

Original Research Article

Clinical utility of the clinical abdominal scoring system in predicting the need for laparotomy following blunt abdominal trauma

Ruchi Choudhary^{1*}, B. K. Arora¹, H. R. Ranga¹, Anuradha Mishra²,
Ruchika Kumari¹, Kanika Mani¹

¹Department of Department of General Surgery, PGIMS, Rohtak, Haryana, India

²Department of Neonatology, ABVIMS and RML Hospital, New Delhi, India

Received: 30 May 2026

Revised: 17 September 2026

Accepted: 05 October 2026

*Correspondence:

Dr. Ruchi Choudhary,

E-mail: ruchimedchoudhary@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Blunt abdominal trauma (BAT) remains a major cause of morbidity and mortality in emergency surgical practice. Early identification of patients requiring laparotomy is essential to reduce complications and improve outcomes. The objective of this study was to evaluate the Clinical Abdominal Scoring System (CASS) in predicting the necessity of laparotomy and clinical outcomes in patients with blunt abdominal trauma.

Methods: This prospective observational study was conducted in the Department of General Surgery, Pt. B.D. Sharma PGIMS, Rohtak, from May 2024 to May 2025. A total of 70 patients with blunt abdominal trauma were included. Clinical parameters including pulse rate, systolic blood pressure, Glasgow Coma Scale, abdominal findings, and time of presentation were used to calculate the CASS score. Radiological investigations including eFAST, X-ray abdomen, and contrast-enhanced CT were performed. Patients were managed conservatively or surgically based on clinical findings and scoring.

Results: The mean age of patients was 27.60 ± 13.69 years, with male predominance (82.85%). Road traffic accidents were the most common mechanism of injury (81.42%). Conservative management was successful in 78.57% of patients, whereas 21.42% required surgery. Patients requiring surgical intervention had significantly higher mean CASS scores compared to conservatively managed patients (12.40 ± 0.63 vs. 7.84 ± 1.34 , $p < 0.001$). Mortality was significantly associated with higher CASS scores (12.50 ± 0.71 vs. 8.71 ± 2.19 , $p = 0.017$).

Conclusion: CASS is a simple, rapid, cost-effective, and reliable bedside scoring system that correlates significantly with operative requirement and clinical outcomes in blunt abdominal trauma patients.

Keywords: Blunt abdominal trauma, Laparotomy, CASS, Trauma scoring system, Emergency surgery

INTRODUCTION

Blunt abdominal trauma (BAT) is challenging due to complex organ injuries and the need for rapid decisions. Advances in imaging and clinical protocols have shifted management from routine exploratory laparotomy to selective non-operative treatment in carefully chosen patients, especially those with solid organ injuries.¹

Blunt abdominal trauma constitutes a major proportion of trauma admissions and is associated with considerable morbidity and mortality. Clinical studies from tertiary care centers have shown that BAT commonly affects young adults and is predominantly caused by road traffic accidents. Timely evaluation and appropriate management play a critical role in improving outcomes, as delayed diagnosis can result in complications such as haemorrhage, peritonitis, and organ failure.²

Despite advances in trauma care, diagnosing blunt abdominal injuries remains difficult due to subtle, unreliable clinical signs. Surgical decisions must balance the risk of missed injuries against unnecessary laparotomy, making a combination of clinical assessment and diagnostic tools essential for better outcomes.³

The development of organized trauma systems and dedicated trauma centers has significantly improved outcomes. Evidence shows lower mortality in patients treated at these centers compared to non-specialized hospitals, highlighting the value of structured care in managing severe injuries like blunt abdominal trauma.⁴

The Advanced Trauma Life Support program has improved trauma care by standardizing assessment and resuscitation, enabling early detection of life-threatening injuries and timely intervention, especially in blunt abdominal trauma.⁵

Studies from tertiary centers show that liver and spleen injuries are common in blunt abdominal trauma, most often due to road traffic accidents. Patients typically present with abdominal pain, tenderness, and instability, highlighting the need for early diagnosis and proper triage to reduce complications and mortality.⁶

