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AN OBSERVATIONAL STUDY ON TRAUMATIC HAEMOPERITONEUM AT A TERTIARY HOSPITAL IN NORTHEASTERN PART OF INDIA

Surgery

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ABSTRACT

Blunt abdominal trauma is a common surgical emergency presenting as an isolated problem or part of polytrauma. Resultant haemoperitoneum throws varied challenges and complexity to diagnosis and management. This prospective observational study of one year was carried out to determine the relationship of haemoperitoneum in abdominal trauma patients while adopting different treatment modalities, which are major concerns to treating surgeons. The study included documentation of patient's demographic variables, injury patterns, dynamics in various treatment modalities and outcomes from these management. Out of 60 patients, 51 were male(85%) mostly in the age group 21-40 years. Majority of injuries were due to motor vehicle accidents(75%), followed by fall from height(20%). Extra-abdominal injuries were seen in 39(65%) patients and associated intra-abdominal injuries with multi-organ involvement in 11(18.3%) patients. Spleen(45%) and liver(28.3%) were the most frequently injured organs. 52(87%) patients were managed conservatively whereas 8(10%) patients required laparotomy, of which two patients needed conversion to operative management. Non-operative management was highly successful in haemodynamically stable patients with better outcome.

KEYWORDS

Haemoperitoneum, Blunt abdominal trauma, Non-operative management, Conversion

INTRODUCTION

Trauma is a major public health problem worldwide and is associated with high mortality and morbidity, regardless of the level of socioeconomic development of any country [1]. It is the leading cause of death, hospitalization, and long-term disabilities in the first four decades of life [2,3]. In a developing country like India, due to rapid urbanization, motorization and expanding roadways, there is a sudden boom of motor vehicular accidents, civil violence and criminal activities. Road traffic accidents accounts for the major bulk of trauma-related deaths and admissions in the emergency department [ED] globally, accounting for more than 1.35 million fatalities as reported in Global Status report on Road Safety 2018 with 90% of these casualties taking place in the developing countries[4]. As reported in MORTH Road Accidents in India 2018, road accidents in India kills almost 1.5 lakhs people annually i.e. 11% of the accident related deaths in the world. Assam, among the northeast states of India accounted for 8288 road accidents and 2966 of these fatalities [4,5].

Haemoperitoneum (blood in the belly) is collection of blood in the peritoneal cavity. Abdomen, being the least protected part of the body, are prone to injuries to internal organs from external force. Blunt abdominal trauma (BAT) is the third most common injuries seen in road traffic accidents after orthopedics and head injury [6]. Abdominal injuries are diverse, may occur as isolated organ-specific or multiple organ injuries or part of polytrauma associated other extra-abdominal injuries. The complexity of varied presentations of haemoperitoneum becomes challenging in achieving the best outcome in trauma management of these patients, especially in a developing country. Inadequate and underdeveloped emergency systems to care for victims further amplify the magnitude of the problem as there are no well-established response teams in most places. In this scenario, an abdominal trauma victim's outcome becomes catastrophic. This study was conducted to highlight the relationship between haemoperit oneum and BAT, and to determine the characteristics of injury patterns, feasibility of different modalities of treatment and its outcomes, at a tertiary care hospital in Northeastern part of India.

METHODS

A prospective hospital based study was carried out for a year from 1st June 2018 to 31st May 2019 in a tertiary care hospital in Northeastern state of India, of patients attending the ED of Assam Medical College & Hospital, Dibrugarh who sustained haemoperitoneum following blunt abdominal trauma, corroborated with radiological findings of USG and CECT abdomen. The injured patients were subsequently admitted in different surgical wards and SICU of the hospital. Prior to the enrollment of the patients, an approval was taken from the institute's ethical committee for conduction of the study and an informed written consent was taken from the patients or accompanying relatives. All patients with haemoperitoneum following penetrating injuries, paediatric age group below 12 years, referred from other health facility after receiving treatment, refusal to give consent to take part in the study and those lost in followup were excluded. Those patients having severe head, spinal or thoracic injuries which needed surgical intervention were also excluded from study. Those patients who required only intercostal drainage for haemothorax were included in the study.

