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Original Research Article

Clinico epidemiological study of blunt abdominal trauma in a tertiary care hospital in north western Himalayas

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ABSTRACT

Background: Blunt abdominal trauma (BAT), a common form of trauma, is one of the major causes of morbidity and mortality. The study was aimed at the study of spectrum of injuries to various intra-abdominal organs after blunt trauma and to ascertain cause/mode of BAT in a hospital of hilly locality of Shimla.
Methods: A prospective study was designed to conduct in the department of Surgery, IGMC, Shimla, India during the period of one year from 1st June 2005 to 31st May 2006. A total of 30 patients who had sustained BAT with or without other associated injuries were selected. In all patient's history was taken and detailed physical examination done while concomitant resuscitation was performed. Chest and abdominal radiographs were done in all patients.
Results: BAT is a major cause of morbidity and mortality especially in young people in the 11-40 years' age group. Males are affected more than females. Road traffic accidents are the predominant mode of injury however, a relatively high incidence of blunt abdominal trauma due to falls is observed in a hilly state like ours. Spleen and liver are the two commonly injured organs after blunt abdominal trauma.
Conclusions: Proper early diagnosis with initial and adequate resuscitation is beneficial in having a good outcome in patients of BAT.

Keywords: AAST, Blunt abdominal trauma, Organ injury scale

INTRODUCTION

Blunt abdominal trauma (BAT), the third most common form of trauma worldwide, is a major cause of morbidity and mortality.[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 intra-abdominal 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]

In the state of Himachal Pradesh, the predominantly hilly terrain and the activities of some of the inhabitants of the state like sheep rearing, tree felling, quarrying, render these people more vulnerable to accidents like falls from cliffs, trees, animal assaults etc. resulting in BAT. The wide network of roads and subsequently increased fast vehicular traffic has also increased the incidence of BAT due to vehicular accidents.

Keeping all this in view, this study was conducted on the spectrum and mode of injuries after BAT in Indira Gandhi Medical College, Shimla, Himachal Pradesh, India. The study was aimed at the study of spectrum of injuries to various intra-abdominal organs after blunt trauma and to ascertain cause/mode of BAT.

METHODS

A prospective study was designed to conduct in the department of Surgery, IGMC, Shimla, India during the period of one year from 1st June 2005 to 31st May 2006. A total of 30 patients who had sustained BAT with or without other associated injuries were selected.

In all cases, an appropriate primary survey of the patients was done and resuscitation initiated. A detailed history, especially history with particular reference to mode of injury was taken with information provided by the patient, relatives of the patient and witnesses of accidents. Detailed history included time elapsed since injury, presenting symptoms especially abdominal and history of allergies, medications, past medical history, last meal or oral intake and events leading to presentation. Resuscitation was continued concomitantly while a detailed physical examination was done for identification of all injuries.

Detailed physical examination was the mainstay to identify patients who required urgent laparotomy from those who could be observed safely, investigated to clinch a diagnosis and plan further management. Detailed physical examination included primary survey (general condition of the patient, pulse rate, blood pressure, respiration, hydration, pallor/cyanosis) and systemic examination.

Conventional radiology (chest x-ray, abdominal x-rays erect/decubitus) and supine along with emergency investigations such as haemoglobin (Hb) total leukocyte count (TLC), random blood sugar (RBS) blood urea, serum creatinine, blood grouping and cross match, electrocardiogram (ECG) were done.

Patients whose examination revealed signs of overt peritonitis with uncontrolled shock not attributable to other extra-abdominal injury/injuries (PR >100/min, BP <90 mmHg on fluid challenge /resuscitation) were urgently taken up for exploratory laparotomy.

