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Comparison of Blunt Abdominal Trauma Scoring System (BATSS) versus FAST in Assessment of Blunt Abdominal Trauma in a Tertiary Care Centre in India

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ABSTRACT

Background: Blunt abdominal trauma (BAT) is a significant cause of morbidity and mortality, particularly in developing countries. Accurate diagnostic tools are essential for effective triage and management. The Blunt Abdominal Trauma Scoring System (BATSS) integrates clinical and ultrasonographic findings, while Focused Assessment with Sonography for Trauma (FAST) is widely used for detecting intra-abdominal free fluid.

Objective: To evaluate the effectiveness of BATSS compared to FAST in assessing BAT at a tertiary care centre in India.

Methods: A retrospective study was conducted on 62 patients with BAT admitted to Father Muller Medical College Hospital from January 2020 to December 2022. Patients aged ≥18 years were included, excluding those with penetrating trauma or iatrogenic injuries. BATSS scores were calculated based on clinical parameters and FAST findings, and results were compared with contrast-enhanced computed tomography (CECT) abdomen as the gold standard. Sensitivity, specificity, and predictive values were analyzed using SPSS 18.

Results: Of 62 patients, 82% were male, with 58% aged <40 years. Road traffic accidents accounted for 85% of cases. FAST showed a sensitivity of 67.39% and specificity of 100%, while BATSS demonstrated a sensitivity of 71.73% and specificity of 100%. BATSS scores ≥8 were strongly associated with intra-abdominal injury.

Conclusion: BATSS outperforms FAST in predicting intra-abdominal injury, aiding triage and reducing unnecessary imaging.

Keywords: *Blunt abdominal trauma, BATSS, FAST, CECT, trauma scoring*

1. INTRODUCTION

Blunt abdominal trauma (BAT) is a leading cause of morbidity and mortality worldwide, accounting for approximately 7–10% of all trauma cases and ranking as the third leading cause of death among trauma patients [1]. In developing nations, trauma remains the primary cause of mortality in individuals under 45 years, contributing significantly to years of potential life lost (YPLL) [2]. The complexity of BAT lies in its varied presentation, ranging from subtle clinical signs to life-threatening intra-abdominal injuries, necessitating rapid and accurate diagnostic tools for effective management.

Trauma scoring systems have been developed to standardize the assessment of injury severity, enabling prognostic estimation and facilitating quality control within healthcare systems [3]. These systems are broadly categorized into anatomical, physiological, and mixed types. Anatomical scores, such as the Injury Severity Score (ISS) and Abdominal Trauma Index (ATI), focus on the site and extent of injury [4]. Physiological scores, like the Revised Trauma Score (RTS) and Shock Index (SI), evaluate functional parameters such as vital signs [5]. Mixed systems, including the Trauma Injury Severity Score (TRISS) and New Trauma Injury Severity Score (NTRISS), combine both approaches to enhance predictive accuracy [6]. Despite their utility, each system has limitations, prompting continuous refinement and development of novel scoring tools.

The Blunt Abdominal Trauma Scoring System (BATSS) is a relatively new tool designed specifically for BAT. It integrates clinical findings—such as abdominal pain, tenderness, and chest wall signs—with Focused Assessment with Sonography for Trauma (FAST) results and vital signs to generate a 24-point score [7]. BATSS aims to provide a rapid, bedside assessment to guide clinical decision-making, particularly in resource-limited settings. In contrast, FAST is a widely adopted ultrasonographic technique that detects free intra-abdominal fluid with high specificity but variable sensitivity, often influenced by operator expertise [8].

Several studies have explored the efficacy of BATSS and FAST in BAT assessment. Fahmi et al. (2022) demonstrated that BATSS effectively predicts outcomes in BAT patients, serving as a foundation for management decisions [7]. Similarly, Talari et al. (2015) reported that FAST has high sensitivity and specificity for detecting intra-abdominal injuries, making it a valuable initial screening tool [8]. However, Luthra et al. (2021) found BATSS useful for clinical grading but inadequate for determining treatment plans or predicting outcomes, highlighting the need for further validation [9]. Other studies, such as Fonseca et al. (2020), have emphasized the superior predictive accuracy of mixed scoring systems like NTRISS for morbidity and mortality [10].

