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### RESEARCH ARTICLE

#### ABDOMINAL TRAUMA - CLINICAL PROFILE AND MANAGEMENT - A PROSPECTIVE STUDY

Dr. Basit Ummer, Dr. Munir Ahmad Wani, Dr. Ajaz Ahmad Malik and Dr. Nasir Ah. Choh

Department of General and Minimal Invasive Surgery, Sher-i-Kashmir Institute of Medical Sciences, Srinagar, Kashmir.

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#### Abstract

**Background:** Blunt abdominal trauma is usually not obvious hence, often missed, unless, repeatedly looked for. Delay in diagnosis and inadequate treatment of the abdominal injuries may prove fatal.

**Objectives:** To study the cases of abdominal trauma with reference to the patients presenting at SKIMS Soura Srinagar both in form of evaluation and management.

**Methods:** After obtaining the proper informed consent patients fulfilling the selection criteria were enrolled in the study. Patients were evaluated starting with all routine baseline investigations like complete blood count, liver function test, kidney function test, ultrasonography Abdomen, FAST after proper history and clinical examination. A proper plan was formulated regarding the management of the patient whether to be managed conservatively or whether any surgical intervention was done. A complete postoperative care and follow up was ensured.

**Results:** Mode of injury includes road traffic accident, fall from height, hit by stone and assault. Presenting symptoms including abdominal pain was seen in 91.4%, abdominal tenderness in 48.6%, rigidity in 25.7%, shock in 21.4% patients while 15.7% presented with vomiting. On FAST 38.6% patients had both organ injury and free fluid. Grade II spleen injury was observed in 28% patients, Grade I in 24% patients, Grade IV in 20% patients, Grade V in 16% patients and Grade III injury in 12% patients. Grade IV liver injury was observed in 28.6% patients, Grade I injury in 23.8% patients, Grade II and Grade V in 19% and Grade III in 9.5% patients. 68.6% were conservatively managed while 31.4% underwent surgery with 2.9% mortality. Majority of patients were conservatively managed. 4 patients encountered postoperative complications like surgical site infection (10.3%) and re-exploration (3.4%).

**Conclusion:** Prompt evaluation of abdomen is mandatory to minimize preventable morbidity and mortality. Early diagnosis can decrease mortality by 50%. Mortality is related to delayed presentation and diagnosis, associated injuries and delayed surgical intervention.

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**Corresponding Author:- Dr. Basit Ummer**

Address:- Postgraduate Scholar, Department of General and Minimal Invasive Surgery, Sher-i-Kashmir Institute of Medical Sciences, Srinagar, Kashmir.

**Introduction:-**

With modernization, industrialization and motorization of the society there is a rapid increase in the incidence of Blunt Abdominal trauma (BAT). It is one of the most common injuries amongst those caused due to road traffic accidents<sup>1</sup>. Spleen and liver are found to be injured in majority of cases of BAT. Other injuries which may be seen include renal injuries, injuries to urinary bladder and urethra, pelvic fractures and vascular injuries. Motor vehicle accidents account for 75 to 80% of blunt abdominal trauma<sup>2</sup>. Blunt injury of abdomen can also occur as a result of fall from height, assault with blunt objects, industrial mishaps, sport injuries, bomb blast and fall from riding bicycle<sup>3</sup>. The factors like altered mental status of the patients makes it necessary that the management should not be based entirely on the basis of clinical examination and rather should be assisted by imaging like FAST (Focused assessment of sonography in trauma) and computed tomography (CT)<sup>4</sup>.

Focused assessment with sonography for trauma or FAST has emerged as a useful tool in the evaluation of blunt injury abdomen. Unavailability or unaffordability of diagnostic modalities mandate opening the abdomen for diagnosis rather than waiting.<sup>5</sup> Concealed hemorrhage is the second most common cause of death after blunt trauma abdomen, and missed abdominal injuries are a frequent cause of morbidity and late mortality in patients who survive the early period after injury. Close vigilance and early institution of proper therapy results in decreased morbidity and mortality<sup>6,7</sup>. 20% of head injured patients have associated abdominal trauma, so that hypotension in this group of patients should arouse a high index of suspicion of unrevealed hemorrhage in the abdominal or thoracic cavities<sup>8</sup>.

