E-ISSN: 2616-3470
P-ISSN: 2616-3462

www.surgeryscience.com
2020; 4(1): 369-374
Received: 16-11-2019
Accepted: 18-12-2019

Bhanwar Lal Barkesiya
Assistant Professor, Department of Surgery, American International Institute of Medical Sciences, Udaipur, Rajasthan, India

Quresh Bambora
Assistant Professor, Department of Surgery, American International Institute of Medical Sciences, Udaipur, Rajasthan, India

Omkant Sharma
Assistant Professor, Department of Surgery, American International Institute of Medical Sciences, Udaipur, Rajasthan, India

Corresponding Author:
Omkant Sharma
Assistant Professor, Department of Surgery, American International Institute of Medical Sciences, Udaipur, Rajasthan, India

A prospective observational study of outcome of conservative management in blunt abdominal trauma

Bhanwar Lal Barkesiya, Quresh Bambora and Omkant Sharma

DOI: https://doi.org/10.33545/surgery.2020.v4.i1g.365

Abstract
Introduction: Blunt abdominal trauma (BAT) presently is the third most common form of trauma worldwide. The management of blunt abdominal trauma (BAT) is challenging. Management may involve non-operative measures or surgical treatment, as appropriate. Recently there has been increasing trend towards non operative management (NOM) of blunt trauma amounting to 80% of the cases with failure rates of 2-3%. NOM is a standard protocol for hemodynamically stable solid organ injuries. Present research was conducted to study the spectrum, mode of injuries and role of conservative management and its subsequent outcome in cases of BAT.
Material & Methods: A hospital based prospective observational comparative study was conducted at Department of Surgery of a tertiary care hospital. A total of 50 cases of blunt abdominal trauma coming to our hospital and fulfilling eligibility criteria were included in the study after taking informed consent. After initial assessment and stabilization of the patient in the emergency ward, the patient was followed in the inpatient ward to assess for clinical improvement. Management decisions i.e. conservative or operative was taken by treating surgeons. All cases managed conservatively were monitored closely for any complications and requirement for conversion to operative treatment was noted. Data was analyzed using statistical software SPSS ver. 21.
Results: Mean age of the study subjects was 32.62 years with 94% males. Most common mode of Injury was road traffic accident (80%) followed by fall from height (20%). Most common site of injury in blunt abdominal trauma cases was spleen (34%) followed by liver (26%). Conservative management was tried initially in 47 (94%) cases. A total of 7 patients out of 47 (14.9%) were converted from conservative to operative management after initial investigations. During the course of hospital stay, 4 out of 40 (10%) cases were converted to operative management. Mortality rate observed in the cases of abdominal blunt trauma in present study was 16%. A solitary patient expired on conservative management, giving failure rate in conservatively managed cases as 2.8%.
Conclusion: Our study proves that non operative management is a safe and effective method in the treatment of blunt injury abdomen. Close monitoring of vital signs and repeated clinical examinations is important as management by conservative management depends on clinical and hemodynamic stability of the patient.

Keywords: Blunt abdominal trauma, conservative management, non-operative management, road traffic accident

Introduction

Trauma is a manmade health problem of the modern era which has assumed epidemic proportions. Trauma literally means wound or injury, whether physical or psychological. Here the term "trauma" is used to denote physical injury. Trauma is characterized by a structural alteration or physiological imbalance that results when energy is imparted during interaction with physical or chemical agents.

Trauma particularly blunt abdominal trauma has become a major cause of morbidity and mortality for the working and aged population in the developing and industrial nations of world. Blunt abdominal trauma (BAT) presently is the third most common form of trauma worldwide [1]. Road traffic accidents, falls, assaults still remain the most common causes of BAT. In children, child abuse and trauma secondary to recreational activities such as cycling, roller skating, horse riding etc. are additional causes of BAT. Rare causes of BAT include iatrogenic trauma during cardiopulmonary resuscitation, manual thrust to clear airway and the Heimlich maneuver [2].

