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Original Research Article

Studying the clinical profile of blunt hepatic trauma

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ABSTRACT

Background: The liver is the largest intra-abdominal organ and is considered to be the second commonest organ to be injured in blunt abdominal trauma. Blunt hepatic injuries due to road traffic accidents are the sixth leading cause for death in India. Approximately 15-20% of abdominal injury presents as hepatic trauma and is liable for 50% of death resulting from abdominal trauma. The mortality rate is higher with blunt hepatic trauma than penetrating injuries. The advent of improved and expeditious imaging technologies amid advances in critical-care monitoring, prompted a significant shift towards conservative management of solid-organ abdominal injuries.
Methods: The study was conducted over 96 patients in General Surgery Department, PGIMS, Rohtak with a history of blunt hepatic injury. The study duration was from 16th May 2018 till 1st June 2020. The aim of the study was to evaluate the pattern of blunt hepatic trauma and the patterns with which they presented in the emergency department.
Results: In this study, 98.96% of the patients were managed conservatively whereas only 1.04% of patients needed surgical intervention. Conservative approach was possible because of strict patient monitoring, availability of experienced surgeons and radiologists, good intensive care unit care.
Conclusions: The study concluded that conservative management of the patient is better than operative management and can be done in the patients who are hemodynamically stable. Most of the patients settle after 48 hours if managed conservatively.

Keywords: Blunt hepatic trauma, Blunt trauma abdominal, Clinical profile, Conservative management, Non-operative management

INTRODUCTION

The liver is the largest intra-abdominal organ in the body with a thin capsule and has a very high chance of injury especially in blunt abdominal trauma.[1] It is the second most common organ to be injured, but unfortunately, liver injury contributes maximum in terms of mortality in intra-abdominal trauma.[1] Blunt trauma abdomen (BTA) is a leading cause of morbidity and mortality among all age groups. Blunt hepatic injuries due to road traffic accidents are the sixth leading cause of death in India.[2] Approximately 15-20% of abdominal injury presents as hepatic trauma and is responsible for more than 50% of death resulting from abdominal trauma. The mortality rate is higher with blunt trauma abdomen than penetrating injuries.[3-5]

The advent of improved and expeditious imaging technologies for the diagnosis and treatment of solid organ injuries, accompanied by advances in critical-care monitoring, prompted a major shift towards non-operative management (NOM) for the treatment of solid-organ injuries.[8] The recent trend of non-operative management in liver trauma has been possible because of a better understanding of the anatomy of the liver, the pathophysiology of liver trauma, imaging modalities like focused assessment by sonography in trauma (FAST) and contrast-enhanced computed tomography (CECT) scan

and the development of interventional radiology like angioembolization. Failure of non-operative management (FNOM) is defined as the need for a laparotomy to be performed after more than six hours after hospital admission.[6-8]

Penetrating and blunt trauma are the two-principal mechanism for liver trauma. There are two previously described mechanisms of blunt liver trauma: deceleration injury and crush injury.[7,8] Deceleration (shearing) injuries occur in motor vehicle accidents and fall from the height where there is the movement of the liver in its relatively fixed position, thereby producing a laceration of its relatively thin capsule and parenchyma at the sites of attachment to the diaphragm.

Crush injuries follow direct trauma to the abdomen over the liver area.[9] Decelerating injuries typically create lacerations between the right posterior section (segments VI and VII) and the right anterior section (segments V and VIII), which can extend to involve major vessels. In hepatic injury, the patient has some typical clinical manifestations such as right upper abdominal pain (sometimes with radiating pain to the right shoulder) nausea, vomiting, thirst, peritonitis, and hypovolemic shock.[10] Radiological examination is widely used for the diagnosis of hepatic trauma. Focused assessment by sonography in trauma (FAST) can quickly assess intra-abdominal hemorrhage and its bedside use is most suitable in a hemodynamically unstable patient. Enhanced CT scan combined with ultrasound is regarded as the most valuable method to evaluate abdominal trauma.[11,12] The characterization of blunt liver trauma is performed using a CT scan-based grading system, adopted from the American Association for the Surgery of Trauma (AAST), and was done initially involving a CT scan by SE Mirvis in 1989. This 6-grades classification reflects the extent of parenchymal liver damage but cannot reliably predict the clinical outcome of attempted conservative management.[13] The conservative treatment is a safe option for blunt hepatic trauma patients with stable hemodynamics. The selection of these patients is very important and should be based on hemodynamic alone rather than bleeding of hepatic injury on CT scan. Intensive monitoring is essential as there may be a failure in a few patients. The patient recovery is to the extent of 97% with a few complications only.[14]