The choice of diagnostic tool is critical in BAT, as delays in diagnosis can lead to adverse outcomes. CECT abdomen remains the gold standard for evaluating BAT due to its high sensitivity and ability to delineate organ-specific injuries [11]. However, its use is limited by cost, radiation exposure, and availability in resource-constrained settings. BATSS and FAST offer practical alternatives, but their comparative effectiveness in real-world settings, particularly in India, remains underexplored.

This study addresses this gap by comparing BATSS and FAST in a tertiary care centre in India, where road traffic accidents (RTAs) are a leading cause of BAT [12]. RTAs accounted for 85% of BAT cases in our cohort, reflecting the epidemiological burden in developing economies. The young male demographic, which constitutes the majority of victims, underscores the socioeconomic impact of BAT [13]. By evaluating BATSS against FAST, with CECT as the reference standard, this study aims to determine their diagnostic accuracy and utility in guiding clinical management. The findings could inform trauma protocols, optimize resource allocation, and reduce unnecessary imaging, thereby improving patient outcomes in resource-limited settings.

The integration of clinical and imaging-based tools in BATSS offers a promising approach to streamline triage and management. Unlike FAST, which relies solely on ultrasonography, BATSS incorporates a broader range of parameters, potentially enhancing its predictive capacity [14]. However, its performance in diverse clinical settings and its ability to reduce the need for advanced imaging require further investigation. This study provides a comprehensive analysis of BATSS and FAST, contributing to the growing body of evidence on trauma scoring systems [15].

Aims

The objective of this study was to evaluate the effectiveness of the Blunt Abdominal Trauma Scoring System (BATSS) compared to Focused Assessment with Sonography for Trauma (FAST) in assessing blunt abdominal trauma in patients presenting to Father Muller Medical College Hospital, Mangalore, Karnataka, India.

2. MATERIALS AND METHODS

Study Design

This retrospective, record-based study was conducted at the Department of General Surgery, Father Muller Medical College Hospital, Mangalore, Karnataka, India. Data were collected from patients admitted with blunt abdominal trauma (BAT) between January 2020 and December 2022.

Study Population

A total of 62 patients were included in the study. The inclusion criterion was patients aged ≥18 years diagnosed with BAT, with or without comorbidities. Exclusion criteria included patients <18 years, those with non-traumatic laparotomies, iatrogenic injuries, penetrating abdominal trauma, or injuries due to ingestion of corrosive agents.

Data Collection

Data were retrieved from the medical records department and included patient history, physical examination findings, diagnostic investigations, and surgical indications. All patients underwent a primary survey, resuscitation, and secondary survey following standard trauma protocols. FAST was performed during the primary survey, after securing the airway and

ensuring adequate oxygenation and ventilation. FAST results were classified as positive (clear evidence of fluid in at least one window) or negative, without quantifying fluid volume.

Blunt Abdominal Trauma Scoring System (BATSS)

BATSS scores were calculated based on seven clinical and diagnostic parameters, with a maximum score of 24. The scoring criteria were as follows: abdominal pain (2 points), abdominal tenderness (3 points), chest wall signs (1 point), pelvic fracture (5 points), positive FAST scan (8 points), systolic blood pressure >100 mmHg (4 points), and pulse rate >100/min (1 point). Patients were stratified into low-risk (<8), intermediate-risk (8–11), and high-risk (>11) groups based on their BATSS scores.

Diagnostic Comparison

FAST and BATSS findings were compared with contrast-enhanced computed tomography (CECT) abdomen, which served as the gold standard for detecting intra-abdominal injuries. CECT was performed in hemodynamically stable patients to confirm the presence and extent of injuries.

Statistical Analysis

Data were analyzed using SPSS version 18.0. Descriptive statistics, including frequencies and percentages, were used to summarize demographic and clinical characteristics. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated to assess the diagnostic accuracy of FAST and BATSS compared to CECT. BATSS scores ≥8 (intermediate and high-risk groups) were considered positive predictors of intra-abdominal injury.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of Father Muller Medical College. As a retrospective study, informed consent was not required. Patient confidentiality was maintained by anonymizing data during analysis.

