Section: General Surgery

Original Research Article

PROSPECTIVE STUDY COMPARING THE CLINICAL ABDOMINAL SCORING SYSTEM (CASS) WITH BLUNT ABDOMINAL TRAUMA SEVERITY SCORING(BATSS) IN PREDICTING THE NECESSITY OF LAPAROTOMY IN CASES ADMITTED WITH BLUNT ABDOMINAL TRAUMA

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ABSTRACT

Background: Blunt abdominal trauma is among the major causes of death due to severe injuries, and motor vehicle accidents have been identified as one of the primary burdens. Improvements in imaging modalities such as FAST and CECT have enhanced diagnosis and care, and the Clinical Abdominal Scoring System (CASS) provides an important predictor of the requirement of further imaging and treatment in patients with blunt abdominal trauma. The purpose of this research was to compare the CASS and BATSS in the prediction of the need for laparotomy in admissions with blunt abdominal trauma. **Material and Methods:** This prospective clinical study comprised 110 patients admitted to the Stanley Medical College Hospital for a period of 12 months. Following initial resuscitation and establishment of hemodynamic stability, all patients underwent meticulous examination based on clinical findings, and the score of the clinical abdominal scoring system (CASS) was determined. All patients were subjected to FAST ultrasonography and chest and abdominal plain radiography, and the severity score of blunt abdominal trauma (BATSS) was determined. **Result:** According to the CASS Score, 64 patients (58.2%) were low-risk, 32 (29.1%) medium-risk, and 14 (12.7%) high-risk. Fifty five patients (85.9%) categorized as low risk were managed conservatively, and the rest required surgery. Among medium-risk patients,8 (25.0%) were managed conservatively, and the rest required surgery. All 14 patients categorized as high-risk required surgery ($p < 0.0001$). With the use of BATSS Score, 46 patients (42.0%) were low-risk, 25 (23.0%) medium-risk, and 39 (35.0%) high-risk. None of the low risk patients under BATSS needed surgery. Seventeen patients (68.0%) classified as medium-risk were treated conservatively, and the remaining needed surgery. All high risk patients needed surgery ($p<0.0001$). There was 7.3% mortality, all eight deaths having been in patients classified as high-risk by both CASS and BATSS ($p<0.0001$).**Conclusion:** Although those cases identified as high risk by CASS score did require surgery, and its adequacy was no different in this respect from BATSS, we observed that certain cases identified as low risk by CASS actually required surgery; a disparity which we could not attribute to BATSS. Thus, we consider BATSS scoring to be more accurate than CASS scoring within our population in determining the necessity for emergency laparotomy. More research is needed to validate its potential to prevent missed diagnoses in emergency departments.

INTRODUCTION

Severe injury continues to be the leading cause of death globally.[1] Within those, abdominal trauma is a common and significant issue in the emergency environment, necessitating expedient decision making and operative planning. In spite of involving fewer than 10% of all cases of trauma,[2] abdominal injuries remain one of the major killers due to life-threatening injury. Almost one-third of all patients with incapacitating injuries have some type of severe abdominal trauma.[3]

As estimated by the World Health Organization (WHO), trauma may be the third leading cause of lost disability-adjusted life years (DALYs) worldwide by the year 2030.[4] Increasingly in developing nations such as India, as many as 85% of fatalities due to trauma and close to 90% of lost DALYs can be attributed to road traffic accidents (RTAs).[5]

This is further compounded in India by very high levels of motor vehicle accidents (MVAs), frequently resulting from poor adherence to safety standards and weak enforcement. It is projected that by the year 2025, road accidents may touch a record high of 250,000 per year.[6] Tamil Nadu contributes as much as 11.5% of the country's RTAs,[7] adding up to 35 deaths per day state-wide, of which two are daily deaths in Chennai.[8] Being a referral centre, we receive a full spectrum of abdominal trauma cases, including those referred from far-off places. Delays in accessing tertiary care add to the complexity. This emphasizes the need for standardized guidelines to facilitate proper patient management.

