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Original Research Article

Effectiveness of clinical abdominal scoring system in the management of patients with blunt trauma abdomen

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ABSTRACT

Background: Abdominal injury being the most common cause of mortality and morbidity, its incidence comes after extremities and head injury. Early diagnosis and treatment can reduce mortality by upto 50%. The common causes for blunt trauma abdomen include motor vehicle crashes, direct trauma and fall from heights. Objectives of the current investigation were to score the patients with BTA with clinical abdominal scoring system and to compare the score of CASS with USG/CT abdomen and pelvis findings in patients of BTA.

Methods: All patients who are suspected to have BTA were scored using CASS and radiological investigations were done in the ED. The decision to proceed with the surgery would be done if the patient had CASS >12 and/or if the radiological investigation shows features of BTA like air under diaphragm or grade IV/V solid organ injury.

Results: Males accounts for 81% of cases and the rest being females. Most common mode of injury was found to be RTA. Most common injured organs are spleen >liver >small intestine (ileum). The CASS has specificity of 84.62%, sensitivity of 99.2%, PPV 33.3%, NPV 100%. Total mortality in the study was 7.1%

Conclusions: Patients with CASS of <8 can be managed conservatively. Patient with score >12 or hemodynamically unstable can be taken up for emergency laparotomy without any delay. Patients with CASS between 9 and 11, with good clinical assessment aided with radiological investigations can be managed depending upon the severity of the injury.

Keywords: CASS, BTA, USG abdomen and pelvis.

INTRODUCTION

Trauma is one of the common causes of mortality and morbidity encountered in routine practice. Abdominal injury is common after extremities and head injury.[1] Early diagnosis and treatment can reduce mortality in abdominal injury by upto 50%. The common causes for blunt trauma abdomen includes motor vehicle crashes, direct trauma and fall from heights.[2] The incidence of abdominal trauma increases with industrialization and rapid development of the rural area thus early and timely evaluations plays significant role in its management.[3] Moreover bull gore injuries which are common in the rural area, early diagnosis of abdominal trauma will improve the outcome.[4] Reports show that more than 50% of mortalities due to blunt trauma abdomen are preventable and hence precise management and in time laparotomy plays a critical role in reducing mortality rate.[5]

Imaging along with others means of investigation plays a vital role in arriving at a precise diagnosis in most of the cases.[6,7] However, non-availability of sophisticated investigations with lack of experienced radiologist may be limiting factors in arriving at a timely precise diagnosis.[8,9] This explains the utmost need for an accurate

and handy method for evaluation of such patients who require further surgical interventions. In this study, effectiveness of clinical abdominal scoring system in relation to the radiological investigation will be assessed in the management of patients with blunt trauma abdomen. In a referral centre like R. L. Jalappa hospital which is rural based and on a highway where abdominal trauma cases are encountered and patients belonging to low socioeconomic status, this clinical abdominal scoring system (CASS) will be useful in timely diagnosis and assessment of severity of blunt trauma abdomen.

According to CASS the total score range is 5-15. Patients with score of 12 or above are subjected to immediate laparotomy. Patients with score of 9-11 are subjected to auxiliary investigations such as CT scanning and USG. Patients with score of 8 and below are subjected to clinical observation with no auxiliary investigations up every 2 months for 6 months

Objectives

Objectives of current investigation were to score all the patients with blunt trauma abdomen with clinical abdominal scoring system and to compare the score of clinical abdominal scoring system with USG/CT abdomen and pelvis findings in patients of blunt trauma abdomen.

METHODS

Study design, population, location and duration

Current study is a prospective observational study conducted on all patients with blunt trauma abdomen treated in the department of general surgery of R. L. Jalappa hospital between the study period of December 2017 and June 2019.