Initial management of the injured patients was done in the ED as per ATLS protocol which included particular attention to airway, breathing and circulation. A quick evaluation for general condition of the patient and for any external haemorrhage from associated injury was done. The clinical assessment of the patients followed immediate resuscitative measures especially those coming in collapsed state or shock, with detailed history and thorough abdominal examination to assess the nature and extent of the injury. After initial stabilisation, patients were subjected to relevant blood and radiological investigations. Four quadrant diagnostic peritoneal aspiration (DPA) was done in all patients. Focused Assessment with Sonography for Trauma (FAST) was utilized in the early assessment of all patients to detect the presence or absence of hemoperitoneum. Patients having free intraperitoneal fluid on FAST or signs of peritonism were further evaluated with CECT of abdomen in hemodynamically stable patients.

The decision for operative or non- operative management depended on the outcome of the clinical examination and results of diagnostic tests. Those patients who were haemodynamically stable, showing no peritoneal signs were selected for non-operative management. These patients were placed on strict bed rest and close monitoring to serial clinical examinations which included hourly pulse rate, blood pressure, respiratory rate, abdominal examination and other systems. Appropriate diagnostic tests especially ultrasound of abdomen was repeated as and when required. Patients were taken up for operative intervention if they showed hemodynamic instability, peritoneal signs, suspicious of bowel injury or failure of non-operative management. A midline approach was used as a standard protocol in all cases. The findings at laparotomy were noted; type of free fluid, amount of haemoperitoneum, organs injured with location and extent of injury, viability of viscera and other incidental findings. The procedure done

varied as per the findings.Closure of abdomen was done with nonabsorbable monofilament polyamide suture in all cases after peritoneal wash. Drain were placed accordingly. Post operatively, patients were managed on IV fluids, blood transfusions, broad spectrum antibiotics and analgesics.

Complications like septicaemia, wound infection, chest infection were recorded and dealt accordingly. Drains were removed postoperatively when they stopped draining. Suture removal was done appropriately. In patients who expired the cause of death was noted. Patients was followed up after 2 weeks and one month after discharge. Documentation of the patient's information was collected in a specially prepared proforma which included demographic data, history and clinical findings, injury mechanisms, type of injuries sustained, associated injuries, diagnostic tests, surgery performed, complications and outcome.

RESULTS

During this one-year period, the study comprised of 60 cases of haemoperitoneum following blunt abdominal trauma after meeting the inclusion and exclusion criteria. Among these patients, 8 patients underwent operations, 52 was managed conservatively and 5 patients died during the course of treatment. The demographic patterns of the study showed males 51(85%) grossly outnumbered females 9(15%) with a male to female ratio of 5.5:1. It was observed that the majority (62%) of the trauma victims were between the 2nd and 4th decades of life, ranging between 16 to 75 years and a mean age of 35.83±8.0 years.

Motor vehicle accidents was the major culprit for haemoperitoneum which accounted for 75% of the study population followed by fall from height (20%) and physical assault (3.33%). One patient's injury was sports-related. Almost half of the patients (48.33) had latency period of 12 hours from time since injury to arrival at the hospital, and 82% patients had delay of 24 hours for treatment (Table 1). Out of 60 patients, 21(35%) presented with shock at the time of arrival to the ER. All 60 patients underwent DPA and FAST examination for haemoperitoneum. DPA was positive in 65% and FAST was positive in 82% of these patients.

