Original Research Article

Efficacy of blunt abdominal trauma scoring system in management of blunt abdominal trauma

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ABSTRACT

Background: Although there are many scores to evaluate a patient having trauma, BATSS is a newer score specifically designed for blunt abdominal trauma which is not adequately studied. The objective was to study the efficacy of BATSS by comparing it with conventional experience-based management of Blunt abdominal trauma.

Methods: 100 patients presenting with blunt abdominal trauma between March 2019 to May 2020 were randomly selected. Patients were treated by conventional experience-based management and it was compared with management guided by BATSS by prospective observation. Analysis was done by assessing need for CT scan of abdomen and laparotomy to check efficacy of BATSS.

Results: 100 patients were included in study. CT Abdomen is rarely required in low-risk category (BATSS<8, p <0.0001). In Moderate and High-risk category (BATSS>8), CT Abdomen is required to accurately identify Intra-abdominal injury (p=0.0006 and 0.0965 respectively). Laparotomy may be necessary in any risk category patient for hollow viscous perforation. BATSS does not have a variable like X-ray-Chest standing to diagnose hollow viscous perforation. So, some patients in Low-risk category may also need Laparotomy (p 0.06892) which is not indicated by BATSS. Not all patients in high-risk category needs laparotomy (p=0.00009).

Conclusions: Variables used to score the severity of trauma are inadequate and some patients would be improperly categorised in blunt abdominal trauma scoring system. So, we conclude that BATSS is not useful in our setup and requires modifications.

Keywords: Blunt abdominal trauma scoring system, CT scan, Laparotomy, Road traffic accident, Focused abdominal sonogram in trauma

INTRODUCTION

Blunt abdominal trauma is regularly encountered presentation in the emergency department. The lack of historical data and the presence of distracting injuries or altered mental status, from head injury or intoxication, can make these injuries difficult to diagnose and manage. Patients are frequently kept for observation following blunt abdominal trauma, despite initially negative evaluations.[1,2] Victims of blunt abdominal trauma often have both intra- abdominal and extra-abdominal injuries further complicating care. Blunt abdominal trauma accounts for the majority (80%) of abdominal injuries seen in emergency department, and is responsible for substantial morbidity and mortality. The majority of cases are related to road traffic accidents (70%). Blunt injury of abdomen is also a result of fall from height, assault with blunt objects, industrial mishaps, sport injuries, bomb blasts, etc.[3]

The prevalence of intra-abdominal injuries among patients presenting to emergency department with blunt

injury abdomen is approximately 13-15%.[4] Spleen is the most commonly injured solid organ followed by Liver. Injuries to bowel, mesentery, bladder, pancreas and diaphragm, as well as retroperitoneal structures (kidneys, abdominal aorta, etc.,) are less common but must also be considered.[4] Thus, designing a scoring system for correct selection of management based on risk assessment and performing suitable diagnostic tests would be highly helpful. One such score designed by Shojaee et al BATSS (Blunt Abdominal Trauma Scoring System).[1] We studied its efficacy by evaluating BATSS for requirement of CT scan of abdomen and laparotomy so to decide its usefulness in clinical practice.

METHODS

This study was approved by institutional ethics committee. The manuscript reporting uses the 'the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines for reporting observational studies. The data for this prospective and observational study was obtained from 100 randomly selected patients during March 2019 to May 2020 admitted with blunt injury abdomen in Sir Sayajirao general hospital (SSG Hospital), Vadodara, India. The exclusion criteria were: patients with penetrating abdominal wall injuries, patients who do not have reliable history or physical examination like patients under alcohol toxicity, head injury patients with GCS (Glasgow coma scale) <15/15, patients below 18 years of age, pregnant females, patient not willing to give consent for taking part in study. All patients with blunt injury abdomen were clinically examined after history taking and then subjected to investigations and finally evaluated using the following parameters for BATSS: pulse rate, systolic blood pressure, abdominal pain, abdominal wall signs and tenderness, chest wall signs and lower chest tenderness, Pelvic fracture, FAST (Focused abdominal sonogram in trauma) (Table 1). Huang FAST Scoring system was used to allocate score depending on findings.[6] Then, in order to study efficacy of BATSS, patients were categorized as: score <8: low risk for intra-abdominal injuries, score 9-11: moderate risk for intra-abdominal injuries, score >11: high risk for intra-abdominal injuries. After dividing patients into risk groups, management was observed and was compared with conventional experience-based management. All patients were kept in follow up till discharge from hospital. Data regarding surgical intervention and mortality was also collected.