Sample size

Sample size for frequency in population was calculated using the equation:

$$n= [DEFF*Np(1-p)]/[d^{2/}Z^{2}_{1-a/2}*(N-1) + p*(1-p)]$$

Were, population size (for finite population correction factor or fpc) N=1000000, hypothesized % frequency of outcome factor in the population p=94%±10, confidence limits as % of 100 (absolute±%) d=10%, design effect (for cluster surveys) DEFF=1 and confidence level=99%. Sample size for the study was estimated based on sensitivity of the CASS. Above study reported a sensitivity of 94%. With 99% confidence interval having an absolute error of 10% the required sample size for the study 38 subjects. Expecting a non-compliance of 10% during the study the final sample size was 38+4=42 subjects.

Table 1: Clinical abdominal scoring system (CASS).

Parameter	Score
Time of presentation after the trauma (hours)	
<2	1
2-6	2
>6	3
Pulse rate (beats/minute)	
<90	1
90-110	2
>110	3
Systolic blood pressure (mmHg)	
>120	1
90-120	2
<90	3
Glasgow coma scale (GCS)	
13-15	1
9-12	2
<9	3
Abdominal clinical findings	
Abdominal pain	1
Guarding	2
Abdominal rigidity and tenderness	3

Inclusion criteria

Inclusion criteria for current study were, all patient of age group 18-70 years, undisplaced pelvic fractures, rib fractures with pneumothorax, peritonitis secondary to hollow viscous organ injury following trauma and solid organ injury.

Exclusion criteria

Exclusion criteria for current study were, blunt trauma abdomen associated with severe thoracic injury and pregnant women.

Data collection

All patients who are suspected to have blunt trauma abdomen are scored using clinical abdominal scoring system and radiological investigations would be done in the emergency department of R. L. Jalappa hospital by the junior resident under the guidance of consultant. The decision to proceed with the surgery would be done if the patient had clinical abdominal scoring system, score of more than 12 and/or if the radiological investigation shows features of blunt trauma abdomen.

Statistical analysis

Data was entered into Microsoft Excel data sheet and was analysed using SPSS 22 version software. Categorical data was represented in the form of frequencies and proportions. Continuous data was represented as mean and SD. ANOVA (analysis of variance) or Kruskal Wallis test was the test of significance to identify the

mean difference between more than two groups for quantitative and qualitative data respectively. MS Excel and MS word was used for graphical representation of data such as bar diagram, pie diagram and scatter plots. Probability that the result are true; p value of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS

Age distribution

Majority of the patient belongs to the age group of 21-30 years, around 16 of 42 constituting about 38.1% followed by 31-40 years constituting (9 of 42) 21.4% , together constituting around 59.5%, thus forming the major bulk of the cases.

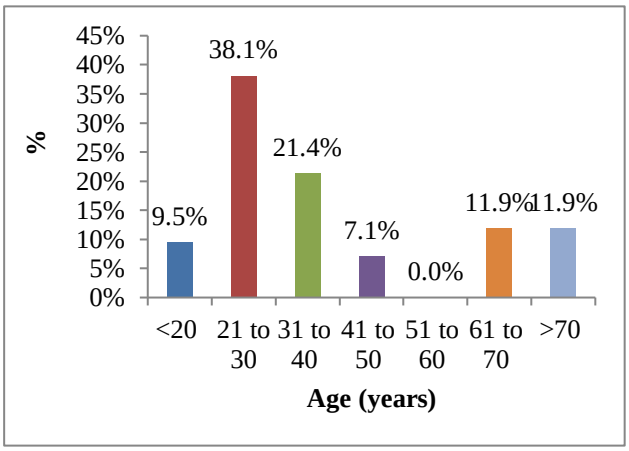

Figure 1: Age distribution of subjects.

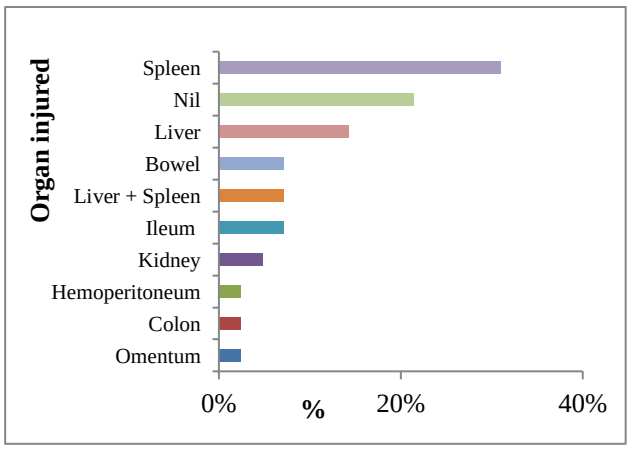

Figure 2: Organ injured distribution in study subjects.