Patients who had sustained BAT with pneumoperitoneum on CXR/AXR erect/decubitus, suggestive of hollow viscus injury were also subjected to exploratory laparotomy. In all other patients of BAT with suspected injuries to intra-abdominal viscera, focused abdominal sonography in trauma (FAST-ultrasound imaging Morrison's Pouch, pouch of Douglas, perisplenic and pericardium for free fluid) was done. Haemodynamically unstable patients with positive FAST examination and no clinical features of peritonitis were also taken up for surgery. CT abdomen and pelvis (plain as well as contrast) was done in haemodynamically stable patients with positive FAST examination or in patients in whom FAST examination was negative or indeterminate but suspicion of injury to intra-abdominal viscera was present. On CT abdomen and pelvis 10 mm sections were taken from the top of diaphragm to pubic symphysis after administration of oral and intravenous contrast. Injuries reported on CT were taken into consideration while planning further management. Haemodynamically stable patients with solid visceral injuries were considered for non-operative treatment provided they did not have concomitant intra or extra-abdominal injury requiring surgery. If during course of non-operative treatment, they developed haemodynamic instability then they were considered for laparotomy.

All the injuries to intra-abdominal viscera reported on CT or seen on laparotomy were graded on organ injury scale (OIS) of the American Association for the Surgery of Trauma (AAST). Injuries to spleen and liver were graded as per 1994 revision of OIS of AAST for spleen and liver. Injuries to stomach, duodenum, small bowel and colon were graded as per OIS-II of AAST while injuries to urinary tract (kidneys, bladder) were graded as per OIS-I

and OIS-III of AAST.6 Injuries to mesentry and retroperitoneal haematomas do not have any grades in the Organ Injury Scale (OIS) of AAST, so they could not be graded.

RESULTS

The study was conducted on 30 patients of BAT admitted in surgical wards of Indira Gandhi Medical College, Shimla from 1st June 2005 to 31st May 2006.

Table 1: Demographic characteristics (n = 30).

Characteristics	No. of patients (%)
Age groups (in years)	
0-10	2 (6.67%)
11-20	8 (26.67%)
21-30	11 (36.67%)
31-40	3 (10.00%)
41-50	4 (13.33%)
51-60	2 (6.67%)
Sex	
Male	26 (86.67%)
Female	4 (13.33%)
Mode of injury	
RTA (n = 14)	
Vehicles rolled off road	6 (20%)
Head-on collisions	2 (6.67%)
Auto-pedestrian accidents	2 (6.67%)
Overturning of vehicles	1 (3.33%)
Motor cycle accidents	3 (10%)
Falls	13 (43.33%)
Blows	2 (6.67%)
Animal hits	1 (3.33%)

The demographic characteristics of the studied patients are tabulated in Table 1. Out of 30 patients, the age of patients ranged from 8-58 years with the mean age of 27.23 years. 24 patients were under 40 years of age with 19 (63.33%) belonging to 11-30 years age group. 26 (86.67%) were males and 4 (13.33%) were females. In this study, RTA accounted for 14 (46.67%) patients of BAT. 13 (43.33%) patients were injured by falls.

Table 2: Distribution of patients according to their common clinical complaints (n = 30).

Complaints	No. of patients (%)
Pain abdomen	28 (93.33%)
Vomiting	5 (16.67%)
Distension abdomen	14 (46.67%)
Constipation	4 (13.33%)
Retention of urine	3 (10%)

Pain abdomen was present in 28 (93.33%) patients followed by abdominal distension, vomiting constipation and retention of urine. In 2 (6.67%) patients with head injuries no abdominal, complaints were present (Table 2).

Table 3: Clinical signs of the patients (n = 30).

Clinical signs	No. of patients (%)
Pallor	17 (56.67%)
Tachycardia (PR >100)	16 (53.33%)
Hypotension (BP<90)	9 (30.00%)
Tenderness/guarding	28 (93.33%)
Rigidity	15 (50%)
Rebound tenderness	7 (23.33%)
Absent bowel sounds	6 (20%)
Bruise abdominal wall	8 (26.67%)
Obliterated liver dullness	5 (16.67%)
Shifting dullness	2 (6.67%)
Unreliable examination	2 (6.67%)

The reports of clinical signs of the patients on clinical examination are presented in Table 3. Pallor was present in 17 (56.67%) patients, 16 (53.33%) patients had tachycardia (pulse rate >100/min) and 9 (30%) patients had hypotension (BP <90mm of Hg). In 2 (6.67%) patients with associated head injuries the physical examination was unreliable.