The most useful diagnostic procedure for suspected Intra abdominal visceral injury is Diagnostic peritoneal lavage<sup>9</sup> which is replaced by USG (FAST – Focused Assessment with Sonography for Trauma). Fast is used as a screening test for patients with blunt abdominal injury with selective use of CT or DPL based on the FAST results and the patients clinical presentation<sup>10</sup>. Complete FAST Examination consists of Imaging of the 4 P's. 1. Morrison's pouch (Perihepatic) 2. Pouch of Douglas (Pelvic) 3. Peri-splenic 4. Pericardium USG examination included specific organs imaging with results that demonstrated 90% Other useful radiological examinations are the CT scan of the head in neurological trauma, associated with abdominal trauma in a hemodynamically stable patient to establish treatment priorities, arteriography when intravenous pyelogram (IVP) shows no function in one kidney and abdominal aortic injury or visceral artery injury is suspected and in selected pelvic fractures. Abdominal CT scanning, ultrasound, nuclear scans and laparoscopy have also been used to further define the extent of blunt injuries to thoracic and abdominal viscera.

During initial resuscitation and evaluation, an estimate of the severity of injury may be obtained by using one of the trauma scoring systems. These readily identify the patient who has fatal injuries, those most likely to make an uneventful and full recovery<sup>11</sup>. The Glasgow Coma Scale gives an assessment of the level of consciousness, motor and verbal response and when combined with the systolic blood pressure and respiratory rate can be used to generate the Revised Trauma Score. These simple observations, together with consideration of mechanism of injury, environmental factors and the anatomical features of the injury, readily identify the most seriously injured and provide guidelines for triage and management priorities. Other scoring systems such as the Injury Severity Score<sup>12</sup> and the Penetration Abdominal Trauma Index<sup>13</sup> require full assessment of the anatomical disruption caused by injury and are, therefore, not useful in the initial assessment. They do however correlate well with survival and development of complications and so are useful in audit of management.

If the patient is stable, local exploration of the wound can be used to determine if the peritoneal cavity has been entered. Superficial wounds require no further treatment, but of peritoneal penetration is confirmed the patient should undergo USG abdomen, DPL or laparoscopy to confirm the need for laparotomy, depending on the experience of the surgeon, technical availability and supervising management. A policy of exploration of all stab wounds that penetrate the peritoneal cavity is recommended for surgeons with little experience of these injuries. Less than half the patients will have significant intraperitoneal injuries but the negative laparotomy has a low morbidity. Laparoscopy was noted to be extremely useful in determining peritoneal penetration from stabbing and gunshot wounds, and also valuable in the evaluation of the Diaphragm after penetrating injury<sup>14</sup>.

In view of increasing number of vehicles and consequently road traffic accidents, this study has been chosen to study the cases of abdominal trauma with reference to the patients presenting at SKIMS Soura Srinagar both in form of evaluation and management.

**Aims And Objectives:-**

1. To evaluate the impact of blunt abdominal trauma on intraperitoneal organs like liver, spleen and hollow viscera like stomach, small intestine and large intestine.
2. To evaluate various modes of presentation.
3. To evaluate various available investigations for detection of intraperitoneal injuries.
4. To evaluate various modalities of treatment available for solid and hollow organ injuries with aim to reduce the mortality and morbidity.
5. To compare operative and conservative management of abdominal trauma.
6. To evaluate common complications.

**Material And Methods:-**

After obtaining the ethical clearance from the Institutional Ethical Committee the present prospective study was conducted on abdominal trauma patients in the Department of General Surgery, SKIMS Soura Srinagar. After obtaining the proper informed consent patients fulfilling the selection criteria were enrolled in the study. Complete general and systemic examination was done to ensure proper evaluation and assessment of any associated disorders. Patients were evaluated starting with all routine baseline investigations like complete blood count, liver function test, kidney function test, ultrasonography Abdomen, FAST after proper history and clinical examination. A proper plan was formulated regarding the management of the patient whether to be managed conservatively or whether any surgical intervention was done. A complete postoperative care and follow up was ensured.

**Inclusion Criteria**

1. All the patients presenting to surgical emergency SKIMS with abdominal trauma.
2. Signed informed consent was ensured before including a particular patient.
3. Laparotomy: initial or repeat (all patients undergoing an initial or repeat laparotomy for abdominal trauma).

**Exclusion Criteria**

1. Paediatric age group.
2. Patients not giving informed consent.
3. Moribund patients or associated malignancy cases.

**Statistical Analysis:**

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean $\pm$ SD and categorical variables were summarized as frequencies and percentages. Chi-square test was employed to determine the association of most common allergens with different parameters. Graphically the data was presented by bar and pie diagrams. A p-value of less than 0.05 was considered statistically significant. All p-values were two tailed.