Clinical scoring systems aid the evaluation of blunt abdominal trauma by offering objective, rapid risk stratification alongside examination and imaging. The Clinical Abdominal Scoring System (CASS) is a simple, quick, and cost-effective bedside tool that assesses injury severity and helps guide management. Its strong predictive value for identifying patients needing laparotomy makes it a practical tool in emergency settings.⁷

Clinical examination and bedside judgment remain essential, as recognizing subtle signs through history and physical exam is crucial for rapid decisions in trauma care.⁸

Modern trauma care relies on advanced imaging, especially whole-body CT, to rapidly detect internal injuries and guide surgical decisions, improving diagnostic accuracy and outcomes. Despite this, early identification of patients needing surgery in blunt abdominal trauma remains difficult, highlighting the need for simple, reliable tools like the Clinical Abdominal Scoring System (CASS) for rapid bedside decision-making.⁹

To aim of this study was to evaluate clinical abdominal scoring system (CASS) in predicting the necessity of laparotomy in blunt abdominal trauma.

METHODS

This prospective observational study was conducted in the Department of General Surgery, Pt. B.D. Sharma

PGIMS, Rohtak, from May 2024 to May 2025 after approval from the institutional ethics committee. Informed consent was obtained from all participants.

A total of 70 patients with blunt abdominal trauma presenting within 24 hours of admission were included. Pregnant women and patients with severe thoracic injuries were excluded from the study.

Detailed clinical evaluation was performed in all patients. Routine investigations included hemoglobin, blood glucose, Glasgow Coma Scale, pulse rate, systolic blood pressure, respiratory rate, temperature, and abdominal radiography. eFAST and contrast-enhanced CT abdomen were performed when indicated.

CASS scoring was calculated using five parameters: time of presentation, pulse rate, systolic blood pressure, Glasgow Coma Scale, and abdominal findings. Scores ranged from 5 to 15. Patients with scores ≥ 12 underwent immediate laparotomy, scores 9–11 underwent further imaging evaluation, and scores ≤ 8 were managed with observation and conservative treatment.

Statistical analysis was performed using standard descriptive and inferential methods. Continuous variables were expressed as mean $\pm$ standard deviation, and categorical variables as frequency and percentage. A p -value < 0.05 was considered statistically significant. Individual components of the CASS scoring system

RESULTS

A total of 70 patients were included in the analysis. The age distribution demonstrated a predominance of young to middle-aged individuals. The largest proportion of cases occurred in the 21–30-year age group, accounting for 24 patients (34.28%). Patients aged 11–20 years and 31–40 years each constituted 16 cases (22.85% for both groups). Children aged 10 years or younger represented 6 cases (8.57%), while patients older than 40 years comprised 8 cases (11.42%). The mean age of the study cohort was 27.60 years (SD: 13.69), with a wide age range spanning from 1 to 84 years, indicating substantial variability within the population (Table 1).

Among the 70 patients included in the study, the majority were male. A total of 58 patients (82.85%) were male, while 12 patients (17.14%) were female. This marked male predominance suggests a strong sex-related difference in the occurrence of the condition within the study cohort (Table 2).

Management of the 70 patients demonstrated a strong preference for non-operative approaches. Conservative treatment was employed in 55 cases (78.57%), while surgical intervention was required in 15 patients (21.42%). These findings indicate that the majority of patients with abdominal trauma were successfully managed non-operatively (Table 3 and 4).

Table 1: Distribution of cases according to age of the patient (n=70).

Age of the patient (in years)	Number of cases
10 or less	6 (8.57%)
11–20	16 (22.85%)
21–30	24 (34.28%)
31–40	16 (22.85%)
Above 40	8 (11.42%)
Mean age of the patient in years (SD)	27.60 (13.69)
Range	1–84 years

Table 2: Sex distribution of patients.

Sex of the patient	Number of cases
Male	58 (82.85%)
Female	12 (17.14%)

Table 3: Distribution of cases according to mechanism of injury (n=70).

Mechanism of injury	Number of cases
Road side accident	57 (81.42%)
Fall from height	10 (14.28%)
Physical assault	3 (4.28%)

Table 4: Distribution of cases according to type of management (n=70).