Objectives

The objectives of the study were to see the feasibility of non-operative management of blunt hepatic trauma, indications of surgical management and to study survival rates in both type of management.

METHODS

It was a prospective observational study. The study was conducted over 96 patients admitted in the Department of General Surgery, Pt. B.D. Sharma PGIMS, Rohtak with an antecedent history of blunt hepatic injury. The study duration was from 16th May 2018 till 1st June 2020. The aim of the study was to evaluate the pattern of blunt hepatic trauma and the patterns with which they presented in the emergency department. All patients have proven to have a penetrating injury and hollow viscous injury and age less than 15 years were excluded from the study. Statistical tests were done with version SPSS 17.0 and Pearson's chi-square test or Fisher's exact test was used in determining the relationship between two categorical variables.

Sample size

For the sample size calculation, we assumed the proportion of patients operated in blunt hepatic trauma by analyzing their clinical profiles (p) =50%. Thus, the minimum required sample size at 5% level of significance was 96 patients with 10% margin of error.

Formula used was:

$$N = \frac{Z_{\frac{\alpha}{2}}^2 \times pq}{d^2}$$

$$\frac{1.96 \times 1.96 \times 0.50 \times 0.50}{0.10 \times 0.10}$$

= 96.04

Where p is the observed efficacy of treatment

q = 1 - p

d is the margin of error

$Z_{\frac{\alpha}{2}}^2$ is the ordinate of standard normal distribution at α% level of significance.

RESULTS

Blunt hepatic trauma has a very important aspect in early medical diagnosis and treatment as the outcome much depends on early management. Blunt hepatic trauma is commonly associated with multiple injuries to other parts of the body including the extremities, spinal injuries, pelvic injuries, head injuries, and most importantly the thoracic injury. The majority of the patients can be saved if proper diagnosis of blunt abdominal trauma and associated injuries is properly done and appropriate resuscitative measures along with surgical intervention if needed are done.

The assessment of vital parameters helps to understand the physiological response and their appropriateness to injury response in blunt hepatic injuries and depending on the status of compensation help to decide the management strategy. The traditional vital sign (blood pressure, heart rate, respiratory rate) can be measured

non-invasively and has been routinely used for initial assessment of blunt abdominal trauma patients. The current study takes a review of on-admission blood pressure and heart rate among blunt abdominal trauma patients and their impact on hospital mortality. Heart rate was categorized into bradycardia (heart rate of less than 60 beats per min), tachycardia (heart rate of more than 100 beats per min), and blood pressure was categorized into hypotension (systolic blood pressure of less than 90 mmHg), hypertension (systolic blood pressure of more than 140 mmHg) and normal (systolic blood pressure of 90-140 mmHg). These categories were compared with mortality. Blood pressure and heart rate as compared to different grades of liver injury at admission has been shown in Figures 1 and 2 and at 48 hours in Figure 3 and 4 (ND = not done).

Demographic data

The age distribution of all patients was studied and the following pattern was noted.

Table 1: Age wise distribution of the patients in blunt hepatic trauma.

Age group (yrs)	Frequency	Percentage
15-25	50	52.08
26-35	26	27.08
36-45	8	8.33
46-55	6	6.25
56-65	6	6.25
Total	96	100.00
Mean age		29.06±12.88

Gender distribution

Gender distribution of the current study has been shown in Figure 1.