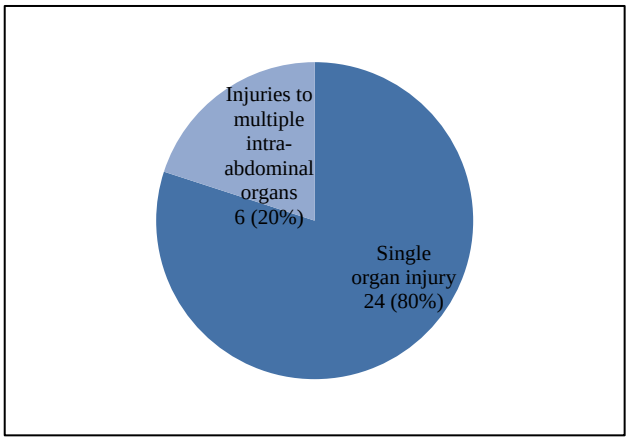

Figure 1: Pattern of injuries to intra-abdominal organs (n = 30).

The patterns of injuries to intra-abdominal organs were shown in Figure 1. 24 (80%) patients were injured single intra-abdominal organs while injuries to multiple intra-abdominal organs were present in 6 (20%) patients.

Table 4: Relation of organs injured to mode of injury (n = 30).

Mode of injury	Single organ injuries	Multiple organ injuries
RTA	10	4
Falls	11	2
Blows	2	-
Animal hits	1	-

Out of 6 patients with multiple organ injury, 4 (66.67%) patients were injured by road traffic accidents while in 2 (33.37%) patients the mode of injury was falls. In the 24

patients with single intra-abdominal injuries, fall was the highest mode of injury i.e., 11 (45.83%) patients followed by road traffic accidents in 10 (41.67%) patients. Only 1 (4.16%) patient was injured by animal hits (Table 4).

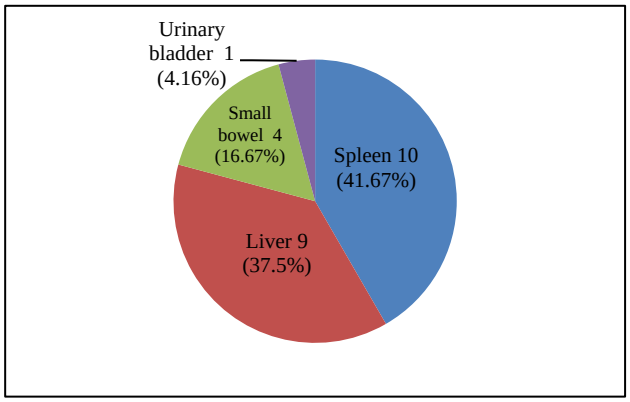

Figure 2: Pattern of organs injured in patients with injuries to single intra-abdominal organs (n = 24).

In patients with injury to single intra-abdominal organ, spleen was found to be injured in 10 (41.67%) patients, liver in 9 (37.5%) patients, small bowel was found to be injured in 4 (16.67%) and urinary bladder in 1 (4.16%) patient (Figure 2).

Table 5: Relation of organs injured to mode of injury in patients with single organ injury (n = 24).

Mode of injury	Organ injured			
	Spleen	Liver	Small bowel	Urinary bladder
RTA	7	2	1	-
Falls	3	6	1	1
Blows	-	1	1	-
Animal hits	-	-	1	-

