Original Research Article

COMPARISON OF BLUNT ABDOMINAL TRAUMA SEVERITY SCORING (BATSS) AND CLINICAL ABDOMINAL SCORING SYSTEM (CASS) IN BLUNT ABDOMINAL TRAUMA FOR NEED OF SURGICAL INTERVENTION

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ABSTRACT: *Blunt abdominal trauma can result in severe intra-abdominal injuries that may necessitate surgery. Scoring systems such as Clinical Assessment Score for Suspected Abdominal Injury (CASS) and Blunt Abdominal Trauma in Severe Spleen Score (BATSS) aid in predicting the need for surgery but require further evaluation.* **Objective:** *To assess the efficacy of the CASS and BATSS scoring systems in predicting the necessity of surgical intervention for patients with blunt abdominal trauma.* **Methods**: *This comparative study was conducted at Dr. Ruth K. M. Pfau Civil Hospital Karachi from July 1, 2023, to December 31, 2023. Vital signs on admission, signs of abdominal tenderness, distension, guarding, and organ-specific symptoms were recorded for all participants. Diagnostic imaging findings from studies such as abdominal ultrasound, computed tomography (CT) scans, or X-rays were also collected. The study included a total of 185 participants. Statistical analysis included sensitivity and specificity calculations to compare the predictive accuracy of the CASS and BATSS scoring systems.* **Results:** *The mean age of the participants was 35.8±12.67 years, with 87% being males. Road traffic accidents were the most common mode of injury (89%). The BATSS scoring system demonstrated higher accuracy in predicting the necessity of surgical intervention after blunting abdominal trauma, with 65.9% sensitivity and 95% specificity compared to the CASS scoring system.* **Conclusion**: *The BATSS scoring system shows superior efficacy in predicting the need for surgical intervention following blunt abdominal trauma compared to the CASS scoring system. This suggests that the BATSS score may be a more reliable tool for clinicians in assessing the severity of abdominal injuries and determining the appropriate course of treatment.*

Keywords: Abdominal Injuries, Diagnostic Imaging, Predictive Value of Tests, Surgical Procedures, Trauma Severity Indices

Introduction

Blunt abdominal trauma may result from falls, automotive accidents, assaults, occupational injuries, and athletic injuries (1). Blunt abdominal trauma is often disregarded first because it seems inactive unless specifically sought for. This leads to an extended duration of time needed to get a diagnosis and subsequent delay in initiating aggressive therapy, resulting in unfavorable results for this ailment (2). Although significant progress has been achieved in the areas of diagnostics, infrastructure, and protocol creation for trauma care, there is still a high level of morbidity and death (3). Possible factors that may contribute to this situation include a more extended period between the occurrence of the trauma and the patient being admitted to the hospital, a lack of sufficient equipment or trained staff, delays in making a diagnosis, a lack of infrastructure to provide necessary post-operative care, and additional injuries to the spine, brain, pelvis, or chest (4, 5).

Blunt abdominal trauma presents a notable difficulty in emergency care, often requiring an immediate evaluation to ascertain the need for surgical intervention (6). Within this framework, doctors find great value in using two frequently used scoring systems (7). The Blunt Abdominal Trauma Severity Score (BATSS) and the Clinical Abdominal Scoring System (CASS). BATSS includes a wide range of factors, including essential indicators like blood pressure and pulse rate, the Glasgow Coma Scale (GCS), results from abdominal examinations, and the cause of injury. The assignment of a score to each characteristic collectively assists in evaluating the degree of trauma and the probability of requiring surgical intervention (8). In contrast, CASS mainly emphasizes assessing physical examination findings such as stomach discomfort, rebound tenderness, and seatbelt symptoms, assigning scores appropriately (9) (10). Research indicates that BATSS may provide more accuracy in terms of sensitivity and specificity when compared to CASS, even if both scoring systems have the same goal of predicting the need for surgical intervention. However, the decision between BATSS and CASS may be influenced by variables such as the clinician's level of knowledge and institutional preference. These grading methods are essential for guiding clinical decision-making and enabling prompt intervention in acute abdominal injuries. The objective of this study is to assess the efficacy of the CASS and BATSS scoring in predicting the necessity of surgical intervention for patients with blunt abdominal trauma in the setting of Dr. Ruth K M Pfau Civil Hospital Karachi.

Methodology

After the ethical approval from the institutional review board, this comparative study was conducted at Dr. Ruth K.