Gender distribution

Most common gender who sustained blunt trauma abdomen was found to be males (34 of 42 cases) with 81% and rest being females with (8 of 42 cases) 19% showing male preponderance in BTA.

Mode of injury

RTA was the most common mode of injury with 78.6% of subjects sustaining injury followed by fall from height with 14.3% and the remainder being other mode which includes assault, bull butt injury.

Time of presentation

Out of 42 cases 24 were brought to the casualty after 6 hours of trauma constituting 57.1% of the total cases. 11 of 42 cases constituting 26.2% were brought between 2 and 6 hours. Only 16.7% were brought within 2 hours.

Organs injured

Out of 42 patients who were included in the study 33 patients had solid organ or viscus injury. Most commonly injured organ was found to be spleen (13/42) with 31% followed by liver (6/42 cases) constituting 14.3% followed by ileum with 7.1%. Other structures injured include kidney, colon, omentum. 21.4% of cases with blunt trauma abdomen doesn't had haemoperitoneum.

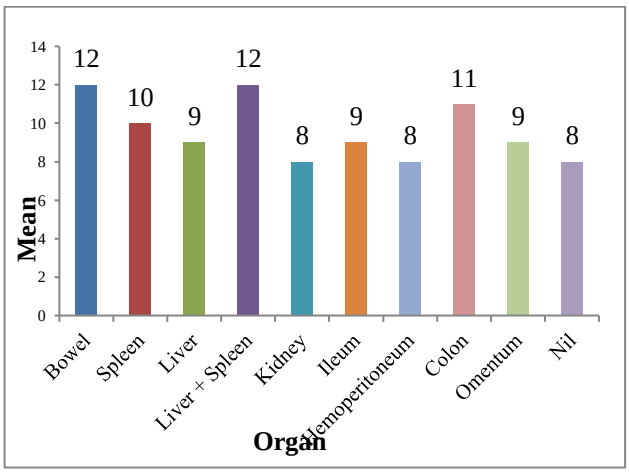

Figure 3: Mean distribution of CASS score comparison with organ injured in study subjects.

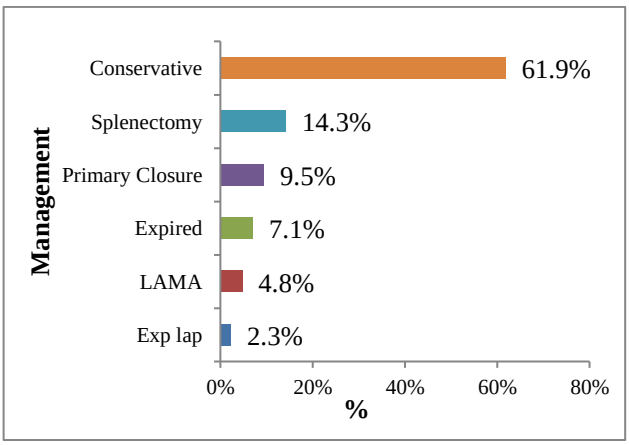

Figure 4: Management distribution in study subjects.

Management

Out of 33 cases who had sustained solid organ injury, 26 cases (61.9%) were managed conservatively, 6 cases had undergone splenectomy who had either grade V or IV injury. 9.5% (4/33 cases) had hollow viscus injury for which primary repair was done. 1 patient had hemoperitoneum without solid organ injury and intra-operatively found to had omental injury for which omental repair was done. Three cases succumbed to death to his injury forming 7.1 % and 2 cases left against medical advice.

Table 2: Patient distribution based on CASS with USG findings.