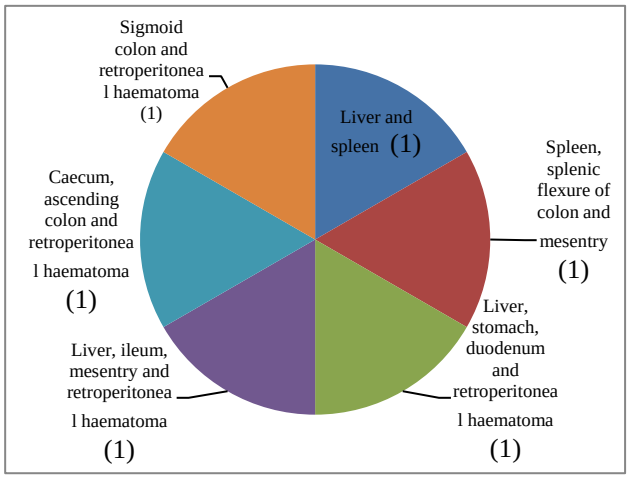

Figure 3: Pattern of organs injured in patients with injuries to multiple intra-abdominal organs (n = 6).

In patients with single intra-abdominal organ injuries, spleen was the commonly injured organ in road traffic accidents while falls resulted in most injuries to liver (Table 5).

Pattern of organs injured in patients with injuries to multiple intra-abdominal organs is presented in figure 3. Liver was the injured organ in 3 (50%) patients with injuries to multiple organ while spleen was injured in 2 (33.33%) patients with injuries to multiple intra-abdominal. Retroperitoneal haematomas was present in 3 (50%) patients.

Table 6: Relation of organs injured to mode of injury in patients with injuries to multiple intra-abdominal organs (n = 6).

Mode of injury	Organ injured			
	RTA	Falls	Blows	Animal hits
Liver and spleen	-	1	-	-
Spleen, splenic flexure of colon and retroperitoneal haematoma	1	-	-	-
Liver, ileum, mesentry and retroperitoneal haematoma	1	-	-	-
Caecum, ascending colon and retroperitoneal haematoma	1	-	-	-
Sigmoid colon and retroperitoneal haematoma	-	1	-	-
Liver, stomach, duodenum and retroperitoneal haematoma	1	-	-	-

Road traffic accidents accounted for 4 (66.67%) patients with multiple intra-abdominal organ injuries. In 1 patient spleen, splenic flexure of colon and mesentry were found to be injured, in the second patient injuries to liver, ileum, mesentry and retroperitoneal haematoma were present. The third patient had perforation of the caecum and ascending colon along with retroperitoneal haematoma while in the 4th patient injuries to liver, stomach, duodenum and retroperitoneal haematoma were present. In the 2 (33.33%) patients with multiple intra-abdominal organ injuries due to falls, 1 had concomitant liver and spleen injuries while the other had perforation of sigmoid colon along with retroperitoneal haematoma (Table 6).

Table 7: Grading of injuries to intra-abdominal organs (n = 30).

Organ	Grades				
	I	II	III	IV	V
Spleen (n = 12)	1	4	3	4	-
Liver (n = 12)	-	3	5	3	1
Small bowel (n = 5)	-	3	1	-	1
Colon (n = 3)	-	-	2	-	1
Stomach (n = 1)	1	-	-	-	-
Duodenum (n = 1)	1	-	-	-	-
Urinary bladder (n = 1)	-	1	-	-	-
Retroperitoneal haematoma (n = 3)	-	-	-	-	-
Mesentry (n = 2)	-	-	-	-	-

Grading of injuries to intra-abdominal organs are documented in Table 7. Out of 12 patients of splenic injury, there were 4 patients of grade II and grade IV injuries respectively while there were 3 patients of grade III injuries and 1 patients of grade I injury. Out of the 12 patients of liver trauma, grade III injuries were the most common, reported in 5 patients while there were 3 patients of grade 4 and 2 patients of grade II injuries. Grade V injury was found in 1 patient. Retroperitoneal haematomas and mesenteric injuries couldn't be graded as there is no grade for these injuries in the OIS of AAST.