Virtually no intra-abdominal viscera is spared from injury due to BAT and the spectrum varies from trivial to catastrophic life threatening injuries.3 Spleen is the intraabdominal organ most commonly injured after BAT followed by liver and small bowel. Kidneys, ureters and urinary bladder are also injured after BAT and 70% of cases of bladder rupture are associated with pelvic fractures. Injuries to colorectum, diaphragm, stomach and pancreas have also been reported after BAT [2].

Blunt force injuries to the abdomen can generally be explained by three mechanisms, when deceleration causes differential movement among adjacent structures, as a result shear forces are created and cause hollow and solid viscera and vascular pedicles to tear, especially at relatively fixed points of attachment. Intra-abdominal contents can also get crushed between anterior abdominal wall and the vertebral column or posterior thoracic cage. This produces crushing effect to which solid viscera are especially vulnerable. External compression forces that result in sudden rise in intra-abdominal pressure can result in rupture of hollow viscus [2, 3].

Evaluation of patients with BAT is a challenging job for a surgeon. Proper early diagnosis and initial resuscitation is beneficial in having a good outcome. Physical examination remains the initial step in diagnosis but due to its proven inconsistency especially in children, patients under the effect of alcohol, or in patients with concomitant injuries to head and spine various diagnostic modalities have been employed to assist the trauma surgeon in diagnosis of abdominal injuries [4]. In haemodynamically stable patients with reliable physical examination, clinical findings may be used to select patients who may be observed safely. In the absence of reliable physical examination, diagnostic choice is between Focused Abdominal Sonography in Trauma (FAST) (with CT in complementary role) and computed tomography (CT) alone. Haemodynamically unstable patients may be initially evaluated with FAST or Diagnostic Peritoneal Lavage (DPL) with need for urgent exploratory laparotomy [5].

The management of blunt trauma abdomen (BTA) is challenging. Management may involve non-operative measures or surgical treatment, as appropriate. Approach to trauma should be systemic and prioritized. About 10% of patients have persistent hypovolemic shock as a result of continuous blood loss in spite of aggressive fluid resuscitation and require an urgent laparotomy. Damage control laparotomy is a life saving procedure for such patients with life-threatening injuries and to control hemorrhage and sepsis. On the other spectrum, there has been increasing trend towards non operative management (NOM) of blunt trauma amounting to 80% of the cases with failure rates of 2-3% [6]. NOM is a standard protocol for hemodynamically stable solid organ injuries.

In the city of Udaipur, the wide network of roads and subsequently increased fast vehicular traffic has increased the incidence of BAT due to vehicular accidents. Keeping all this in view, this study was conducted on the spectrum, mode of injuries after BAT, conservative management and its subsequent outcome in a tertiary care hospital.

Materials and Methods

A Prospective, observational study was conducted in the Department of Surgery of a tertiary care hospital. A total of 50 cases of blunt abdominal trauma coming to our hospital and fulfilling the eligibility criteria were included in the study after taking informed consent.

Inclusion Criteria

1. Patients of either gender presenting to the emergency ward with history of blunt abdominal trauma.
2. Only those patients were included who were later admitted in the hospital so that we can follow them to know their outcome.

Exclusion Criteria

We excluded those patients who have hollow viscus injury like stomach, small bowel, large bowel perforation.

Methodology

All patients satisfying inclusion and exclusion criteria were explained the purpose of the study and an informed consent was taken from them. At the time of enrollment detailed history was taken. This was followed by a detailed general and physical examination of the study participation. All the findings were noted on a pre-designed proforma.

We took basic demographic information about the patient like name, age, gender, residence, family income. Clinical information like mode of injury, time since injury, presenting complaints, associated complaints, previous medical history was also obtained from the patient. Vital signs of the patient were noted at the time of admission and during the stay as well. Patient's injury was classified as per American Association for the Surgery of Trauma Organ Injury Scale [7].

The patients underwent standard investigations as prescribed by their treating Surgeon, during their stay in the hospital. Hematocrit, cell count, liver function tests, pancreatic enzymes, urinalysis and additional testing if required will be performed. Radiological investigations will include x-rays, ultrasonography (USG) and computed tomography (CT) and MRI. After initial assessment and stabilization of the patient in the emergency ward, the patient was followed in the inpatient ward to assess for clinical improvement.