CASS score	N	%	USG abdomen and pelvis
<8	10	23.8	Soft tissue injury ± grade I/II splenic/liver/renal injury
9-11	23	54.7	Bowel injury predominantly ileal perforation ± grade II/III splenic/renal/liver injury
>12	9	21.4	Severe injury in the form of grade IV/V splenic/complex injury

DISCUSSION

Trauma is one of the commonest causes for increased morbidity and mortality in the younger age group, across the world. The evaluation of patients with blunt trauma abdomen poses a significant diagnostic challenge to most of the trauma surgeons. Timely diagnosis and intervention improves the outcome of the patient. Thus the need for clinical scoring system which helps in assessing the need for surgical or conservative management without any undue delay in investigations which improves the outcome. Thus CASS is one among the other promising scoring system which is going to help in early diagnosis and timely intervention. The advantage of CASS is, it is purely based on the clinical features and hence can be applied bedside during initial assessment and resuscitation phase even in the centres where there is lack of FAST or other radiological investigations.

Mode of injury

The most common mode of injury, following road traffic accident was found to be 78.6% which is consistent with Rahman et al with 67%, Mehta et al with 53% and Peyman et al with 80.6%.[10,11] Mehta et al says increase in the incidence of RTA is because of easily procurable of vehicles, daily migration to urban area for livelihood, unaccustomed to traffic, traffic sense and ignorance of safety measures.[11] The other mode of injury includes fall from heights which is 14.3% which is comparable to the Rahman et al. As our hospital is rural based referral centre hence bull butt injuries are other mode of injury leading to the blunt trauma abdomen.

Gender distribution

It has been observed that male are more predisposed for the blunt trauma abdomen constituting 81% and remaining being females which is supported by Mehta et al with male being 79% female 21% and Yogesh et al with male forming 75% and rest being female.[12] But Peyman et al showed female were predominantly involved in blunt trauma abdomen. The reason for above is more dependency on male gender for earning livelihood and thus migration to urban area and more substance abuse in male gender than female.

Age distribution

The age group in this study is 18-70 years. Youngest age involved is 18 years and oldest one being 70 years. The most common age group affected belongs to 21-30 years forming 38.1% of the total incidence followed by 31-40years constituting 21.4% which is similar to study done by Mehta et al, Yogesh et al and Rahman et al.[10-12] This shows that young population which is more vulnerable to RTA, thus leading to loss of young productive group of the people.

Time of presentation

Time of presentation in the EMD after trauma is a major deciding factor for the better outcome. In the present study around 57.1% of the patients presented to the casualty after 6 hours of trauma and the reason being lack of awareness of the significance of time, delay in response by the ambulance person, multiple hospital visits before coming to our hospital. As a result of delayed presentation three cases who had severe injury and presented late succumbed to their injury thus showing need for early reference to the referral hospital for the appropriate assessment, resuscitation and management.

Most common organs injured distribution

In BTA, the most common injured was spleen with 31% of cases followed by liver with 14.3% and then bowel 11.9% which is similar to Singh et al where spleen (28%) >liver (18%) >bowel (16%) were injured.[13] But as per Srivastava et al most commonly injured organ is bowel followed by spleen and liver.[14] The reason for more solid organ injury compared to hollow viscus was explained by Yogesh et al who said it is because of crushing injury. Intra-abdominal contents are crushed between the anterior abdominal wall and the vertebral column or posterior thoracic cage. This produces a crushing effect, to which solid viscera (e.g. spleen, liver, and kidneys) are especially vulnerable.

Management distribution

Here in our referral centre we managed 61.9% of cases conservatively because most of them responded well to

initial resuscitation and continuously observed for signs of deterioration like hypotension, feeble thready pulse, increased abdominal girth, signs of peritonitis in well-established ICU care. Only 38.1% had undergone surgery and the most commonly performed surgery was splenectomy followed by primary closure of bowel perforations. This shows that most of the cases with BTA can be managed conservatively with keen observation on their vitals and abdominal symptoms and signs. But in study done by Yogesh et al and Rahman et al majority of the patients were managed surgically comprising of 71.6% and 60% respectively.