Data analysis

Data analysis was done both manually and using computer. Calculated data was arranged in a systematic manner, presented in various table and figures. The Chi-square test was used for categorical variables. The results of the binary logistic analyses were summarized by estimating the odds ratios and the respective 95% confidence intervals. All statistical analyses were performed using the Medcalc and Epinfo software.

Table 1: Blunt abdominal trauma scoring system.

| Variable	Value	Score
Pulse rate (per minute)	>100	1
	<100	-
Systolic blood pressure (mmHg)	<100	4
	>100	-
Abdominal pain	Absent	0
	Present	2
Abdominal wall signs and tenderness	Absent	0
	Present	3
Chest wall signs and lower chest tenderness (lower 6 ribs)	Absent	0
	Present	1
Pelvic fracture	Absent	0
	Present	5
FAST	Based on site of fluid collection	0-8
Total score		24

RESULTS

Patient characteristics

Among 100 patients, most patients were in 18-30 years age group (42%) followed by 41-50 years (23%) (Figure 1).
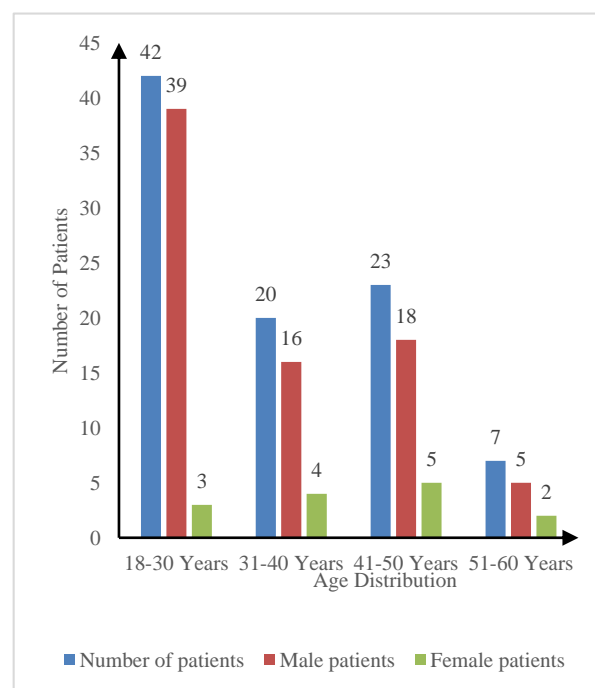
Figure 1: Age distribution of patients with blunt abdominal trauma.

81% patients were male and only 19% patients were female (Figure 2). Road traffic accident was the most common cause of blunt injury abdomen (70%) followed by physical assault (15%).
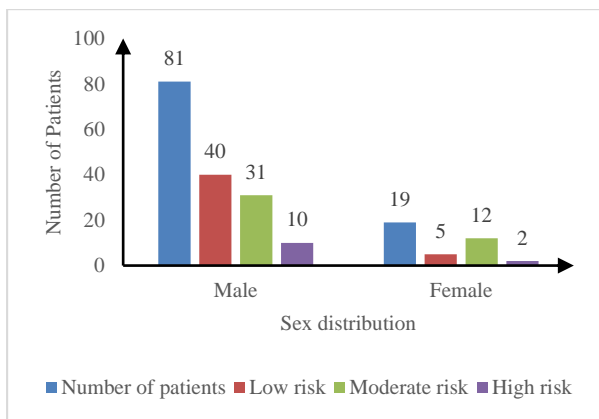
Figure 2: Sex distribution of patients with blunt abdominal trauma.