Table-1 Demographic Parameters

Variables	n	%
Age (years)		
<20	5	8.33
21-30	20	33.33
31-40	17	28.33
41-50	10	16.67
51-60	5	8.33
>60	3	5.00
Gender (Male)	**51**	**85.00**
Mechanism of injury		
Motor vehicle accidents	45	75.00
Fall from height	12	20.00
Physical assault	2	3.33
Others	1	1.67
Time since injury (hrs)		
<12	29	48.33
12-24	20	33.33
24-48	8	13.33
>48	3	5.00

Table -2 Patterns Of Abdominal Injuries

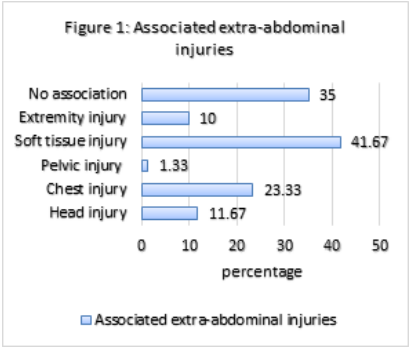
Abdominal organs	FAST+ CECT	Laparotomy
Spleen		
Liver	27(45.0)	3(37.5)
Bowel	17(28.3)	0
Mesentery	3(5.0)	2(25.0)
Multiple organs	2(3.3)	1(12.5)
Liver+ Spleen	11(18.3)	2(25.0)
Spleen+ Pancreas	*6(10.0)*	*0*
Spleen+ Kidney	*2(3.3)*	*0*
Bowel+ Mesentery	*2(3.3)*	*0*
Spleen+Pan+Duo+C	*0*	*1(12.5)*
BD	*1(1.7)*	*1(12.5)*

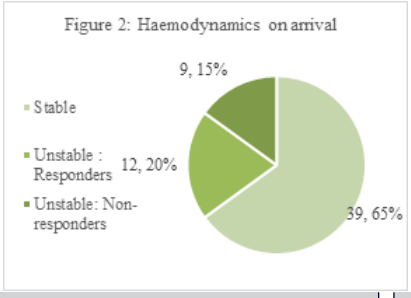
The resuscitative efforts failed in one patient, who died during transit to operation theatre. Five patients underwent immediate surgery for haemodynamic instability, 15 patients responded to resuscitations with crystalloids and blood products. After adequate stabilisation, they underwent CECT scan and were planned for nonoperative management. 39 patients were haemodynamically stable at presentation, one patient was operated for suspicion of bowel injury. All remaining 49 stable patients underwent CECT abdomen and other relevant investigations. A total of 39 patients (65%) were detected having associated extra-abdominal injuries. The study population had associated soft tissue injuries (42%), chest injuries (23%), head injuries (12%) and extremity injuries (10%). One patient had associated pelvic injury. Haemoperitoneum with no association to any extra-abdominal injuries was found majority in 21 (35%) patients. Patterns of abdominal injuries leading to haemoperitoneum are summarized in (*Figure 1*).

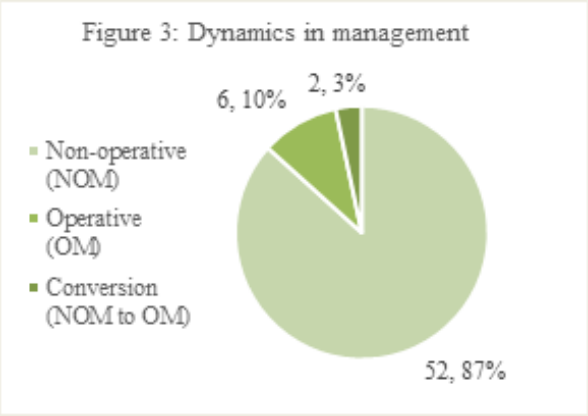
The frequently associated abdominal injuries were spleen 27(45%), liver 17(28.3), bowel 3(5%), mesentery 2(3.3%). These occurred as isolated organ-specific injuries. Multiple organ injuries were found in 11(18.3%), of which liver-spleen, spleen-pancreas, spleen-kidney and spleen-pancreas-duodenum-CBD were identified in 6,2,2,1 patients respectively. Overall involvement of spleen and liver amounted to major part of haemoperitoneum in the study with 38(63.3%) and 23(38.33%), respectively (Table 2).