M. Pfau, Civil Hospital Karachi, from 1st July 2023 to 31st December 2023. Through non-probability consecutive sampling, 185 patients aged 18-60 years, either gender, who have sustained blunt abdominal trauma were included in the present study. Patients who have penetrating abdominal trauma and have not consented to participate in the study were excluded from the present study. Firstly, primary demographic data such as age, gender, and relevant medical history were collected to provide context for understanding patient characteristics and potential risk factors. Subsequently, the mechanism of blunt abdominal trauma was documented, including details such as motor vehicle accidents, falls, assaults, or other traumatic events, aiding in the assessment of injury severity and determination of appropriate management strategies. Vital signs on admission, including blood pressure, heart rate, respiratory rate, and temperature, were recorded along with any signs of abdominal tenderness, distension, guarding, or organ-specific symptoms such as hematuria or rectal bleeding. Imaging findings from diagnostic studies such as abdominal ultrasound, computed tomography (CT) scans, or X-rays are captured, noting any evidence of intra-abdominal injuries such as solid organ lacerations, free fluid, pneumoperitoneum, or bowel perforation. Additionally, both BATSS and CASS assessments were administered to calculate severity scores based on predefined criteria, encompassing parameters such as the mechanism of injury, physical examination findings, laboratory results, and imaging findings for BATSS, and evaluating parameters such as abdominal tenderness, peritoneal signs, and hemodynamic stability for CASS. Lastly, surgical intervention outcomes were documented, including whether patients underwent surgery or were treated conservatively. SPSS version 21 was used to analyze the data. We compare the BATSS and CASS scores in predicting the necessity of surgical intervention using various statistical methods such as sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and receiver operating characteristic (ROC) curve analysis. This allows us to quantitatively assess the predictive accuracy of each scoring system and determine their respective strengths and limitations. Additionally, we examine the correlation between BATSS and CASS scores to ascertain whether there is consistency or discrepancy between the two systems in evaluating the severity of blunt abdominal trauma. Subsequently, we conduct subgroup analyses based on factors such as age, mechanism of injury, and imaging findings to explore potential variations in the performance of BATSS and CASS across different patient populations.

Results

The mean age of the recruited participants in the present study was 35.8±12.67 years, and about 50% of the participants were between 18-30 years old. 87% of the participants were males. 89% of the participants have road traffic accidents as a mode of injury (Table 1). Tables 2 and 4 show the mean of CASS and BATSS scoring parameters with an average score of 8.96±1.26 and 10.84±3.18, respectively. Tables 3 and 5 show the stratification of BATSS and CASS scoring based on age, gender, and mode of injury—Figures 1 and 2 Show the ROC-curve analysis of BATSS and CASS scoring. Table 6 shows the management

strategies utilized in the treatment of the participants. In this study, out of 185 participants, 56 patients died.

Table 1: Study Participant's Characteristics

Parameters	Frequency (N%)
Age (Mean)	35.8±12.67
18-30	92 (50%)
31-50	66 (36%)
Above 50	27 (14%)
Gender	
Male	161 (87%)
Female	24 (13%)
Mode of Injury	
RTA	165 (89%)
Fall	16(9%)
Assault	4 (2%)

Table 2: CASS scoring

CASS parameters	Mean
Time of presentation (hours)	2.38±0.63
Pulse rate (beats/min)	1.8±0.64
SBP (mmHg)	2.12±0.52
GCS	1.3±0.6
Abdominal findings	1.36±0.66
Score	8.96±1.26
<8 Low	24 (13%)
8-11 Moderate	154 (83%)
>11 High	6 (4%)

Table 3: Stratification of CASS scoring

parameters	CASS Score			P
Age groups	Low	Moderate	High	Value
18-30	16 (17%)	76 (83%)	0	0.002
31-50	8 (52%)	52 (79%)	6 (6%)	
Above 50	0	27 (100%)	0	
Gender				0.06
Male	24 (14%)	131 (81%)	6 (4%)	
Female	0	24 (100%)	0	
Mode of injury				0.188
RTA	18 (11%)	141 (85%)	6 (4%)	
Fall	0	16 (100%)	0	
Assault	0	4 (100%)	0	

Table 4: BATSS Scoring

Parameters	Mean
Pulse rate (beats/min)	0.64±0.48
SBP (mmHg)	3.52±1.31
Abdominal Pain	1.44±0.90
Tenderness	0.3±0.91
Chest wall tenderness	0.44±0.50
Pelvic fracture	1.6±2.4
FAST	2.9±1.96
Score	10.84±3.18
<8 Low	34(18%)
8-11 Moderate	107 (54%)
>11 High	44 (28%)

Table 5: Stratification of BATSS scoring

Parameters	Blunt Score			P Value
Age groups	**Low**	**Moderate**	**High**	
18-30	12 (14%)	60 (62%)	20 (24%)	0.259
31-50	16 (22%)	32 (44%)	18 (33%)	
Above 50	6 (22%)	15 (55%)	6 (22%)	
Gender				0.03
Male	36 (22%)	89 (56%)	36 (22%)	
Female	0	16 (67%)	8 (33%)	
Mode of injury				0.001
RTA	36 (22%)	93 (56%)	36 (22%)	
Fall	0	12 (75%)	4 (25%)	
Assault	0	0	4 (100%)	

Table 6: Management strategies

BATSS Score	N	Management	
		Operative	**Conservative**
<8 Low	9	0	9
8-11 Moderate	27	15	12
>11 High	14	14	0
CASS Score			
<8 Low	6	0	6
8-11 Moderate	42	18	24
>11 High	2	2	0