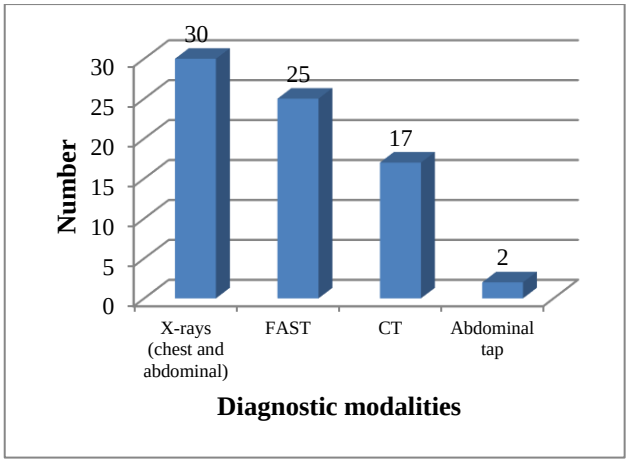

Figure 4: Diagnostic modalities used for diagnosis of BAT (n = 30).

Diagnostic modalities used for diagnosis of BAT are presented in Figure 4. Chest and abdominal X-rays erect/decubitus and supine position were done in all 30 (100%) patients and in 4 (13.33%) patients revealed pneumoperitoneum. In 2 (8%) patients who had features of overt peritonitis but were haemodynamically stable and had FAST negative examination with no evidence of pneumoperitoneum on X-ray, abdominal tap was done and it was bilous. These patients were also subjected to surgery.

Table 8: Patients operated before and after FAST (n = 19).

Patients operated before FAST		Patients operated after FAST		
		Before CT		
Pneumoperitoneum On CXR/AXR	Haemodynamically unstable with overt peritonitis	Haemodynamically unstable, FAST +ve	Haemodynamically stable with overt peritonitis, FAST -ve, abdominal tap +ve	After CT
4	1	6	2	6

Four patients were subjected to exploratory laparotomy after the chest and abdominal X-rays revealed pneumoperitoneum. One patient of overt peritonitis with shock but no pneumoperitoneum on X-ray was also subjected to exploratory laparotomy. Rest of the 25 patients was subjected to FAST and in 18 of these, FAST examination was positive while 7 had negative FAST examination. Of the FAST-positive patients, 6 were haemodynamically unstable and were subsequently subjected to exploratory laparotomy.

In 2 patients with clinical features of overt peritonitis but negative FAST examination and no pneumoperitoneum on X-ray, abdominal tap was done and the aspirate was bilous. These patients were also operated upon. The remaining 17 patients who underwent FAST and were haemodynamically stable were subjected to CT abdomen and pelvis. On the basis of reported CT findings and the deterioration in the haemodynamic status, 6 of these 17 patients were subsequently explored. These included 2 patients of grade III, 1 patient of grade IV splenic injuries, 1 patient of grade III and 1 patient of grade IV hepatic injuries with haemoperitoneum. One patient of both spleen (grade IV) and liver (grade II) injuries with haemoperitoneum were also operated upon (Table 8).

Out of the 30 patients with BAT in our study, 19 (63.33%) were managed operatively while 11(36.67%) were managed non-operatively. Of the 24 patients of single intra-abdominal organ injuries, 11 patients were managed non-operatively. Injuries to solid intra-abdominal viscera were present in 10 of the 11 patients managed non-operatively while 1 was a patient of extraperitoneal rupture of urinary bladder. All 6 patients

with multiple intra-abdominal and 13 patients with single intra-abdominal organ injuries were managed operatively (Table 9).

Figure 5 shows operative procedures in those 19 patients among that splenectomy and hepatorrhaphy were performed in 6 patients each. Resection anastomosis of colon was done in 1 patient while resection of colon with ileostomy/sigmoid colostomy was done in 1 patient each. Figure 6 depicts fracture ribs was the associated extra abdominal injury in 8 (26.67%) patients out of patients with BAT followed by fracture of long bones was present in 5(16.67%) patients while fracture pelvis was present in 4 (13.33%) patients and there were 2 (6.67%) patients each of head and spine injuries.