Blunt abdominal trauma most often involves the liver (36%), followed by the spleen (32%) and kidneys (24%).[9] Imaging advances have transformed trauma care.Focused Assessment with Sonography for Trauma (FAST) enables the quick detection of intra-abdominal fluid by emergency staff.[10] Coupled with Contrast-Enhanced Computed Tomography (CECT), which has high-resolution detection of internal haemorrhage, organ injury, and vascular compromise , These modalities have significantly replaced the previously ubiquitous Diagnostic Peritoneal Lavage (DPL).[11]

CECT allows clinicians to detect extravasation points evaluate mesenteric and bowel trauma, and depict vascular injury, particularly important in high-mortality retroperitoneal injuries. Interventional procedures like angiography-guided embolization or stent placement can be lifesaving.With accurate imaging and close clinical attention, non-operative management (NOM) is being used more and more.

As the momentum of NOM picks up, the need for good scoring systems has increased. The Blunt Abdominal Trauma Scoring System (BATSS) created by Shojaee et al. was presented as a rapid and effective screen to detect significant organ injury and surgical requirement.[12] Though helpful, some have questioned under-triaging on the basis of BATSS alone, leading some to call for improvement.[13] Clinical judgment is still essential, with physical exam indispensable in trauma evaluation.

Thus, we tested the Clinical Abdominal Scoring System (CASS), originally developed to forecast the requirement of laparotomy on the basis of clinical values like pulse rate, systolic blood pressure, Glasgow Coma Scale, and abdominal examination.[14] Because these are regularly evaluated in cases of trauma, CASS can act as a useful triage instrument, particularly if combined with elaborate imaging methods.

Purpose of the Study

To identify if blunt abdominal injury is the most frequent *aetiology* of abdominal trauma in those admitted after road traffic accidents (RTAs) in Stanley Medical College.

This shall be done by comparing two scoring systems in clinical practice BATSS and CASS to assess their effectiveness in determining large abdominal trauma and the requirement of further imaging or surgery

Aim and Objectives

Aim

This study aimed to compare the Clinical Abdominal Scoring System (CASS) and The Blunt Abdominal Trauma Scoring System (BATSS) in predicting the necessity of laparotomy in cases admitted with blunt abdominal trauma.

Objectives

To find value of clinical abdominal scoring system (CASS), a new scoring system based on clinical signs, comparing with the BATSS (blunt abdominal injury severity scoring system) in predicting whether a Blunt abdominal trauma patient needs laparotomy or not in Stanley, Chennai.

MATERIALS AND METHODS

Study design: Prospective clinical study

Place of study: Department of General Surgery, Government Stanley Medical College

Period of study:12months (April2023toApril 2024)

Sample size calculation and study population

We included all patients admitted with blunt abdominal trauma at Stanley Medical College Hospital, Chennai. Based on previous year statistics, the sample size was calculated using the formula:

$n = (Z\alpha^2 \times \text{Sensitivity} \times (1 - \text{Sensitivity})) / d^2$

Where:

- $Z\alpha^2 = 1.96^2$ (for 95% confidence level)
- Sensitivity = 0.54
- d = Absolute precision = 10% = 0.1

$n = (1.96^2 \times 0.54 \times (1 - 0.54)) / (0.1^2) = (3.8416 \times 0.54 \times 0.46) / 0.01 = 0.954 / 0.01 = 95.4$

Rounding up, the sample size = 99

Adding a 10% non-response rate:

n = 99 + (10% of 99) = 99 + 10 = 109

Therefore, the final sample size = 110 patients

A total of 110 patients admitted with blunt abdominal trauma were enrolled in this study at Stanley Medical College Hospital, Chennai.