AUC:0.775
Sensitivity=52.5%
Specificity=96.77%
PPV:95.2%
NPV:62.50%
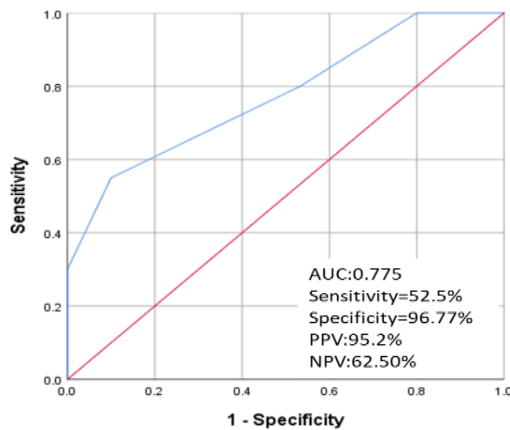
Figure 1: CASS Scoring ROC curve analysis

AUC:0.841
Sensitivity=65.9%
Specificity=95.45%
PPV:96.7%
NPV:58.33%
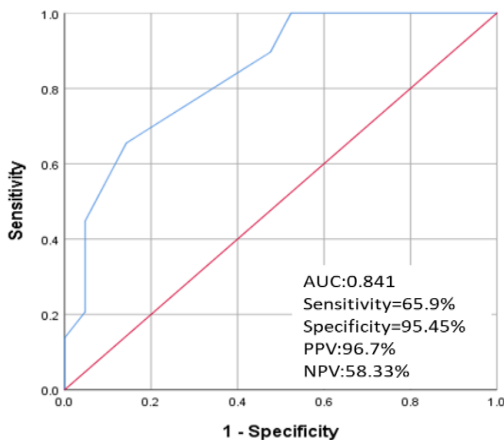
Figure 2: BATSS Scoring ROC curve analysis.

Discussion

Assessing blunt abdominal trauma (BAT) poses a significant diagnostic challenge for trauma surgeons, given its status as a leading cause of mortality. Medical management of BAT hinges on accurately determining which patients necessitate laparotomy. However, the difficulty in diagnosing intra-abdominal injuries underscores the critical need for precise evaluation methods to identify those requiring surgical intervention (11). In their research, Peyman Erfantalab-Avini et al. found that the CASS exhibited promising accuracy, with a score of 94% and sensitivity, specificity, positive predictive value, and negative predictive value, all exceeding 88% among a cohort of 400 patients (12). Similarly, Majid Shojaee et al. examined the BATSS in 261 patients, advocating for immediate laparotomy in high-risk groups (score > 12), further assessments for moderate-risk groups, and observation for low-risk groups. They noted a specificity of 100% for low-risk patients. This study revealed a strong correlation between higher CASS and BATSS scores and increased mortality (13). The operative group demonstrated an average CASS score of 11.45 ± 1.02 and a mean BATSS score of 14.23 ± 1.17, exceeding the threshold for laparotomy (score > 12) with a specificity of 100%. Notably, BATSS scores below eight effectively ruled out intra-abdominal trauma, obviating the need for unwarranted CT investigations and emphasizing the utility of ultrasound in these cases. These findings emphasize the importance of employing scoring systems like CASS and BATSS to guide clinical decision-making and optimize patient management and outcomes in blunt abdominal trauma scenarios.

The primary cause of injury, primarily stemming from road traffic accidents, accounted for 90% of cases, consistent with findings by Rahman et al. (67%)(14), Mehta et al. (53%) (14), and Peyman et al. (80.6%). According to Mehta et al., the surge in road traffic accidents is attributed to easy vehicle access, migration to urban areas for work, lack of familiarity with traffic norms, and disregard for safety measures. Fall from heights constituted 8% of injuries, aligning closely with Rahman et al.'s findings. In our study, patients with a mean CASS score of 7.56 were deemed suitable for conservative management, while those with a mean CASS score of 11.45 required surgical intervention. These outcomes mirror those of Vanitha et al., where patients with a mean CASS score of 6.35 (SD 1.56) were conservatively managed, while those with a mean CASS score of 11.56 (SD 2.02) underwent surgery (14).

Conclusion

In the present study, the BATSS score is more accurate in predicting the need for surgical intervention after blunt abdominal trauma, with 65.9% sensitivity and 95% specificity, compared to the CASS scoring system. A score of 12 or higher in either system indicates the requirement for laparotomy, necessitating prompt planning for the procedure upon the patient's arrival in the casualty department. This approach facilitates efficient patient triage and minimizes delays in transferring the patient to the operating table.

Declarations

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

SADIA (Postgraduate Trainee)
Coordination of collaborative efforts.
Conception of Study, Final approval of manuscript.
OMER BIN KHALID (Assistant Professor)
Study Design, Review of Literature.
Conception of Study, Development of Research Methodology Design, Study Design, manuscript Review, and final approval of manuscript.
IMRANA ZULFIKAR (Professor)
Manuscript revisions, critical input.
Coordination of collaborative efforts.
RABBIYA ALI (Consultant)
Data acquisition, analysis.
Manuscript drafting.
MUHAMMAD SHEHERYAR HUSSAIN
Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
RADEYAH WASEEM
Data entry and Data analysis, drafting article.
Coordination of collaborative efforts.

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