In presenting complains, all patients had abdominal pain (100%). On examination, Tachycardia (pulse >100/min) was found in 31% patients and hypotension (systolic blood pressure <100 mmHg) was found in 11% patients. 87% patients were having abdominal tenderness, 26% patients were having abdominal wall signs like abrasion and contusion. Based on variables, patients were divided in 3 risk groups: Low risk (score<8), Moderate risk (score 8-11), High risk (score>11). Number of patients (N) in low risk, moderate risk and high-risk category were 45,43 and 12 respectively. Average pulse rate in low-risk category was 92/minute (58-126), 98/minute (68-120) in Moderate risk category and 102/minute (84-136) in high-risk category. Average systolic blood pressure in low-risk category was 118 mmHg (96-146), 112 mmHg (90-136) in moderate risk category and 96 mmHg (84-122) in high-risk category. Average Huang FAST score in low risk category was 1.19 (1-3), 3.30 (1-6) in moderate risk category and 5.91 (5-8) in high risk category.[6]

Outcomes based on BATSS

Average BATSS in low-risk category, Moderate risk category and high-risk category was 5.55, 9.65 and14.17 respectively (Figure 3).
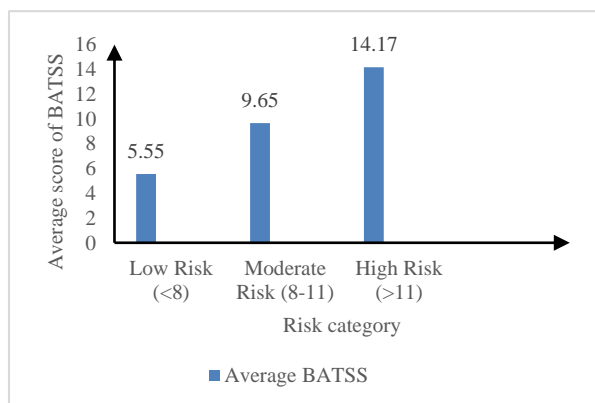

Figure 3: Average score of BATSS in each risk category.

2 patients in low risk (p<0.0001), 23 patients in moderate risk (p 0.0006) and 7 patients in high-risk category (p=0.0965) underwent CT scan of abdomen and all CT scan showed intraabdominal injury. In low risk category (N=45), 40 patients were treated conservatively and 5 patients underwent laparotomy. Out of operated 5 patients, 4 were operated based on X-ray chest suggesting air under both domes of diaphragm indicating hollow viscous perforation (Table 2) and 1 patient was operated for hollow viscous perforation based on CT scan of abdomen (Table 3).

Table 2: X-ray Chest findings in each risk category.

Category	N	No. of patients having positive findings	No. of patients having negative findings
Low risk (<8)	45	8	37
Moderate risk (8-11)	43	14	29
High risk (>11)	12	3	9
Total	100	25	75

In Moderate risk category (N=43), 36 patients were treated conservatively and 7 patients underwent laparotomy. Out of operated 7 patients, 6 were operated based on X-ray chest suggesting air under both domes of diaphragm indicating hollow viscous perforation and 1 patient was operated for splenectomy based on CT scan of abdomen. In high-risk category (N=12), 5 patients were treated conservatively and 7 patients underwent laparotomy. Out of operated 7 patients, 2 were operated based on X-ray chest suggesting air under both domes of diaphragm indicating hollow viscous perforation and 1 patient was operated for hollow viscous perforation based on CT scan of abdomen. 3 patients were operated for splenectomy based on CT scan of abdomen and 1 patient was operated for splenectomy (Figure 4).
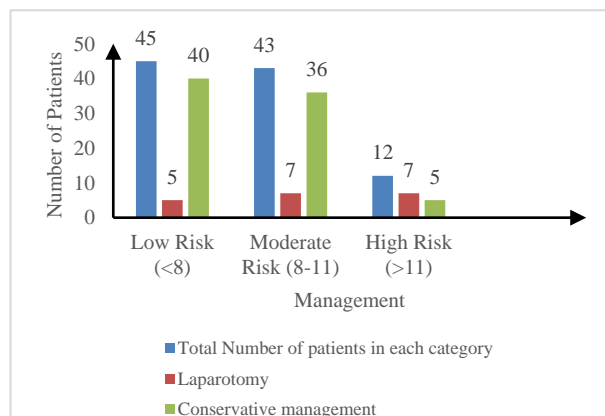
Figure 4: Management done in each risk category.