Inclusion Criteria

- Patients>18yearsofage
- Patients with blunt injury abdomen admitted in the emergency ward
- Patients who consent to participate in the study

Exclusion Criteria

- Patients with age below18

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- Patients not consenting to participate in the study
- Patients not consenting for emergency laparotomy
- Patients with multiple co morbidities
- Patients with chronic kidney disease or chronic liver disease

Methods

Informed written consent was obtained regarding participation, and all patients were included in the study. After initial resuscitation, detailed history, presenting complaints, history of presenting illness, past history, history of any treatment undertaken, personal history, and detailed clinical examination were recorded. Detailed clinical examination done and findings noted. Appropriate investigations and routine blood investigations were performed. Patients taken up for exploratory laparotomy were followed up and post-operative period was studied for development of any complications.After initial resuscitation patient' CASS is calculated, then FAST is taken then BATSS is calculated. If unstable taken for laparotomy. If stable CT is planned. Patients were followed up for a week to determine their possible need for laparotomy, and the decision for operative or non-operative management depended on the outcome of the clinical examination and the results of diagnostic tests. Patients selected for non-operative or conservative management were placed on strict bed rest and were subjected to serial clinical examination, which included hourly pulse, blood pressure, respiratory rate, and repeated examinations of the abdomen and other systems.Patients were assessed at the time of presentation and followed up periodically. Appropriate diagnostic tests, especially abdominal ultrasound, were repeated as and when required.

Statistical Analysis

Descriptive statistical analyses were performed using data obtained from the study. The results of the continuous measurements were analyzed and depicted as mean ± S.D. Categorical data were presented as percentages (%). The chi-square or Fisher exact test was used to determine the significance of the study parameters on the categorical scale between two or more groups. SPSS Statistical Package (v21.0) and Microsoft Excel were used to compute and calculate the data.

RESULTS

Distribution of age

We enrolled 110 patients over one year. We noticed that the majority of them were younger, with 25.5% each being in the < 30 and 30-40 age group. Another 30% were in the 41-50 age group.

Mode of Injury

On analyzing the mode of injury necessitating admission, 49 patients (44.5%) were admitted due to fall from height, 38 (34.5%) of the patients had encountered a road traffic accident, and another 23 (20.9%) were victims of assault.

Time since incident at time of admission

The time since the incident was between 2-6hours in 62 (56.4%) individuals and <2h in19 patients. (17.3%). 29 patients (26.4%) were brought to the hospital after 6 hours.

Pulse Rate of Patients enrolled

40% of the patients had pulse rates in the range of 90-110/min, and 25.5% had a pulse rate higher than 110/min. Only 34.5% of patients did not have tachycardia.

Systolic BP of Patients enrolled

On analyzing blood pressure, 38patients (34.5%) were haemo dynamically unstable,with an SBP < 90 mmHg. 31 patients (28.2%) had hypertension with an SBP > 120 mmHg.

Involvement of Major Intra-abdominal organs

Analysis of the abdominal organs revealed that 59 patients (53.6%) had no major intra- abdominal injuries. 32 patients (29.1%) had splenic injury, seven patients (6.4%) had injury to the bladder, five(4.5%) had small bowel injury, fourhad hepatic injury(3.6%), two had injury in the retroperitoneal structures, and one had colonic injury.

Glas cow Coma Scale(GCS) score of Patients enrolled

Analysis of the GCS scores revealed that 51 patients (46.4%) had a GCS score below 9, 35 patients (31.8%) had a GCS between 9-12, and 24 patients (21.8%) had an almost normalGCS between 13-15.

Abdominal Pain

In our study, 88(89%) patients complained of abdominal pain.

Abdominal Tenderness

Further, 97patients (88.2%) showed abdominal tenderness on clinical examination.

Chest wall Tenderness

36 of the patients had chest wall tenderness(32.7%)

Pelvic Fracture

Three (2.7%) patients had concomitant pelvic fractures.

FAST Positivity in Patients Enrolled

FAST results were positive in 52 patients (47.3%) with abdominal trauma.

CASS Scoring

According to the CASS Score, 64 patients (58.2%) were categorized as low-risk, 32 patients (29.1%) were categorized as medium-risk, and 14 patients (12.7%) were categorized as high- risk.