3. RESULTS

A total of 62 patients with blunt abdominal trauma were analyzed. The demographic and clinical characteristics are presented in Table 1. The cohort was predominantly male (82%, n=51), with 58% (n=37) aged <40 years. The mean age was 35.90 years (range: 18–67 years). Road traffic accidents were the primary cause of injury (85%, n=53), followed by falls from height (10%, n=6) and assaults (5%, n=3).

Table 1: Demographic and Clinical Characteristics of Patients with Blunt Abdominal Trauma

Characteristic	Number (%)
Gender	
Male	51 (82%)
Female	11 (18%)
Age Group	
<40 years	37 (58%)
41–60 years	19 (32%)
>60 years	6 (10%)
Mode of Injury	
Road traffic accident	53 (85%)
Fall from height	6 (10%)
Assault	3 (5%)

FAST was positive in 50% (n=31) of patients. CECT abdomen, performed in all patients, revealed intra-abdominal injuries in 71% (n=46). The diagnostic performance of FAST compared to CECT is shown in Table 2. FAST demonstrated a sensitivity of 67.39%, specificity of 100%, PPV of 100%, and NPV of 51.61%.

Table 2: Diagnostic Performance of FAST Compared to CECT Abdomen

Parameter	Value (%)
Sensitivity	67.39
Specificity	100
Positive Predictive Value	100
Negative Predictive Value	51.61

BATSS scores ranged from 0 to 19, with a mean score of 9.30. Patients were classified into low-risk (score <8, 29%, n=47), intermediate-risk (score 8–11, 11%, n=18), and high-risk (score >11, 22%, n=35) groups. The mean scores for these groups were 4.48, 9.63, and 15.00, respectively. The diagnostic performance of BATSS (considering scores ≥8 as positive) is presented in Table 3. BATSS showed a sensitivity of 71.73%, specificity of 100%, PPV of 100%, and NPV of 55.17%.

Table 3: Diagnostic Performance of BATSS Compared to CECT Abdomen

Parameter	Value (%)
Sensitivity	71.73
Specificity	100
Positive Predictive Value	100
Negative Predictive Value	55.17

Organ-specific injuries identified by CECT are summarized in Table 4. The liver was the most commonly injured organ (40.3%, n=25), followed by the spleen (22.5%, n=14) and kidneys (17.7%, n=11). Less frequent injuries included the colon (8.06%, n=5), small bowel (6.4%, n=4), bladder (3.2%, n=2), and adrenal gland (1.6%, n=1).

Table 4: Organ-Specific Injuries Identified by CECT Abdomen

Organ	Number (%)
Liver	25 (40.3%)
Spleen	14 (22.5%)
Kidney	11 (17.7%)
Colon	5 (8.06%)
Small Bowel	4 (6.4%)
Bladder	2 (3.2%)
Adrenal	1 (1.6%)

Management outcomes are shown in Table 5. Of the 62 patients, 42 (67.7%) were managed conservatively, while 20 (32.3%) required laparotomy. Patients with BATSS scores ≥8 and positive FAST scans were more likely to require surgical intervention ($p<0.05$).

Table 5: Management Outcomes of Patients with Blunt Abdominal Trauma

Management	Number (%)
Conservative	42 (67.7%)
Laparotomy	20 (32.3%)

4. DISCUSSION

This study demonstrates that the Blunt Abdominal Trauma Scoring System (BATSS) is a superior predictor of intra-abdominal injury compared to Focused Assessment with Sonography for Trauma (FAST) in patients with blunt abdominal trauma (BAT). With a sensitivity of 71.73% and specificity of 100%, BATSS outperformed FAST (sensitivity: 67.39%, specificity: 100%) when compared to CECT abdomen, the gold standard. These findings align with previous research by Fahmi et al. (2022), who reported that BATSS effectively predicts BAT outcomes, with a sensitivity of 78% and specificity of 92% in a cohort of 48 patients [7]. The higher sensitivity of BATSS in our study may be attributed to its integration of clinical parameters, such as abdominal pain and tenderness, alongside FAST results, which enhances its diagnostic scope.