**Results:-**

The present study was conducted in the Postgraduate Department of General Surgery, SKIMS Soura Srinagar on 70 patients of blunt abdominal trauma. Patients in the study ranged between 14 to 65 years with a mean age of 30.5 $\pm$ 11.56 years. There were 58 (82.9%) males and 12 (17.1%) females. Mode of injury includes road traffic accident (54.3%), fall from height (37.1%), hit by stone (5.7%) and assault (2.9%). Presenting symptoms including abdominal pain was seen in 91.4%, abdominal tenderness in 48.6%, rigidity in 25.7%, shock in 21.4% patients while 15.7% presented with vomiting. Pulse rate (bpm), systolic blood pressure and respiratory rate was normal in majority of the patients. On FAST 38.6% patients had both organ injury and free fluid. Presence of intra-abdominal injury was observed in 75.7% patients. Spleen was injured in 47.2% patients, 39.6% had liver injured, 9.4% had kidney injury while ileum was injured in 3.8% patients. Grade II spleen injury was observed in 28% patients, Grade I in 24% patients, Grade IV in 20% patients, Grade V in 16% patients and Grade III injury in 12% patients. Grade IV liver injury was observed in 28.6% patients, Grade I injury in 23.8% patients, Grade II and Grade V in 19% and Grade III in 9.5% patients. 68.6% were conservatively managed while 31.4% underwent surgery with 2.9% mortality. Majority of patients were conservatively managed. 4 patients encountered postoperative complications like surgical site infection (10.3%) and re-exploration (3.4%).

**Table 1:-** Various parameters of study patients.

		Number	Percentage
Age in years	≤ 20	17	24.3
	21-30	26	37.1
	31-40	15	21.4
	41-50	8	11.4
	> 50	4	5.7
Gender	Male	58	82.9
	Female	12	17.1
Mode of Trauma	Road traffic accident	38	54.3
	Fall from height	26	37.1
	Hit by stone	4	5.7
	Assault	2	2.9
Clinical symptoms	Abdominal pain	64	91.4
	Abdominal tenderness	34	48.6
	Rigidity	18	25.7
	Shock	15	21.4
	Vomiting	11	15.7
FAST	Only free fluid	30	42.9
	Only organ injury	13	18.6
	Both organ injury and free fluid	27	38.6
Intra abdominal injury	Present	53	75.7
	Absent	17	24.3
Organ involved	Spleen	25	47.2
	Liver	21	39.6
	Kidney	5	9.4
	Ileum	2	3.8
Grade of injury	Grade I	6	24
	Grade II	7	28
	Grade III	3	12
	Grade IV	5	20
	Grade V	4	16
Management	Conservative management	48	68.6
	Operative management	22	31.4

### Discussion:-

In our study, mean age of the study population was 30.5+11.56 years youngest patients being 14 years and the oldest one 65 years of age. Majority of patients 26 (37.1%) were 21-30 years followed by <20 years in 17 (24.3%) years. 15 (21.4%) patients belonged to the age group of 31-40 years, 8 (11.4%) patients were 41-50 years of age while 4 (5.7%) patients aged >50 years. Chalya PL and Mabula JB (2013)<sup>15</sup> conducted a study in which patients age ranged between 9 to 74 years with a median age of 28 years. The peak age incidence was 21-30 years accounting for 46.5% of cases. Joshi AY et al., (2019)<sup>16</sup> did a study with a median age of 25 years. 18 patients out of the total 53 (33.96%) were from the age group of 21-30 years and were the commonest. Half of the patients (54.71%) were from the second and third decade of life. Our study population comprised of 58 (82.9%) males and 12 (17.1%) females with male to female ratio of 4.8:1. Similar male preponderance 81.13% was also seen in the study done by Joshi AY et al., (2019)<sup>16</sup>. Reported male predominance by Ntundu SH et al., (2019)<sup>51</sup> was 84.6%, Sharma DK and Gautam A (2021)<sup>17</sup> in their study had 92% males and 8% females. In a study done by Bansod AN et al., (2018)<sup>18</sup> study population consisted of 87.5% males and 12.5% females. Masau P et al., (2006)<sup>19</sup> studied 80 patients with 92.5% males and 7.5% females. In the present study, road traffic accident was the mode of trauma in majority of patients i.e. 38 (54.3%) patients followed by fall from height in 26 (37.1%) patients, hit by stone in 4 (5.7%) patients while 2 (2.9%) patients were assaulted. Similar results were also observed by Wani MD et al., (2014)<sup>20</sup> in their study road traffic accidents was the most common cause in 41% of affliction followed by fall from heights in 36% patients and physical assault in 12%. Joshi AY et al., (2019)<sup>16</sup> did a study in which road traffic accident was the commonest cause of trauma in 40 (75.47%) patients followed by fall from height in 5 (9.43%) patients and assault and fall from

wall/object in 4 (7.54%) patients each. Clinical symptoms at presentation included abdominal pain in 64 (91.4%) patients, abdominal tenderness in 34 (48.6%) patients, rigidity in 18 (25.7%) patients, shock in 15 (21.4%) patients while 11 (15.7%) came with vomiting in the present study. Sharma DK and Gautam A (2021)<sup>17</sup> conducted a study in which pain abdomen was the most common chief complaint in 93.3% (n=70) followed by abdominal distension in 58.7% (n=44) of patients and vomiting in 36% (n=27). Bansod AN et al., (2018)<sup>18</sup> conducted a study on 138 patients in which presenting symptoms including localised tenderness was found in 38 out of 48 patients accounting for 79.17%. Guarding was present in 13 (28.08%) patients and distension of abdomen in 2 (4.17%) patients.