Management decisions i.e. conservative or operative was taken by treating surgeons. All cases managed conservatively were monitored closely for any complications and requirement for conversion to operative treatment was noted.

Statistical Analysis

The quantitative data was represented as their mean ± SD. Categorical and nominal data was expressed in percentage. All analysis was carried out by using SPSS software version 21.

Results

Mean age of the study subjects was 32.62 years with most of the subjects were between 21-40 years of age (68%). Out of the total 50 cases, 94% were males while 6% were females. Most common mode of Injury was road traffic accident (80%) followed by fall from height (20%).

Most common associated injuries were head and spinal (30%), chest (18%), fracture of the extremities (16%) and pelvic fracture (6%). On physical examination, Pain & tenderness was experienced by almost all the cases. Visible injuries and fractures were observed in 52% and 30% cases respectively. On general examination, tachycardia and tachyapnea was seen in 64% and 44% cases while low systolic and diastolic BP was seen in 20% and 26% cases respectively. GCS below 10 was seen in 3 cases while in 7 cases urine was not passed. On systemic examination, abdominal distension was seen in 76% cases while guarding/ rigidity was seen in 36% cases. No bowel sound was present on auscultation in 44% cases. None of the patients suffered genital trauma while per rectal bleeding was

present in 6% cases (Table 1).

Out of the total 50 cases, 34% were hemodynamically unstable. Most common site of injury in blunt abdominal trauma cases was spleen (34%) followed by liver (26%). Other organs injured were Kidney (12%) and pancreas (14%). Multiple organ injury was seen in 8% cases. In most of the cases (24/ 39), grade I or II injuries were seen while grade IV and V injuries were seen more commonly in cases with liver (6/13) and spleen (6/17) injury (Table 2).

Table 1: Distribution of patients as per examination findings

Variables	N	%
Associated Injuries		
Head/ Spinal	15	30.0%
Chest	9	18.0%
Fracture Extremities	8	16.0%
Pelvic Fracture	3	6.0%
Physical Examination		
Pain	48	96.0%
Tenderness	50	100.0%
Visible injury	26	52.0%
Fractures	15	30.0%
BSRL	2	4.0%
SPO2< 90%	4	8.0%
Pulse > 100/ min	22	44.0%
RR > 20/ min	32	64.0%
SBP< 90	10	20.0%
DBP< 60	13	26.0%
PICCLE	27	54.0%
GCS< 10	3	6.0%
Urine Not Passed	7	14.0%
Systemic Examination		
Abrasions	43	86.0%
Ecchymosis	23	46.0%
Injury Marks	39	78.0%
Abdominal Distension	38	76.0%
Genital trauma	0	0.0%
Guarding/ Rigidity	18	36.0%
Abdominal Tenderness	48	96.0%
No Bowel Sounds	22	44.0%
Per Rectal Bleeding	3	6.0%

Table 2: Distribution of patients as per organ involved and type of injury

Organ Involved (n-39)	I	II	III	IV	V	Total
Spleen	2	7	1	4	0	14
Liver	0	5	2	4	0	11
Kidney	1	5	0	0	0	6
Pancreas	2	2	0	0	0	4
Spleen & Pancreas	0	0	1	0	1	2
Liver & Pancreas	0	0	0	1	0	1
Spleen & Liver	0	0	0	1	0	1
Total	5	19	4	10	1	39

In most cases, mild (42%) to moderate haemoperitoneum (44%) was observed on ultra-sonography while gross hemoperitoneum was seen in cases with liver (3/13) and spleen (3/17) injury. A total of 3 patients were hemodynamically unstable due to gross hemoperitoneum, 1 had splenic grade 4 laceration; 1 had both liver & splenic grade 4 laceration while no organ injury was identified in 3rd case. Apart from these 3 cases, Conservative management was tried initially in all remaining 47 cases. A total of 7 patients out of 47 (14.9%) were converted from conservative to operative management after initial investigations. During the course of hospital stay, 4 out of 40 (10%) cases were converted to operative management.

Mortality rate observed in the cases of abdominal blunt trauma in present study was 16%.