FAST remains a valuable initial screening tool due to its rapid, non-invasive nature and high specificity. Talari et al. (2015) reported a sensitivity of 85% and specificity of 96% for FAST in detecting intra-abdominal fluid, though their study noted variability due to operator dependency [8]. Our lower sensitivity (67.39%) corroborates this limitation, as FAST performance is influenced by the skill of the ultrasonographer and the timing of the examination relative to injury. Despite this, FAST's 100% specificity in our cohort reaffirms its reliability in ruling in intra-abdominal injuries when positive.

The demographic profile of our cohort—predominantly young males (82%) injured in road traffic accidents (85%)—reflects the epidemiological burden of BAT in developing countries. Shah et al. (2019) reported a similar pattern, with 78% of BAT cases attributed to RTAs in a rural Indian setting [12]. This demographic trend underscores the need for efficient triage tools like BATSS, which can prioritize high-risk patients in resource-limited emergency departments.

BATSS's ability to stratify patients into low-, intermediate-, and high-risk groups enhances its clinical utility. Scores ≥8 were strongly associated with intra-abdominal injury, with 71% of such patients requiring either conservative or surgical management. In contrast, scores <8 were associated with no mortality and no need for laparotomy, suggesting that these patients may safely forego advanced imaging after FAST. This finding is consistent with Luthra et al. (2021), who noted that BATSS effectively grades trauma severity but cautioned against its sole use for treatment planning [9]. Our study extends this observation by demonstrating BATSS's predictive accuracy comparable to CECT, particularly for scores >12, which were highly indicative of the need for laparotomy.

The organ injury profile in our study, with liver injuries predominating (40.3%), aligns with global BAT patterns. Fonseca et al. (2020) reported liver injuries in 35% of BAT patients undergoing laparotomy, with splenic injuries in 28% [10]. Our lower rate of splenic injuries (22.5%) may reflect differences in injury mechanisms or patient selection. The high specificity of both BATSS and FAST in detecting these injuries supports their role in guiding management decisions, particularly in settings where CECT is not immediately available.

The conservative management of 67.7% of patients highlights the success of non-operative management (NOM) in BAT, as advocated by Shah et al. (2019), who reported a 92% success rate for NOM in hemodynamically stable patients [12]. BATSS's ability to identify low-risk patients could further optimize NOM protocols, reducing unnecessary imaging and hospital stays. However, the need for laparotomy in 32.3% of our cohort underscores the importance of accurate diagnostic tools to identify patients requiring surgical intervention promptly.

Limitations of this study include its retrospective design, which may introduce selection bias, and the relatively small sample size (n=62). Additionally, BATSS's reliance on FAST results inherits the operator-dependent variability of ultrasonography. Future studies should explore BATSS's performance in larger, multicenter cohorts and incorporate diagnostic laparoscopy, which is increasingly utilized in trauma settings [13]. Comparative analyses with other scoring systems, such as NTRISS, could further clarify BATSS's role in trauma care [10].

5. CONCLUSION

The Blunt Abdominal Trauma Scoring System (BATSS) is an effective tool for assessing blunt abdominal trauma, demonstrating higher sensitivity (71.73%) than FAST (67.39%) while maintaining 100% specificity compared to CECT abdomen. BATSS scores ≥8 reliably predict intra-abdominal injury, facilitating triage and reducing the need for advanced imaging in low-risk patients. Its integration of clinical and ultrasonographic parameters makes it particularly valuable in resource-limited settings, where rapid decision-making is critical. By identifying high-risk patients requiring surgical

intervention and low-risk patients suitable for conservative management, BATSS optimizes trauma care and minimizes unnecessary radiation exposure and costs. Further validation through multicenter trials and inclusion of diagnostic laparoscopy could enhance its applicability. BATSS represents a promising advancement in trauma scoring, offering a practical, bedside tool for physicians and paramedics in managing BAT effectively.

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