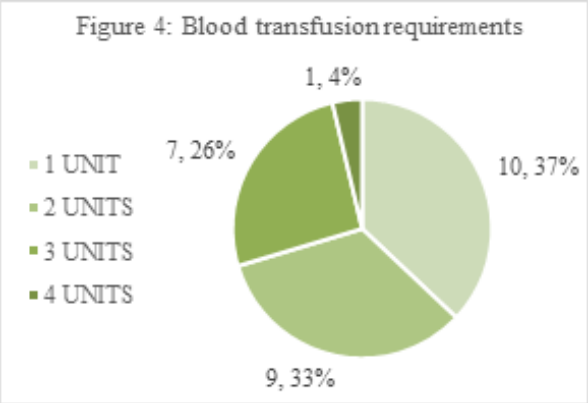
Based on the clinico-radiological findings, after initial resuscitation 52 patients (87%) was managed conservatively as non-operative management group (NOM) on the basis of haemodynamic stability and with no other immediate indication for laparotomy. Of these NOM group, 39(65%) patients were haemodynamically stable at presentation and 12 (57%) patients were responders to the resuscitative measures undertaken (*Figure 2*). Two patients later had to be converted to OM from NOM group as they became haemodynamically unstable during the course of treatment, amounting to a total of eight patients under OM group (*Figure 3*). The operative findings of the injured organs have been shown in (Table 2). On laparotomy haemoperitoneum was noted in all cases. Splenectomy was performed in four patients, two patients for grade IV injuries , one for Grade V injury as isolated splenic injuries and one patient needed splenectomy (for grade IV injury) with concomitant injuries to duodenum and CBD. Mesenteric repairs were done in two patients, one of them was associated with ileal injury. Two patients had jejunal injuries for which bowel repair was done. Injury to intervention time was 12-24 hours in four patients (50%), one patient in 25-36 hours, another patient in 37-48 hours and two patients after 48 hours. Blood transfusions were required in 42(80%) patients of the NOM group, of which 92% required 2 units or less. A significant number of units were required in the OM group compared to NOM group. 10 patients did not require any blood transfusion (*Figure 4*).

Majority of the patients recovered without a complication. Respiratory complications were the most frequent, followed by septicaemia. Most common complication in the OM group were surgical site infections in 3 patients (37.5%). Other complications included renal dysfunction and dyselectrolytemia.









The range of hospital length of stay was from 7 to 26 days (mean 11.65±4.0) Average duration of hospital stay was longer in OM group with 15.4 days compared to NOM group of 10.9 days, also more prolonged stay was observed with associated extra-abdominal injuries and those developing complications. Rate of ICU admission was more in OM group, 3 patients (37.5%) compared to 8 patients (15.4%) in NOM group. Overall mortality rate in this study was 8.33%. Out of the five patients who died, three were in the NOM group and two patients in OM group. These deaths were related mainly to associated multiple organ injuries, respiratory and renal complications. One patient's death was related to severe head injury (Table 3).

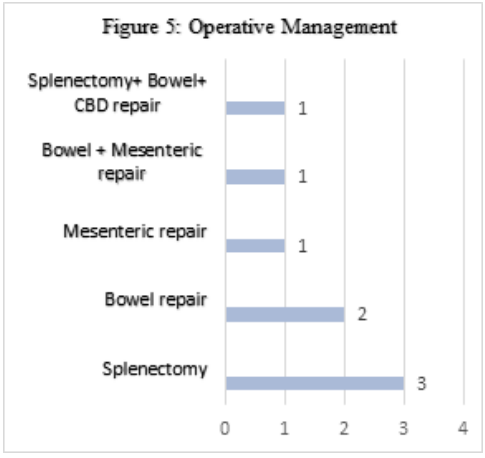


Table-3 Treatment Outcomes

Variable	NOM	OM
Hospital stay *	10.9±3	15.4±7
ICU stay *	8 (15.4%)	3 (37.5%)
Complications		
SSI	0	3(37.5)
Sepsis	3(11.32)	2(25)
Respiratory	6(5.66)	2(25)
Others	3(5.66)	1(12.5)
Mortality	3(5.8%)	2(25%)