Type of management	Number of cases
Conservative	55 (78.57%)
Surgical	15 (21.42%)

The mean CASS score differed significantly according to the type of management. Patients who required surgical intervention had a mean CASS score of 12.40 (SD: 0.63), whereas those managed conservatively had a mean score of 7.84 (SD: 1.34). This difference was statistically significant ($p < 0.001$), indicating that higher CASS scores were strongly associated with the need for operative management. (Table 5)

Table 5: Comparison of mean CASS score according to need for surgical management (n=70).

CASS score	Mean (SD)		P value
	Surgery done	Conservative management	
	12.40 (0.63)	7.84(1.34)	<0.001

Analysis of CASS scores in relation to clinical outcome demonstrated that patients who expired had a higher mean score of 12.50 (SD: 0.71) compared to 8.71 (SD: 2.19) in those who were discharged. This difference was statistically significant ($p=0.017$), suggesting that elevated CASS scores were associated with increased risk of mortality in the study cohort.

Table 6: Comparison of mean CASS score according to clinical outcome (n=70).

CASS score	Mean (SD)		P value
	Expired	Discharged	
	12.50 (0.71)	8.71 (2.19)	0.017

DISCUSSION

BAT is a critical concern in emergency medicine, often necessitating rapid decision-making to determine the appropriate course of management. Early identification of patients requiring laparotomy is crucial to avoid delays in surgical intervention while simultaneously preventing unnecessary operative procedures. The present study evaluated the usefulness of the clinical abdominal scoring system (CASS) in predicting the need for laparotomy and clinical outcomes in patients with blunt abdominal trauma.

BAT continues to show a strong predilection for the younger male population, largely attributed to increased involvement in road traffic accidents, occupational hazards, and high-risk activities. In the present study, male predominance was observed in 82.85% of patients, with a male-to-female ratio of approximately 4.83:1. The 21-30 years age group accounted for the highest incidence at 34.28%, followed by patients aged 11–20 years and 31–40 years each constituted 22.85% for both groups. These findings are in accordance with several studies. Arshad et al reported 83.7% male in their study on blunt trauma abdomen, while Raghuveer et al observed 88% of male predominance with a peak incidence in the third decade of life.^{10,11} Similarly, Kumar et al and Yordanius et al also reported young adult males as the most commonly affected group.^{12,13}

The most frequent clinical presentation in the current study was tenderness in abdomen, observed in 57.14% of cases, followed by abdominal guarding in 34.28%, and abdominal pain in 8.57%. These signs form the primary clinical indicators for evaluating blunt abdominal trauma in the emergency setting. Comparable results were noted by Yordanius et al who reported tenderness in 55%. Similarly, Arshad et al and Raghuveer et al emphasized the diagnostic relevance of abdominal tenderness and guarding in predicting intra-abdominal pathology.

Management outcomes among the 70 patients favored a non-operative approach, with conservative treatment employed in 78.57% of cases. Surgical intervention was required in only 21.42%, underscoring the effectiveness of non-operative management in the majority of abdominal trauma patients. Patients with CASS score 12 or more were taken up for immediate laparotomy as were patients with pneumoperitoneum on X-ray abdomen.

Operative exploration demonstrated a predominance of small bowel injuries among surgically managed patients. Jejunal perforation was the most frequently encountered

lesion, occurring in 10% of cases, followed by ileal perforation in 8.57%. In contrast, injuries involving the bladder and sigmoid colon were uncommon, each accounting for only 1.42% of cases, indicating that genitourinary and colonic injuries were relatively rare in this cohort.

These observations are similar to those of Raghuveer et al who reported laparotomy in 14% of the patients, while Arshad et al. reports emergency laparotomy in 48.8% cases.

Overall outcomes were favorable, with successful discharge achieved in 97.14% of patients. Mortality was observed in only 2.85% of cases, accounting for two patients.

This study offers several notable strengths. It is one of the few prospective observational studies conducted at a tertiary care trauma center that evaluates the practical utility of the CASS in real-time clinical settings. The structured scoring system was uniformly applied to all patients, and correlation with radiological findings, operative intervention, and patient outcomes was meticulously recorded. The inclusion of a wide spectrum of trauma severity, ranging from conservatively managed cases to those requiring emergency laparotomy, adds robustness to the clinical applicability of CASS.

