to our institution being a tertiary referral centre situated near a major express highway, receiving referrals from multiple district and sub-district hospitals. Similar to the observations of the World Health Organization (WHO)**,** RTAs were the leading mechanism of injury (58.3%), followed by assault (30%) and falls from height (11.6%).

Hemodynamic stability was the most important factor influencing management. Patients presenting with systolic blood pressure ≤90 mmHg were significantly more likely to undergo operative management (p=0.008), which is in agreement with the findings of Thakur S et al.[11]**,** who demonstrated that hemodynamic status is a stronger predictor of management than the anatomical grade of splenic injury. Overall, 70% of patients in the present study were managed successfully with non-operative management (NOM), which is comparable to the success rates reported by Requarth and D'Agostino[12]**,** who observed NOM success rates exceeding 80% in appropriately selected patients. In our study, all Grade I and II injuries were managed successfully without surgery, while most Grade III injuries were also treated conservatively. However, all Grade IV and V injuries required operative intervention, similar to the observations of Bhullar et al.[13]**,** who reported significantly higher failure rates of NOM in high-grade splenic injuries, particularly in centres without splenic artery embolization facilities.

Contrast-enhanced computed tomography (CECT) was the primary imaging modality for injury assessment, and the American Association for the Surgery of Trauma (AAST) grading system showed a significant association with the management strategy ($p<0.001$). These findings are consistent with the recommendations of the World Society of Emergency Surgery (WSES) and previous studies supporting CT-based grading for treatment planning.[3-8] The overall survival rate in the present study was 96.7%**,** with mortality limited to patients with severe associated polytrauma rather than isolated splenic injury. Operative management was associated with a higher incidence of haemorrhage, surgical site infection, respiratory complications, renal dysfunction, and longer ICU and hospital stays compared with NOM. These observations are comparable to those reported by Skattum et al.[14]**,** who demonstrated that successful protocol-based NOM reduces complications, hospital stay, ICU utilization, and overall healthcare resource consumption. Overall, the findings of the present study support current evidence favouring non-operative management in hemodynamically stable patients while reserving operative intervention for unstable patients and those with high-grade splenic injuries.

Conclusion

This study demonstrates that non-operative management (NOM) is a safe, effective, and preferred approach for hemodynamically stable patients with blunt splenic injury. High-grade injuries and unstable presentations

are more likely to require surgery. The results highlight the importance of individualized management protocols, radiologic support, and timely decision-making to reduce complications, optimize outcomes, and preserve splenic function whenever possible.

Limitations

It was conducted at a single tertiary care centre, which may limit the generalizability of the findings to other healthcare settings. The management approach (operative versus non-operative) was based on the treating surgeon's clinical judgment rather than randomization, introducing the possibility of selection bias. Additionally, the follow-up period was limited to 30 days after admission, which did not permit assessment of long-term outcomes, delayed complications, or quality of life. As an observational study, causal relationships between management strategies and outcomes could not be established.

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References

1. Chugh I, Kumar P, Paruthi C, Garg K, Agrawal V. An observational study of the healing time, associated factors, and complications during non-operative management of patients with blunt abdominal trauma. Archives of Trauma Research. 2023 Jul 1;12(2):76-83.
2. Kumar S, Katiyar V, Sharma S, Srivastava VK, Bhartiya SK, Mishra SP, Katiyar VK, Srivastava Sr VK. A clinical review and experience of splenic trauma in north India: a retrospective observational study. Cureus. 2024 Mar 2;16(3).
3. Akhila NT. Non Operative Management of Splenic Trauma. Clin Surg. 2021;6:3309.
4. Singh AK, Paruthy SB, Belsariya V, Choudhary S, Singh A, Paruthy Sr SB. Survival secrets: unmasking the factors predicting failure of non-operative management (NOM) in splenic injuries. Cureus. 2023 Oct 19;15(10).
5. Rode A, Bansod PY, Gaikwad U, Pind VR, Kulkarni TV, Mandhare AV, Rao RN. Clinical review of splenic trauma in central India: a prospective observational study. International Surgery Journal. 2021;8(10):2951–2955.
6. Dalvi MR, Beedkar AN, Dhakne BS, Tongse PS. Hospital based study of non-operative management of blunt splenic trauma. International Surgery Journal. 2017 Jan;4(1):35.
7. Vasireddy DD, Pakalapati DC. A prospective analysis of operative versus non-operative management of grade III splenic injury: outcomes and efficacy in trauma care. TPM–Testing, Psychometrics, Methodology in Applied Psychology. 2025;32(S2):2139-44.
8. Hashemzadeh SH, Hashemzadeh KH, Dehdilani M, Rezaei S. Non-operative management of blunt trauma in abdominal solid organ injuries: a prospective study to evaluate the success rate and predictive factors of failure. Minerva Chirurgica. 2010 Jun 1;65(3):267-74.
9. Peitzman AB, Heil B, Rivera L, Federle MB, Harbrecht BG, Clancy KD, Croce M, Enderson BL, Morris JA, Shatz D, Meredith JW. Blunt splenic injury in adults: multi-institutional study of the Eastern Association for the Surgery of Trauma.

Journal of Trauma: Injury, Infection & Critical Care. 2000 Aug;49(2):177-89.

10. Al-Busaidi A, Al-Shafei T, Al-Moqbali H, Al-Kindi S, Al-Saadi M, Al-Busaidi N, Al-Qadhi H. The incidence of splenic injury following blunt abdominal trauma (BAT), Sultan Qaboos University Hospital experience.
11. Thakur S, Awan NA, Mushtaq U, Jeelani S, Attri MR, Gilkar IA, Wani YH. Non operative management of isolated traumatic splenic injury. International Surgery Journal. 2021 Mar 26;8(4):1101-8.
12. Requarth JA, D'Agostino RB, Miller PR. Nonoperative management of adult blunt splenic injury with and without splenic artery embolotherapy: a meta-analysis. Journal of Vascular Surgery. 2012 Mar 1;55(3):886.
13. Bhullar IS, Frykberg ER, Siragusa D, Chesire D, Paul JS, Tepas JJ III, Kerwin AJ. Age does not affect outcomes of nonoperative management of blunt splenic trauma. J Am Coll Surg. 2012 Jun;214(6):958-64.
14. Skattum J, Naess PA, Gaarder C. Non-operative management and immune function after splenic injury. Journal of British Surgery. 2012 Jan;99(Supplement_1):59-65.