BATSS Score

On applying the BATSS Score, 46 patients (42.0%) were categorized as slow-risk, 25(23.0%) as medium-risk, and 39 (35.0%) as high-risk.

Operative vs Conservative Management

63 patients (57.3%) were managed using non-operative means, and 47patients (42.7%) underwent emergency surgery.

Mortality Rate

Of the patients enrolled, 8 succumbed during treatment (7.3% mortality). All 8 were categorized

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as high risk in both CASS and BATSS Score (p<0.0001).

Prediction of Need for Surgery with CASS Score

None of the patients categorized as high-risk by the CASS had a need for conservative management. Fifty-five patients (85.9%) categorized as low-risk were managed conservatively, and the rest required surgery. Among medium-risk patients, 8 (25.0%) were managed conservatively, andtherestrequired surgery.All 14patients categorized ashigh-risk required surgery (p < 0.0001).

Prediction of Need for Surgery with BATSS Score

None of the patients categorized as low-risk by the BATSS had a need for surgical management. Seventeen patients (68.0%) categorized as medium-risk were managed conservatively, and the rest required surgery. All 39 patients categorized as high-risk required surgery (p < 0.0001).

Table 1: Distribution of age

		Number of Patients	Percentage
Age group	<30	28	25.50%
	31-40	28	25.50%
	41-50	33	30.00%
	51-60	21	19.10%

Table 2: Distribution of sex

		Number of Patients	Percentage
Gender	Female	32	29.1%
	Male	78	70.9%

Table 3: Mode of Injury

		Number of Patients	Percentage
Mode of Injury	ASSAULT	23	20.90%
	FALL	49	44.50%
	RTA	38	34.50%

Table 4: Time since incident at time of admission

		Number of Patients	Percentage
Time	<2	19	17.30%
	6-Feb	62	56.40%
	>6	29	26.40%

Table 5: Pulse Rate of Patients enrolled

		Number of Patients	Percentage
PR	<90	38	34.50%
	90-110	44	40.00%
	>110	28	25.50%

Table 6: Systolic BP of Patients enrolled

		Number of Patients	Percentage
SBP	>120	31	28.20%
	90-120	41	37.30%
	<90	38	34.50%

Table 7: Involvement of Major Intra-abdominal organs

		Number of Patients	Percentage
Organ injured	Bladder	7	6.40%
	Colon	1	0.90%
	Liver	4	3.60%
	Retroperitoneum	2	1.80%
	Small bowel	5	4.50%
	Spleen	32	29.10%
	Nil	59	53.60%

Table 8: Glascow Coma Scale(GCS) score of Patients enrolled

		Number of Patients	Percentage
GCS	13-15	24	21.80%
	12-Sep	35	31.80%
	<9	51	46.40%

Table 9: Abdominal Pain

		Number of Patients	Percentage
Abdominal pain	No	22	20.00%
	Yes	88	80.00%

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Table 10: Abdominal Tenderness

		Number of Patients	Percentage
Abd tenderness	No	13	11.80%
	Yes	97	88.20%

Table 11: Chest wall Tenderness

		Number of Patients	Percentage
Chest wall sign	No	74	67.30%
	Yes	36	32.70%

Table 12: Pelvic Fracture

		Number of Patients	Percentage
Pelvic fractures	No	107	97.30%
	Yes	3	2.70%

Table 13: FAST Positivity in Patients Enrolled

		Number of Patients	Percentage
FAST	Negative	58	52.70%
	Positive	52	47.30%

Table 14: CASS Scoring

		Number of Patients	Percentage
CASS	Low risk	64	58.20%
	Medium risk	32	29.10%
	High risk	14	12.70%

Table 15: BATSS Score

		Number of Patients	Percentage
BATSS	Low risk	46	42.00%
	Medium risk	25	23.00%
	High risk	39	35.00%