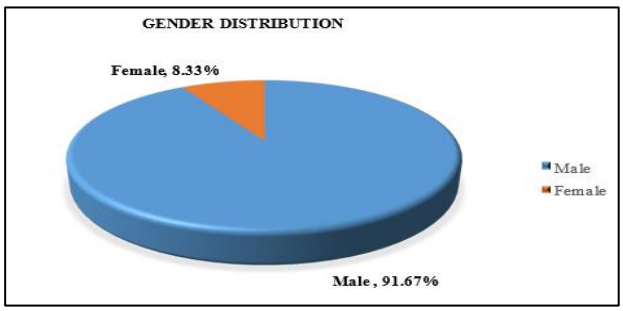

Figure 1: Pie chart showing gender distribution in the current study.

Clinical characteristics

Following were the patterns of clinical presentation at the time of presentation of patient in emergency department of the institute as has been depicted in the Table 2.

Table 2: Physical symptom on presentation in patients of blunt hepatic trauma.

Symptom	Frequency	Percentage
Abdomen pain	96	100
Chest pain	21	21.87
Vomiting	5	5.20
Distention	37	38.54
Urinary retention	2	2.08
Haematuria	6	6.25

Clinical signs

Following were the signs observed in patients of blunt hepatic trauma (Table 3).

Table 3: Physical sign on presentation in blunt hepatic trauma patients.

Sign	Frequency	Percentage
Tachycardia	49	51.4
Tachypnoea	54	56.25
Tenderness	96	100
Guarding	31	32.29
Rigidity	9	9.37
Bowel sounds absent	1	1.04
Shock	12	12.5

AAST grade of liver injury at presentation

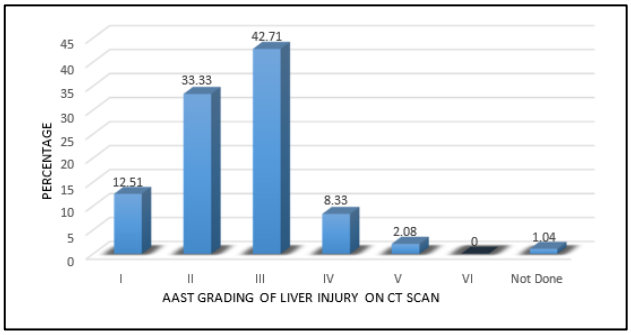

Figure 2: Number of patients with different grades of injury.

Mode of management

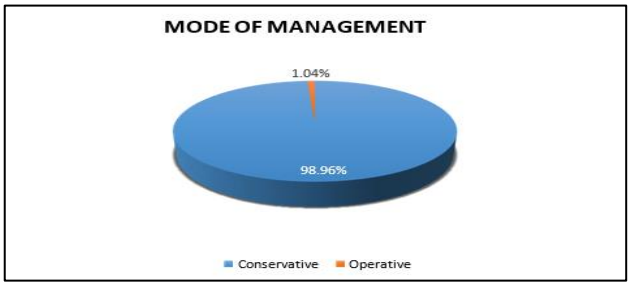

Figure 3: Different modes of management in burnt hepatic trauma.

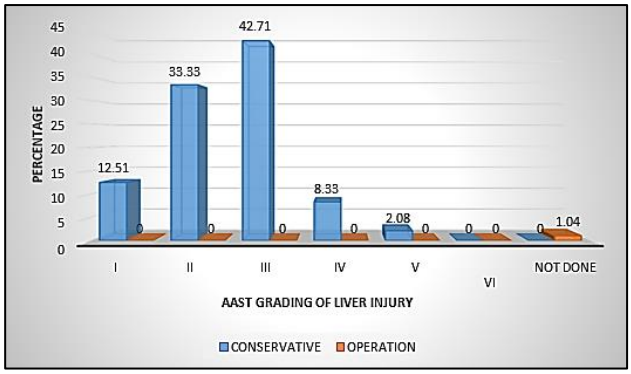

Figure 3: Different modes of management on burnt hepatic trauma.