Table 3: Number of patients operated (Laparotomy) with and without CT-scan in each risk category.

Category	N	CECT Abdomen (N)	Laparotomy (N)	Splenic trauma (N)		Hollow viscous injury (N)	
				After CT scan	Without CT scan	After CT scan	Without CT scan
Low risk (<8)	45	2	5	0	0	1	4
Moderate risk (8-11)	43	23	7	1	0	0	6
High risk (>11)	12	7	7	3	1	1	2
Total	100	32	19	4	2	1	12

DISCUSSION

The study was carried out with a view to check efficacy of BATSS to decide the management of blunt abdominal trauma patients. Age of 100 patients ranged from 18 to 70 years. Most of the patients (42%) were between 18-30 years; with mean age of 36.69 years and standard deviation of 13.552 years. The commonest age group of patients in this study are compared with other studies. Commonest age group was 21-30 years (20.80%) in Nabachandra et al 21-30 years (21.2%) in Mousami Singh et al, 21-30 years (46.4 %) in Shojaee et al 21-30 years (48%) in Vanitha et al.[1,3,4,7]

Among the study participants, 81 % were males and 19% were females. The male to female ratio was 4.26:1. So, males were the predominantly involved group. On comparing with other studies, the male to female ratio was 3.8:1 in Nabachandra et al, 4:1 in Singh et al 4.2:1 in Shojaee et al and 7.33:1 in Vanitha et al.[1,3,4,7] In our study, road traffic accident (RTA) was the most common mode of trauma (70%) followed by Physical assault (15%) and fall from height (7%) while 4% patients suffered trauma due to fall on ground while walking and running, 2% due to hit by animal, 1% due to fall in manhole and 1% due to accidental fall of instrument at work. In Erfantalab-Avini et al 84%, 1% and 4% patients were reported for RTA, Physical assault and fall from height respectively.

In Singh et al 71%, 18% and 9% patients were reported for RTA, Physical assault and fall from height respectively. In Vanitha et al, 61%, 25% and 14% patients were reported for RTA, Physical assault and fall from height respectively.[4,5,7]

Need for CECT abdomen and pelvis in patients of Blunt abdominal trauma

To know association between each Risk category of BATSS and need for CECT abdomen and pelvis, chi-square test was applied. In a study by Shojaee M. et al (2014), in low-risk category, CECT abdomen and pelvis was done in 85.4% patients and all were negative. In our study, in low-risk category, CECT abdomen and pelvis was done in 4.44% patients and all were positive.[1] As per BATSS, in patients of low-risk category, CECT abdomen and pelvis is not required. As per our study, p value of need for CECT abdomen in low-risk category patients is

<0.0001 suggesting that CECT abdomen is not required in most patients of low-risk category. In a study by Shojaee et al, in moderate risk category, CECT abdomen and pelvis was done in 100% patients and 24.39% were positive. In our study, in moderate risk category, CECT abdomen and pelvis was done in 53.48% patients and all were positive.[1] As per BATSS, in patients of moderate risk category, CECT abdomen and pelvis is always required. As per our study, p value of need for CECT abdomen in moderate risk category patients is 0.0006. So CECT abdomen is required in majority of patients in moderate risk category.