Table 16: Operative vs Conservative Management

		Number of Patients	Percentage
Management	Conservative	63	57.30%
	Surgical	47	42.70%

Table 17: Mortality Rate

		Number of Patients	Percentage
Mortality	No	102	92.70%
	Yes	8	7.30%

Table 18: Prediction of Need for Surgery with CASS Score

		Management				P value
		Conservative		Surgical		
		Count	RowN%	Count	RowN%	
CASS	Low risk	55	85.90%	9	14.10%	<0.0001
	Medium risk	8	25.00%	24	75.00%	
	Highrisk	0	0.00%	14	100.00%	

Table 19: Prediction of Need for Surgery with BATSS Score

		Management				P value
		Conservative		Surgical		
		Count	Row N%	Count	Row N %	
BATSS	Low risk	46	100.00%	0	0.00%	<0.0001
	Medium risk	17	68.00%	8	32.00%	
	High risk	0	0.00%	39	100.00%	

DISCUSSION

This prospective study of 110 patients of blunt abdominal trauma proves comparative efficacy of CASS and BATSS scoring systems in the prediction of the need for surgical intervention.

The majority of our cohort was young males (70.9%, male-to-female ratio 2.4:1), with fall from height being the most common mechanism of injury (44.5%), followed by road traffic accident (34.5%) and assault (20.9%). This pattern of demographics is consistent with that well established in India and worldwide.

Clinical presentation was marked by great physiological compromise 65.5% were tachycardic, 34.5% were hemodynamically unstable (SBP <90 mmHg) and 46.4% had severe neurological impairment (GCS <9) reflecting heavy polytrauma burden. In spite of the severity, 53.6% were free from severe intra-abdominal injuries, and the most frequent organ involvement was splenic injury (29.1%).

FAST examination was positive in 47.3% of patients, although its operator dependent nature emphasizes the necessity for formalized assessment tools.

Both scoring systems had outstanding mortality prediction, with all eight deaths (7.3%) being in the high-risk category for both CASS and BATSS ($p<0.0001$). But stark differences arose in their predictive value for surgery.

CASS had 58.2% in the low-risk group, 29.1% in the medium risk
group and 12.7% in the high-risk group, and all of the high risk patients underwent surgery. Yet 14.1% of the CASS low-risk patients ultimately underwent surgery, a major shortcoming in conservative management recommendation.

BATSS exhibited higher specificity, stratifying 42.0% as low-risk, 23.0% as medium-risk, and 35.0% as high risk.

There were no surgical necessities among BATSS low-risk patients, but all high-risk patients were subjected to surgery.

This result corroboratesSubbiah et al.'s published BATSS performance statistics of 100% sensitivity and 98.3% specificity.

The enhanced accuracy in low-risk stratification by BATSS results in more accurate guidance for conservative management choice.

Our findings suggest that although both systems accurately detect patients who need urgent surgical intervention, BATSS has a higher specificity for decisions on conservative management. This greater discrimination is particularly important in high-trauma centers where accurate patient triage is crucial to optimize resource use and outcomes. Incorporation of BATSS into institutional practice guidelines may improve accuracy while decreasing unnecessary surgery without jeopardizing patient safety.

CONCLUSION

Although CASS scoring well predicted high-risk cases needing surgery, there were low-risk CASS cases that were later in fact taken to emergency laparotomy, a finding that was not seen with BATSS.

Thus, BATSS has better predictive value for emergency laparotomy within our patient population. Nonetheless,CASS can prove to be a useful clinical tool for patient triage and can be integrated into hospital protocols for abdominal trauma evaluation. Additional multicenter trials are needed to measure CASS effectiveness in decreasing missed diagnoses and to establish its performance on a variety of injury patterns and poly trauma situations.

Limitations

This one-center trial did not compare the performance of CASS in single organ injury subgroups or poly trauma patients with compounding trauma. Multicenter trials must be used to fully assess the efficiency of CASS on a wide variety of patient groups and clinical situations.

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