The cause of death was haemorrhagic shock in 5 out of 8 cases while in remaining 3 cases, septicaemia was the underlying cause of death. Mortality can be attributed to abdominal trauma in 6 out of 8 cases (total 12%) while in other 2 cases, mortality was attributed to pelvic fracture and head injury. A solitary patient expired on conservative management, giving mortality rate in conservatively managed cases as 2.8%. The underlying cause of death was haemorrhagic shock. The patient was suffering from grade 2 splenic laceration with displaced pelvic fracture.

Discussion

There has been a significant shift from operative to non-operative management of blunt abdominal injuries in the past two decades. Selective non-operative management (NOM) of solid organ injuries has become the standard of care today, as there is reduced surgical intervention and consequently reduced transfusions, lower morbidity, and shorter length of stay.

Present study was conducted on 50 patients to study the efficacy of conservative management in blunt abdominal trauma patients admitted at our hospital. Present study observed that the most common mode of Injury was road traffic accident (80%) followed by fall from height (20%). Blunt injury of abdomen as one of the most common injuries caused by road traffic accidents has been reported by many studies. [10]

John S *et al*. [9] also reported most common mode of injury was due to Road traffic accidents in their study from Chennai. Maurice A *et al*. [11] in Nigeria also observed Road traffic accidents were the commonest cause of abdominal injury. Tiwari C *et al*. [8] in a study from Mumbai, India also observed that the Road traffic accident was the most common mode of injury seen in 14 patients (58.33%), followed by fall from height in 7 patients (29.16%) and these findings were similar to the findings of the present study.

Blunt trauma in the present study was strongly associated with other co-morbid injuries, visible injuries and fractures were observed in 52% and 30% cases respectively. Associated injuries observed were head and spinal (30%), chest (18%), fracture of the extremities (16%) and pelvic fracture (6%). Gad MA *et al*. [12] also observed the associated injuries in their study, common associated injuries in blunt cases were injury of extremities (51.2%), chest injuries (34.1%), and head and neck injury (14.6%). It varies with type of accident and mode of injury in various patients.

With respect to the site of injury, head injury is seen to be the most common site. Bajracharya A *et al*. [13] evaluated the surgical trauma and observed that the most common site of injury and was the head in 733 cases followed by the abdomen in 204 cases, face and neck in 60 cases and chest in 176 cases in cases of Road traffic accidents and fall. Associated injuries increases morbidity and mortality in blunt abdominal trauma cases. In our series out of eight patients, who died, six had associated injuries.

On physical examination, Pain & tenderness was experienced by almost all the cases. On general examination, tachycardia and tachyapnea was seen in 64% and 44% cases while low systolic and diastolic BP was seen in 20% and 26% cases respectively. GCS below 10 was seen in 3 cases while in 7 cases urine was not passed. Gad MA *et al*. [12] have mentioned the clinical status of injured in their study and have reported findings which were similar to the results of the present study.

On systemic examination, abdominal distension was seen in 76% cases while guarding/rigidity was seen in 36% cases. Most common site of injury in blunt abdominal trauma cases was spleen (34%) followed by liver (26%). Other organs injured were Kidney (12%) and pancreas (14%). Multiple organ injury was seen in 8% cases. Anuradha G *et al*. [14] reported pain, localised tenderness, abdominal distention and guarding among abdominal trauma patients, Spleen was the most common organ (66%) involved followed by liver (38%), which is in accordance with the present study.

This also compares favourably with similar studies carried out by Cox [15], who reported splenic injury (42.2%), followed by liver (35.6%) and intestine and mesentery injury (17%) in his study. Gerald *et al*. [16] also reported spleen as commonest injured organ (26%), followed by intestine and mesentery (21%) and liver (19%) in their study.

History of substance abuse was given by 34% cases in present study. A large proportion of road traffic crashes are related to driving under the influence (DUI) of alcohol or drugs [17]. Many studies have investigated the high prevalence of Substance Abuse in drivers who experienced RTA [18, 19].

Haemodynamic stability was defined as serial blood pressure and heart rate appropriate for age with adequate end organ perfusion measured on admission or after fluid resuscitation with normal saline/Ringers lactate. Haemodynamic stability has been considered as a significant predictors of Non Operative Management success. Malhotra *et al*. [20] reports that a large amount of hemoperitoneum (when blood is present in the lateral channels, the perihepatic space, and the Douglas pouch) is a significant risk factor for the failure of conservative treatment.