CASS score and management

In present study we observed that patient with mean CASS score of 8.62 with SD of 1.359 can be managed conservatively and mean CASS score of 11.18 with SD of 1.601 can be managed by surgical intervention. These results are similar to the study done by Vanitha et al where patients with mean CASS score of 6.35 with SD of 1.56 were managed conservatively and mean CASS score of 11.56 with SD of 2.02 were managed by surgical intervention.[15] The number of patients who had a CASS of less than 8 were 10 out of 42 forming 23.8%. The number of patients who had CASS of 9-11 were 23. Thus more than half of the patients (54.7%) had CASS between 9 and 11. Patients with CASS >12 includes 9 of 42 forming around 21.4%.

All the patients who had CASS <8 were managed conservatively. These patients had minor injuries either in form of the soft tissue injury or grade I/II splenic/renal/liver injury. Among the patients who had CASS >12, 4 patients required surgical intervention, 3 succumbed to their injury and 2 were went LAMA for whom surgery was the plan. These patients had grade IV and grade V splenic injury and the findings were consistent with the USG and CECT findings. Further, CASS between 9 and 11 includes 23 patients, out of which 7 required surgical interventions. Out of 7, 5 patients had bowel perforation predominantly ileal perforation for whom primary repair was done without waiting for any other higher radiological investigations. In 1 case USG abdomen and pelvis showed gross intraperitoneal collection without solid organ injury. USG guided tapping showed hemoperitoneum. As the patient was non responder to the resuscitation, patient was taken up for the exploratory laparotomy without going for CECT abdomen and pelvis. On table it was found to be active bleed from the omentum which shows that with high degree of suspicious and good clinical examination supported with FAST scan patient can be taken up for the surgery. Other one patient had grade III splenic injury but patient was transient responder hence patient was planned for the exploratory laparotomy and it was found to be grade IV splenic injury. This shows that radiological investigations had its own fallacy. Rest of the patients however were managed conservatively with close monitoring of the vitals of the patients. Hence those who fall in the CASS 9-11 group may require careful close observation. Though most of them can be managed conservatively, a close observation or monitoring is essential in determining the need for the surgical intervention.

USG abdomen and pelvis and organs injured and management

It has been observed that USG abdomen and pelvis was positive for 33 cases and had sustained hollow viscus injury, liver injury, splenic injury and kidney injury and most of them had CASS >8. Out of 33 cases, 17 were managed conservatively and 11 had undergone surgery which includes splenectomy, omental repair and primary repair of the viscus, 3 succumbed to their injuries and 2 left against medical advice. The drawback of USG which was observed that we cannot assess which case to take for surgery or conservative management as it was evident by above observation and reporting is subjective. So in this respect CASS had upper hand in deciding the line of management and it is very economical and can be used in rural based hospital where there is unavailability of USG and radiologist.

Efficacy of CASS

All parameters of CASS i.e. specificity, sensitivity, PPV and NPV were 84.62%, 99.2%, 33.3% and 100% respectively which is comparable study done by Peymann et al where specificity, sensitivity, PPV and NPV were 88%, 100%, 90% and 100% respectively. This shows its efficacy in predicting which case to take for conservative management with better outcome.

Mortality distribution

The number of mortality observed in the study was 3 out of 42 cases constituting 7.1%. All these patients had a CASS of >12. There is no death for CASS score of less than 11. Thus the mortality is directly proportional to the CASS. Mortality in the study done by Vanitha et al and Mehta et al was 8% and 4% respectively.[15]

Limitations

The sample size of the study is low which is the limiting factor of the study.

CONCLUSION

It was concluded that most common gender involved was male and most common mode was RTA. Most of the patient of blunt trauma abdomen can be managed conservatively if patients are hemodynamically stable. With score less than 8 as per CASS; patient can be managed conservatively with regular monitoring of the vitals even in the absence of imaging modality. Patient with score more than 12 or hemodynamically unstable can be taken up for emergency laparotomy without any

radiological investigations. Patients with CASS score 9-11, with good clinical assessment aided with radiological investigations can be managed depending upon the severity of the injury.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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