In this study, fracture ribs were present in 6 patients of splenic trauma while only 3 patients of hepatic trauma had fracture ribs. One of these patients of fracture ribs had both liver and splenic injury. Fracture pelvis was the associated extra-abdominal injury in 4 patients, 2 of these patients had isolated injury to the spleen and urinary bladder respectively while 2 patients had injuries to multiple intra-abdominal organs (Table 10).

Table 9: Management of injuries (n = 30).

Organ injured	Management	
	Operative	Non-operative
Single intra-abdominal organ injury	13	11
Multiple intra-abdominal organ injuries	6	-

Table 10: Relation of extra-abdominal injuries to intra-abdominal organs injured (n = 15).

Extra abdominal injuries	Intra-abdominal organ injured								
	Spleen	Liver	Small bowel	Colon	Stomach	Duodenum	Urinary bladder	Mesentry	RPH
Fracture ribs (n = 8)	6	3	-	1	1	1	-	1	1
Fracture pelvis (n = 4)	3	2	-	1	-	-	1	1	-
Fracture long bones (n = 5)	1	4	1	-	1	1	-	1	2
Head injury (n = 2)	1	-	-	-	-	-	1	-	-
Spine injury (n = 2)	1	-	-	1	-	-	-	-	-
Miscellaneous (n = 1)	-	-	-	1	-	-	-	-	-

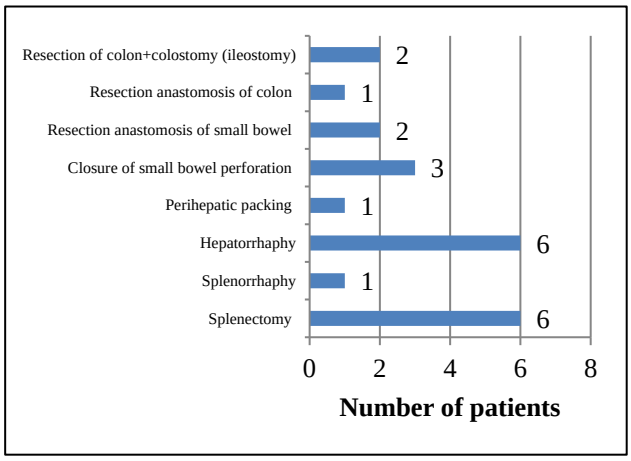

Figure 5: Operative procedures done (n = 19).

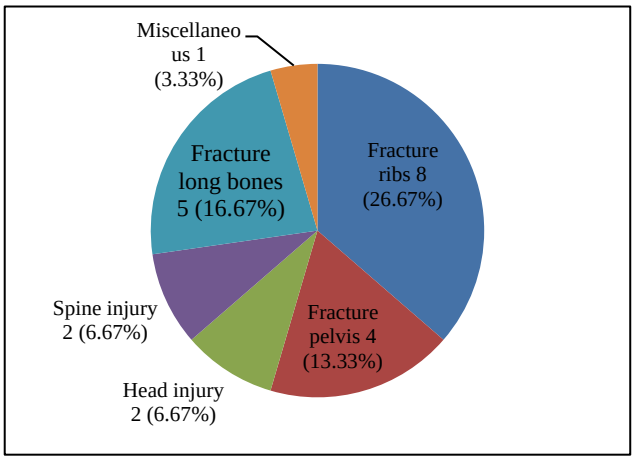

Figure 6: Associated extra-abdominal injuries (n = 30).

Table 11: Mortality (n = 30).

Management	No. of patients	Mortality
Operative	19	3
Non-operative	11	1

The mortality rate in this study was 13.33% i.e. 4 out of 30 which is presented in Table 11. In the patients managed operatively the mortality was 3 (15.79%). Among those 3 patients, 1 had grade V liver injury while the 2nd patient was known patient of diabetes mellitus with multiple intra-abdominal injuries (grade II liver injury, grade V injury of ileum, laceration of mesentry and retroperitoneal haematoma). The 3rd patient who died post operatively was a 2 days old patient of perforation of sigmoid colon (grade III) with generalized peritonitis with retroperitoneal haematoma. In the 11 patients managed non-operatively, the mortality was 1 (9.09%). This patient was also a known patient of diabetes mellitus being managed conservatively for grade II splenic injury. The patient had associated head injury which caused his death.