Harbrecht *et al*. [21] also support that this is a major factor not only for Non Operative Management failure but also for preventable deaths.

A total of 34% of the patients were hemodynamically unstable in present study. Our basic criterion in operating a non-operative management (conservative) patient was deterioration of hemodynamic status, despite a second attempt for resuscitation. Clinical, ultrasonography and laboratory evidence of ongoing hemorrhage or development of hemo-peritonium determined failure of conservative management. On ultra-sonography, gross hemoperitoneum was seen in 6 cases with liver and spleen injury. 1 had splenic grade 4 laceration; 1 had both liver & splenic grade 4 laceration. While no organ injury was identified in 3rd case. Progressive fall in packed cell volume (PCV) and ultrasonography evidence of ongoing bleeding were other indicators for failure of conservative management. In our study, conservative management was initially tried on 47 (97%) blunt abdominal trauma patients. A total of 7 patients out of these 47 (14.9%) were converted from conservative to operative management after initial investigations. During the course of hospital stay, 4 out of 40 (10%) cases were converted to operative management.

In our study, overall conservative management was done in 36 (72%) patients and was successful in 35 (97.2%) patients. Operative treatment was done in 14 (28%) patients because of hemodynamic instability.

Similar management scenario has been observed in a study by Tripathi MD *et al*. [22]. Varied management decisions have been observed, Norman *et al*. [23] reported that 55% were managed conservatively with a low failure rate and routine CT scan did not appear to add clinically relevant information affecting patient management. Other reports were; Yaghoubi *et al*. [24] reported that 31.5% were managed conservatively, Al-Mulhim and Mohammed [25] 82.5% and Velmathos *et al*. [26] from california reported it to be 85%, which is comparable to present study.

Without doubt, these results are not directly comparable to other studies as the injury grade distribution varies among studies. Besides, decision to operate does not only depend on the clinical status of the patient, for which no clear guidelines have been described, especially in the "gray zone". Personal judgment and experience, hospital's infrastructure and homogeneity of the team are important, decisive factors.

The reasons for conversion in most of the studies were fall in haemoglobin [27, 28]. In present study, the most common reason for conversion was fall in haemoglobin, followed by fall in haemoglobin with hypotension and also persistent fever with peritonitis. Raza M [29] in Oman also explains that they the failure group had a mean fall BP <90 mmHg.

The overall mortality in this study was 16%. Three patients died postoperatively because of septicaemia and Acute respiratory distress syndrome and remaining five Succumbed to Hemorrhagic shock with multiple organ failure (only 1 mortality was from conservative group).

Cox *et al*. [15] reported a mortality of 16.6% in their study,

whereas Allen and Curry *et al.* [30] reported a mortality of 10.8% in their study. Mortality was also higher in the converted group in study done in Oman by Raza M. [29].

John S *et al.* [9] reported that mortality was also higher in the operative group. Malhotra *et al.* [31] and Schroeppel and Croce [32] reported that non-operative management significantly improved outcomes over operative managements in terms of decreased abdominal infections, decreased transfusions and decreased lengths of stay. This was in keeping with the overall findings of our study.

Conclusion

Our study proves that non operative management is a safe and effective method in the treatment of blunt injury abdomen. Non operative management depends on clinical and hemodynamic stability of the patient. The most common mode of injury in our study was due to road traffic accidents. The most common organ to be injured was the spleen followed by liver. In our study, non-operative management was successful in 70% of the patients with good outcome. Liver is the best organ to be managed conservatively following blunt trauma. The highest rate of failure of non-operative management was seen in splenic injury. Timing of the decision to convert to operative management is predominantly in the first 48 hours after admission. Criteria for conversion in our study were fall in haemoglobin, hypotension and persistent fever with signs of peritonitis despite on-going resuscitation. Close monitoring of vital signs and repeated clinical examinations is important as management by conservative management depends on clinical and hemodynamic stability of the patient. Conservatively managed patient with Blunt trauma abdomen should have early and accurate diagnosis, prompt and thoughtful management to improve overall prognosis.

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