Despite its valuable contributions, the study has certain limitations. Being a single center study with a relatively limited sample size, the findings may not be generalizable to broader populations. Decisions regarding imaging and surgical intervention were influenced by clinician judgment, which could introduce observer bias. The study also lacked long-term follow-up data, restricting analysis to immediate in-hospital outcomes.

The timing of presentation after trauma was not uniformly controlled and may have influenced the accuracy of initial scoring. Lastly, although CASS incorporates multiple objective parameters, certain subjective clinical signs (e.g., abdominal tenderness) may vary depending on the experience and interpretation of the examiner.

Multicentric trials with larger sample sizes, standardized protocols, and longer follow up periods are recommended to further validate the clinical relevance and generalizability of CASS.

CONCLUSION

It is concluded that the CASS is a simple, cost-effective, and reliable scoring system for evaluating patients with blunt abdominal trauma. It enables early risk stratification, guides decision-making, and correlates significantly with operative requirement and clinical outcome.

While the present study establishes the clinical utility of CASS, further research with larger multicentric trials is needed to improve its external validity. Incorporation of CASS into emergency and trauma triage protocols and its integration with imaging modalities and emerging digital decision-support systems may further enhance early diagnosis and management, especially in resource-limited settings, ultimately improving trauma care and patient survival.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. van der Vlies CH, Olthof DC, Gaakeer M, et al. Changing patterns in diagnostic strategies and the treatment of blunt injury to solid abdominal organs. *Int J Emerg Med.* 2011;4:47.
2. Mehta N, Babu S, Venugopal K. An experience with blunt abdominal trauma: evaluation, management and outcome. *Clin Pract.* 2014;4(2):599.
3. Karamercan A, Yilmaz TU, Karamercan MA, Aytac B. Blunt abdominal trauma: evaluation of diagnostic options and surgical outcomes. *Ulus Travma Acil Cerrahi Derg.* 2008;14(3):205-10.
4. Celso B, Tepas J, Langland-Orban B, et al. A systematic review and meta-analysis comparing outcome of severely injured patients treated in trauma centers following the establishment of trauma systems. *J Trauma.* 2006;60(2):371-8.
5. van Olden GD, Meeuwis JD, Bolhuis HW, Boxma H, Goris RJA. Advanced trauma life support study: quality of diagnostic and therapeutic procedures. *J Trauma.* 2004;57(2):381-4.
6. Amuthan J, Vijay A, Pradeep C, Anandan H. A clinical study of blunt injury abdomen in a tertiary care hospital Tamil Nadu. *Int J Sci Stud.* 2017;5(1):108-12.
7. El Arini AMH, Abdellatif T, Sallam AM, Ebrahim A. Clinical abdominal scoring system in predicting the necessity of laparotomy in blunt abdominal trauma. *Zagazig Univ Med J.* 2023;29(1):56-63.
8. Taylor RB. *White coat tales: medicine's heroes, heritage, and misadventures.* Cham: Springer; 2016.
9. Qamar SR, Evans D, Gibney B, Redmond CE, Nasir MU, Wong K, et al. Emergent comprehensive imaging of the major trauma patient: a new paradigm for improved clinical decision-making. *Can Assoc Radiol J.* 2021;72(2):293-310.
10. Alam A, Gupta A, Gupta N, Yelamanchi R, Bansal L, Durga C. Ewaluacja skal ISS, RTS, CASS i TRISS w ocenie rokowania u pacjentów po urazie tępych jamy brzusznej. *Pol J Surg.* 2021;93(2):9-15.
11. Raghuveer MN, Dinesh HN, Bagdalkar A. CASS—a cost-effective strategy in the management of blunt

trauma abdomen. *Asian J Med Sci.* 2023;14(8):238-43.

12. Kumar R, Singh V, Gupta A, Shukla VK. Clinical abdominal scoring system for blunt abdominal trauma in rural setup. *Int Surg J.* 2021;8(7):2089-93.
13. BATSS in blunt trauma abdomen. *MedPulse Int J Surg.* 2019;19(2):77-81.

Cite this article as: Choudhary R, Arora BK, Ranga HR, Mishra A, Kumari R, Mani K. Clinical utility of the clinical abdominal scoring system in predicting the need for laparotomy following blunt abdominal trauma. *Int Surg J* 2026;13:2135-9.