DISCUSSION

A prospective study of 30 cases of BAT was conducted in the department of Surgery, IGMC, Shimla, Himachal Pradesh, India during the period of one year from 1st June 2005 to 31st May 2006.

In the study of 30 patients with BAT 24 (80%) patients were under 40 years of age with the mean age of 27.23 years. The most common age group involved was 21-30 years with 11 (36.67%) patients belonging to this age group. Davis et al in their study also observed that 79% of patients with BAT were under 40 years of age.7 Cox EF observed in his study that the mean age of the 870 patients of BAT included in the study was 29.76 yrs.8 The observations in this study are comparable with the above-mentioned studies and are due to the fact that young people indulge more in outdoor activities. In our study, 26 (86.67%) of the 30 patients were males and only 4 (13.33%) were females with male: female ratio of 6.5:1. Cox EF observed that the ratio of male to female patients in his study of 870 patients of BAT was 2.7:1.8 Davis et al in their study found that 70% of patients with BAT were males and only 30% were females.[7]

The most common mode of injury in our study was road traffic accidents with 14 (46.67%) cases. The second most common mode of injury in our study was fall with 13 (43.33%) patients. Boulanger BG et al reported road traffic accident as the mode of injury in 65.7% patients with BAT while falls accounted for 7.8% patients.[9] Cox EF et al also observed that 89.5% patients with BAT had sustained injury because of road traffic accidents.[8] The hilly terrain in Himachal Pradesh, with its treacherous pathways which make the inhabitants susceptible to falls and falls from trees especially in villages in the hilly areas was the reason for the relatively high incidence of BAT due to falls in this study.

History and physical examination are an important aspect in the diagnosis of patients of BAT with intra-abdominal injuries. Common presenting features of intra-abdominal injuries are abdominal pain, tenderness, guarding and distension. In our study abdominal pain, tenderness and guarding were present in 93.33% cases while in 6.7% cases the examination was unreliable because of associated head injuries. Distension abdomen was present in 46.67% cases in this study. Davis et al reported in their study that the physical findings most often associated with internal injury were abdominal tenderness and guarding, present in 75% of cases while distension abdomen was present in 28% cases.[7] Mohapatra et al reported pain abdomen in 77.8% cases. Abdominal tenderness and guarding was present in 70.8% cases while distension abdomen was present in 25% cases in their study.[10] These observations are comparable to our study.

Patients with BAT may have injuries to one or multiple intra-abdominal organs. In our study, 6 (20%) patients had multiple intra-abdominal injuries while 24 (80%) patients had isolated single intra-abdominal organ injuries. Spleen and liver were the two most commonly injured organs with 12 (40%) cases each. Isolated splenic injuries were present in 10 (33.33%) cases while isolated hepatic injuries were present in 9 (30%) cases while 3 patients with hepatic injuries had injuries to other intra-abdominal organs. Small bowel was the most commonly injured hollow viscus 5 (16.67%) in this study. Similar reports were given in the studies of Davis et al and Cox EF.[7,8] 15 (50%) of the 30 patients had associated extra-abdominal injuries. Fracture ribs were present in 8 (26.67%) patients and in most patients, they were associated with splenic 6 (75%) and liver 3 (37.5%) injuries. Fracture long bones and fracture pelvis were the associated extra-abdominal injuries in 5 and 4 patients respectively. Head injuries and spine injuries were present in 2 patients each.

In the present study, chest and abdominal X-rays (erect/decubitus and supine) were done in all patients with BAT. In 4 (13.33%) patients they revealed pneumoperitoneum while in 8 (26.67%) patients fracture ribs were seen. In 25 patients FAST was done and in 18 (72%) patients FAST was positive and while in 7 (28%) cases FAST was negative. CT abdomen and pelvis was done in 17(68%) of these 25 patients, who were haemodynamically stable. In 12 of these 17 patients FAST was positive while in the remaining 5 patients, CT was done on clinical suspicion of intra-abdominal injury inspite of negative FAST. Four quadrant abdominal tap was done in 2 patients with overt peritonitis who had FAST negative examination and no evidence of pneumoperitoneum on X-ray.