DISCUSSION

Abdomen being a Pandora's box, can reveal the unexpected with the different entities it houses in, so a case of haemoperitoneum is no different of the multitude of challenges it presents with. Approach towards management of abdominal trauma has been ever evolving with changing times. Historically, Sir William MacCormace in 1900 advocated "a man wounded in war in the abdomen dies if he is operated upon and remains alive if he is left in peace" from his experiences while serving in Franco-Prussian/Boer wars [7]. This dictum remained for most half of 20th century which subsequently was replaced with practice of mandatory laparotomy for abdominal injuries till the advent and availability of newer technologies in diagnostic tools and modern intensive care facilities in the last few decades. There have been refinements and changing trends back towards nonoperative management of abdominal trauma with better outcomes [8].

In our present study, majority were young male patients between second and fourth decades of life that represented the economically active age groups. The greater incidence of abdominal trauma reflects their higher mobility and participation in high-risk activities. Road traffic accidents accounted majority (three-quarters) of the patients in our study attending ED with haemoperitoneum following blunt abdominal trauma. These findings corroborated with other studies by Venkanna M et al (2018) and Bansod AN et al (2019) [9,10]. Higher incidence of road traffic accidents in our study may be attributed to increased number of vehicles on roads to the width of the roads, reckless driving, driving under influence of alcohol or drugs and disobeying of traffic rules, especially by the younger age group.

More than half of the patients attended to ER after 12 hours of injury in our study. Only 14 of our patients received pre-hospital care near the site of injury. Prolonged injury-arrival time have contributed significantly to high mortality and morbidity was observed in the present study as well as study by Chalya et al (2012) [11,12]. The lack of advanced pre-hospital care in our environment coupled with ineffective ambulance system for transportation of patients to hospitals is a major hindrance in providing care for trauma patients and have contributed significantly to poor outcome of these patients due to delay in definitive management. Patients of BAT are commonly victims of polytrauma.

In our study, soft tissue injuries were commonest (42%) extra abdominal injuries, followed by chest injuries (23%) and head injuries (11.67%). Other associated injuries were extremity and pelvic fractures. No association with other injuries was noted in 35% of the study population. These findings corroborated with studies conducted in India by Venkanna M et al (2019) and Sankpal JT et al (2015) [9,12]. Study by Bhattacharjee B et al (2015) [13] found that diagnosis of rib fractures in blunt trauma victims are markers for increased likelihood of solid organ injuries and severity of injury. Our study was associated with significant increase in mortality and length of hospital stay from concomitant extra abdominal injuries. Associated injuries complicate the management and affects the outcome [14].

Inadequate history and unreliable physical findings make evaluation of these patients with haemoperitoneum a challenging task. Early recognition of these injuries and source of hemorrhages in body cavities is crucial in acute trauma management of abdominal injuries. Bedside tools, Four quadrant peritoneal aspiration (DPA) and Diagnostic Peritoneal Lavage (DPL) helps in quick evaluation of haemoperitoneum. DPA is a simple, safe, and inexpensive test which can be employed for diagnosing hemoperitoneum in doubtful cases and it can reduce mortality by avoiding delay in treatment. With use of FAST and CECT for trauma management, use of DPL has decreased. In the present study, all 60 patients were subjected for DPA for quick observation. 39 cases (65%) were found to be positive and 21 cases were negative, as against 44% in study by Davis et al (1996) [15]. However negative results do not rule out absence of haemope ritoneum. Two patients with negative tap cases were operated with the suspect of bowel injury as X-ray abdomen in these two patients showed gas under diaphragm and intraoperative findings also had haemoperitoneum. FAST was used in emergency ultrasonographic evaluation of all 60 patients. It detected haemoperitoneum in 49 cases (82%) which confirmed that negative tap did not exclude haemop eritoneum. Of majority of cases, it identified the injured organ correctly. FAST is a feasible investigation in patients with BTA, and it can be performed easily and quickly in the emergency room with a reasonable sensitivity, specificity, and accuracy. It helps in the initial triage of patients for conservative management or immediate

operation. Like most trauma centers, ultrasonography is employed in our setup for initial screening for abdominal injuries.