Table 4: Outcome of blunt hepatic trauma

Outcome	Frequency	Percentage
Discharged	93	96.88
Death	1	1.04
Left against medical advice	2	2.08
Total	96	100.00

DISCUSSION

Assessment of hemodynamic stability is the most important initial concern in the evaluation of the vitals in patients with blunt hepatic injuries. In the hemodynamically unstable patient, a rapid evaluation for hemoperitoneum is often accomplished by means of focused assessment with sonography in trauma (FAST). Radiographic studies of the abdomen other than FAST, are indicated in stable patients. CT scan often provides the foremost detailed images of traumatic pathology. The management of the blunt hepatic injury is complicated and demands adequate pre-hospital care, a rapid diagnostic process, and a high level of intensive care.[15]

Treatment strategy mainly depends on the grade of injury, hemodynamic stability of the patient, clinical and radiological findings. Most of the patients were managed conservatively. Few of them can undergo operative management also. But prognosis does not depend on the type of management. Comparative studies with peer articles have been shown in Table 5.

Table 5: Study comparison on mode of management in blunt hepatic trauma.

Study	Conservative (%)	Operative (%)
Narayanaswamy et al[16]	87.1	12.9
Jain et al[17]	86.7	13.3
Li et al[18]	97.2	2.8
Present study	98.96	1.04

In the current study, 98.96% of the patients were managed conservatively whereas only 1.04% of the patients needed surgical intervention. Maximum patients were managed conservatively because of proper patient monitoring, availability of experienced surgeons and radiologists, and good infrastructure including proper intensive care unit (ICU) care. It was observed that most of the patients who came to causality with blunt trauma abdomen to solid organs were managed conservatively because the majority of the patients were hemodynamically stable at presentation and during the course in causality due to dynamic controlled resuscitation. This difference in the mode of management among different studies can be attributed to good infrastructure and availability of advanced monitoring. Whereas those managed operatively were hemodynamically unstable with all deranged clinical parameters. Hence the current study is at par comparable to other studies in regard to the mode of management in blunt hepatic trauma. The current study was consigned for observing the clinical profile of the patients of blunt hepatic trauma. As this study is an observational study, the findings of the current study mostly correlated to the other peer studies of comparison as per the different study criteria. Blunt hepatic trauma is a very common injury noted on an almost daily basis in our surgical emergency department. The morbidity and mortality have been going down with advancement in management criteria, its technique, better availability of monitoring equipment, and availability of skilled surgeons even at the district level.

In this study, pulse rate and blood pressure were noted at admission, at 6 hours, at 12 hours, at 24 hours, at 48 hours, and after 48 hours. Differences in pulse rate i.e. bradycardia, normal pulse rate, and tachycardia were observed according to different time-lapse periods. Similar values were noted in blood pressure regarding hypotension, hypertension, and normal blood pressure with a different time-lapse period. These observations helped in determining the time period at which the patients can be selected for shifting the patient from conservative management to surgical approach. Observations of the current study can be helpful in future aspects of the management of blunt hepatic trauma.

The present study had a number limitations like the sample size was less i.e. 96 due to limited number of patients available at the study time. Also the poor transport facilities available in India leads to on site mortality of major trauma patients causing decreased operative interventions.

CONCLUSION

Blunt trauma to the abdomen is on rising due to excessive use of motor vehicles. It poses a therapeutic and diagnostic dilemma for the attending surgeon due to the wide range of clinical manifestations ranging from no early physical findings to progression to shock. So, the trauma surgeon should rely on his physical findings in association with the use of modalities like FAST. Bowel

perforations are relatively easy to pick on abdominal or chest x-ray. From our study, we conclude that in hemodynamically stable patients with solid organ injury conservative management can be tried and non-operative management is associated with less complication and morbidity. The most common age group involved is 15-25 years. Predominantly males are affected in large proportions.

Most of the patient presents in the emergency department with a deranged clinical profile having alterations in pulse rate, blood pressure, respiratory rate, etc. With time after hospital admission, after conservatively managing the patient, the clinical profile improves. Tachycardia, bradycardia, hypertension, hypotension, and the majority of the other clinical profiles improve after 48 hours. By observing the clinical profile of patients with blunt hepatic trauma, it can be said that conservative management of the patient is better than operative management and can be done in most of the patients. This study concluded that most of the patients settle after 48 hours if managed conservatively and the outcome came that it is better to conservatively manage the hemodynamically stable patient.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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