Conventional radiography is an integral part of investigations to rule out intra-abdominal injury especially hollow viscus perforations. Small amounts of intra-peritoneal or retroperitoneal air may be detectable in patients with gastric, duodenal, small bowel or colonic perforations.[11] In North America, algorithms with FAST as screening tool along with selective use of CT and DPL based on FAST results and clinical presentation of the patients have yielded good results.[12] Boulanger et al also reported that FAST based algorithm was more rapid, less expensive and as accurate as an algorithm that employed CT or DPL instead.[13] McKenney et al reported FAST to be highly accurate (97%) in detecting haemoperitoneum after BAT.[14]

Management

In the present study, 19 (63.33%) patients underwent laparotomy for injuries due to BAT while 11 (36.67%) patients were managed non-operatively. The 19 patients who were managed operatively included all cases of hollow viscus and multiple intra-abdominal organ injuries. Patients with solid visceral injuries who were haemodynamically unstable or developed haemodynamic instability during non-operative treatment were also operated upon. These included 2 patients with isolated grade III and 3 patients with isolated grade IV splenic injuries. Two patients with isolated grade III, 1 patient with isolated grade IV and 1 patient with isolated grade V hepatic injuries were also subjected to laparotomy. Non-operative management was done in 10 haemodynamically stable patients with isolated solid organ injuries and 1 patient of extraperitoneal rupture of urinary bladder. The 10 patients with solid organ injuries managed non-operatively included 1 patient with grade I and 4 patients with grade II splenic injuries. One patient with grade II, 2 patients with grade III and 1 patient with grade IV hepatic injuries were also managed non-operatively.

Exploratory laparotomy is the rule for patients with generalized peritonitis, hollow visceral injuries and haemodynamically unstable patients of BAT with associated injuries requiring surgery.[2,11] In patients with solid visceral injuries, options are between non-operative management and surgery. Classic criteria for non-operative management include haemodynamic stability, absence of other clear cut indications for laparotomy or associated injuries requiring surgical intervention, absence of health conditions that carry increased risk of bleeding, grade I-III injuries and patients under 55 years of age.[15] Myers et al reported successful management of solid visceral injuries irrespective of grades, in haemodynamically stable patients of age more than 55 years. 96 So the choice between operative and non-operative treatment should be guided primarily by haemodynamic considerations rather than grades or severity of organ injury. The management of extraperitoneal rupture of urinary bladder is primarily non-operative provided the patient has no other intra-abdominal injuries requiring surgical exploration.[2]

Mortality

In the present study, the mortality was 4 (13.33%). In the 11 patients managed non-operatively, the mortality was 1(9.09%). Similar findings were also reported by Mohapatra S et al (14% mortality) in patients of BAT with solid visceral injuries managed operatively while the mortality in patients who were managed non-operatively was 9%. All the deaths in the patients managed non-operatively were due to associated head injuries.[10]

CONCLUSION

Blunt abdominal trauma is a major cause of morbidity and mortality especially in young people in the 11-40 years' age group. Males are affected more than females. Road traffic accidents are the predominant mode of injury however, a relatively high incidence of blunt abdominal trauma due to falls is observed in a hilly state like Himachal Pradesh. Spleen and liver are the two commonly injured organs after blunt abdominal trauma. Some patients with blunt abdominal trauma have injuries to multiple intra-abdominal organs; however no specific pattern could be defined from the present study. A number of patients have associated extra-abdominal injuries and most cases of fracture ribs are associated with splenic and hepatic trauma. Patients of BAT present with multitude of manifestations ranging from trivial to catastrophic so proper early diagnosis and initial and adequate resuscitation is beneficial in having a good outcome.

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