All haemodynamically stable patients and responders to resuscitative measures were subjected to CECT scan of abdomen for further evaluation, which could provide reliable information on haemop eritoneum, extent of intra-abdominal injuries and ongoing bleeding by means of radiographic blush. CT findings in one of the operated cases were correlated in our study and found to be correct. Rest 48 cases were treated conservatively depending on CT findings and clinical improvement. Studies by Bansod AN et al (2018) and Sinwar PD et al (2014) [10,16] showed CT scan of abdomen detecting haemo peritoneum and intraabdominal injuries to have sensitivity of 100%. In our present study, solid organ injuries were the major cause of haemoperitoneum following blunt abdominal injuries. Spleen (45%) and liver (28%) were found to be most vulnerable organs to be injured. Other organs involved were bowel (5%), kidney (3%), mesentery (3%), pancreas and bile duct. Multiple organ involvement as a cause of haemoperitoneum in present study was 11(18%) patients. Velmahos et al (2003) [17] and previous studies [7,10,15] showed similar results.

In our institution, there was no specific guidelines for management of BAT. One definitive requirement for NOM was haemodynamic stability of the patient. Evaluation with CECT scan had significant role in deciding for NOM in the present study. Out of 54 patients, initially managed by NOM, 52 patients (96%) who presented with haemoperitoneum could be successfully managed by conservative approach, these included Grade I, II, III of splenic injuries, Grade I,II,III liver injuries and all renal injuries(both were Grade II).Two of these patients had to be converted to OM. Failure of NOM can be related to both patients developing haemodynamic instability, one due to rebleeding from Grade IV splenic injury on 4th day and another patient due to frank peritonitis from associated multiple injuries with bowel injury after 36 hours. Eight patients eventually required laparotomy. Splenectomy was performed for Grade IV, V splenic injuries. Other procedures for OM included visceral repair for bowel, mesenteric and biliary-pancreatic-duodenal injury. Success rate for OM was 75%. Two patient's mortality following laparotomy was related with multiple intraabdominal organ injuries, one with splenic injury with biliary-pancreatic-duodenal injury. In comparison to OM, overall outcome from NOM was significantly better, lesser blood transfusion requirements, lesser hospital stay, decreased mortality rate and incidence of non-therapeutic laparotomy was markedly reduced.

Study conducted by Raza et al (2013) [18] also showed comparable results with success rate of 90% in nonoperative management of intraabdominal solid organ injuries. Malhotra A K et al (2000) [19] concluded that blunt trauma patients with concomitant injury to liver and spleen have higher mortality, length of stay and transfusion requirements. Extra vigilance is warranted when choosing NOM in the presence of injury to both organs. In our study also, increased severity of injury and associated injuries was observed to prolong the length of hospital stay and increased complications rate.

CONCLUSION

Unlike haemorrhage from external injuries, haemoperitoneum following blunt injury to abdomen is unobvious and deceptive, diagnosis and control becomes challenging. Prompt evaluation and intervention is needed to negate the effects of these preventable cause of deaths. Spleen and liver were major cause of haemoperitoneum. Use of ultrasonography and CT scan had contributed significantly in adopting for conservative management. Nonoperative management can be recommended for haemodynamically stable patients upto grade III abdominal injuries with better outcomes. Concomitant extra/intra-abdominal and multiple injuries were associated with increased morbidity and mortality.

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