In a study by Shojaee et al in high-risk category, CECT abdomen and pelvis was done in 100% patients and all were positive. In our study, in high-risk category, CECT abdomen and pelvis was done in 53.33% patients and all were positive.[1] As per BATSS, in patients of high-risk category, CECT abdomen and pelvis is not required. As per our study, p value of need for CECT abdomen in high-risk category patients is 0.0965. So CECT abdomen is required in majority of patients in high-risk category. As per our study, decision for CECT abdomen and pelvis must be taken considering vital stability of patients, clinical findings and USG abdomen-pelvis/FAST findings.

In some cases where patients are vitally unstable and clinical findings suggests serious intra-abdominal injury, we have to operate patients without CT scan. So, need for CT scan cannot be decided by BATSS but it should be decided by considering hemodynamic stability of patient, clinical findings and USG abdomen-pelvis/FAST findings.

Need for Laparotomy in patients of Blunt abdominal trauma

To know association between each risk category of BATSS and need for laparotomy, Chi-square test was applied. In a study by Shojaee et al in low-risk category, no patients were operated and all were discharged from emergency department. In our study, in low-risk category, 11.11% patients were operated and rest were discharged after keeping them under observation.[1] As per BATSS, in patients of high-risk category, laparotomy is not required. As per our study, p value of need for laparotomy in low-risk category patients is 0.06892. So, laparotomy may be required in several patients in low-risk category.

In a study by Shojaee et al in Moderate risk category, no patients were operated, 73.17% patients were discharged from Emergency Department and rest were admitted. In our study, in Moderate risk category, 16.27% patients were operated and rest were discharged after keeping them under observation.[1] As per BATSS, in patients of moderate risk category, laparotomy is not required without CECT abdomen. As per our study, p value of need for laparotomy in moderate risk category patients is 0.6588. So, laparotomy may be required in patients in moderate risk category without CECT abdomen based on clinical findings, X-ray and USG abdomen/FAST.

In a study by Shojaee et al in high-risk category, 28.94% patients were operated and rest were admitted. In our study, in high-risk category, 58.33% patients were operated and rest were discharged after keeping them under observation.[1] As per BATSS, in patients of high-risk category, laparotomy is always required. As per our study, p value of need for laparotomy in high-risk category patients is 0.0009. So, laparotomy may be required in most patients in high-risk category.

In contrast to our study, a study done by Vanitha et al showed findings similar to Shojaee et al and concluded that decision for CT scan and laparotomy can be taken by BATSS for patients of blunt abdominal trauma in casualty.[1,7] As per our study, decision for laparotomy should be taken considering hemodynamic instability, clinical findings, X-ray chest and abdomen standing, USG abdomen-pelvis/FAST findings of patient and cannot be decided by BATSS.[1]

Importance of X-ray chest and abdomen in management of blunt abdominal trauma

In our study, total 12 out of 100 patients were operated for hollow viscous perforation based on X-ray chest/abdomen findings suggestive of air under diaphragm. But in BATSS, X-ray chest and abdomen is not included which further decreases its usefulness as X-ray is an important indicator of hollow viscous perforation which requires immediate laparotomy.

So, based on our study, BATSS is not very useful in management of blunt abdominal trauma patients in our hospital. There may be several factors responsible for difference in our study and study by Shojaee et al like delayed presentation of patients to tertiary health care hospital due to lack of specialty hospitals in rural areas, more serious injuries in patients coming from nearby areas etc.[1]

Limitations

Limitations of current study were; study was conducted in a single hospital with a smaller number of patients. So, BATSS requires more research through multicentric trials including large number of patients for validation of its efficacy in clinical decision making.

CONCLUSION

BATSS is a not useful score for management of blunt abdominal trauma patients in our setup. Decision for conservative or operative management should be based on correlation between clinical findings and radiological investigations like X-Ray chest and abdomen, USG abdomen and pelvis and CT scan of abdomen & pelvis. But as our study was conducted in a single hospital with a smaller number of patients, BATSS requires more research through multicentric trials including large number of patients.

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