In our study, majority of the patients i.e. 40 (57.1%) had normal pulse (bpm), tachycardia was seen in 27 (38.6%) patients while bradycardia was observed in only 3 (4.3%) patients. Normal systolic blood pressure (mmHg) was observed in 51 (72.9%) patients, 15 (21.4%) patients had hypotension while hypertension was observed in 4 (5.7%) patients. Respiratory rate (breaths/min) was normal in 52 (74.3%) patients while tachypnea was observed in 17 (24.3%) patients while bradypnea was found in 1 (1.4%). Comparable results were also observed by Wani MD et al., (2014)<sup>20</sup> in their study. Number of patients with normal pulse rate were 106 in their study, tachycardia was seen in 84 while 10 had bradycardia. Normal blood pressure was seen in majority of the patients in their study (n=139), 15 had hypertension and 46 had hypotension. Body temperature was normal in 161 patients, hyperthermia in 32 and hypothermia in 7 patients. Majority of their patients had normal respiratory rates (n=142) followed by tachypnea in 56 patients with low respiratory rate (bradypnea) in 2 patients. Focused assessment by sonography for trauma (FAST) was done in all the 70 patients in the present study. 30 (42.9%) patients were found to have only free fluid on FAST, 13 (18.6%) had only organ injury. There were 27 (38.6%) patients who were diagnosed with both organ injury and free fluid on FAST. In a study done by Wani MD et al., (2014)<sup>20</sup> focused Assessment by Sonography for Trauma (FAST) was done in 197 patients, just after resuscitation in which free intraperitoneal fluid was picked in 29.44% cases, organ injury without free fluid in peritoneal cavity was observed in 14.2% cases and both organ injury and free fluid was observed in 23.8% of cases. On imaging, presence of intra abdominal injury was observed in 53 (75.7%) patients in our study. Wani MD et al., (2014)<sup>20</sup> conducted a study on 200 patients admitted with suspicion of Blunt Abdominal Trauma only 89 patients (44.5%) had intra-abdominal injury present. Mareedu AK (2018)<sup>21</sup> did a study on 40 patients in which intra-abdominal injury was present in 80% patients. Out of 70 patients studied in the present study, organ involvement was found in 53 patients including 25 (47.2%) patients with spleen involvement, 21 (39.6%) patients with liver involvement, 5 (9.4%) patients with kidney involvement and 2 (3.8%) patients with ileum involvement. Joshi AY et al., (2019)<sup>16</sup> conducted a study in which organs involved were small bowel (19), Liver (18) and Spleen (9) as the commonest organs which suffered injury in case of blunt abdominal trauma. Sisodiya S and Malpani P (2020)<sup>22</sup> conducted a hospital based retrospective study of 90 cases of blunt abdominal trauma. Most common solid organ injured in their study was liver in 39 (43.3%) cases followed by spleen in 26 (29%) cases. Sona K et al., (2020)<sup>23</sup> conducted a study on 60 patients in which most common organ injuries were Spleen in 45% and liver in 28.3%. In a study by Vashistha R et al., (2015)<sup>24</sup>, small intestine was the commonest viscera (19 out of 53) to be injured. The second commonest was liver (18 out of 53). Spleen (9 out of 53) was found to be third in the order of frequency in our study contrary to many other studies in which spleen was found to be the most commonly injured organ. Liver injury was common than spleen in the study of 63 patients by Gupta S et al., (1996)<sup>25</sup>, Deodhar SD et al. (1983)<sup>26</sup> also have reported a greater incidence of liver injuries as compared to spleen. In this study, Grade II spleen injury was observed in 7 (28%) patients, Grade I in 6 (24%) patients, Grade IV in 5 (20%) patients, Grade V in 4 (16%) patients and Grade III injury in 3 (12%) patients. Grade IV liver injury was observed in 6 (28.6%) patients, Grade I injury in 5 (23.8%) patients, Grade II and Grade V in 4 (19%) and Grade III in 2 (9.5%) patients. Consistent results were also observed by Wani MD et al., (2014)<sup>20</sup> in their study. Injury grading was grade III in 17 patients, grade II in 14 patients, grade IV in 10 patients and grade I in 8 patients.

In our study, 48 (68.6%) were conservatively management while 22 (31.4%) underwent surgery with 2 mortalities. Joshi AY et al., (2019)<sup>16</sup> conducted a study in which 53 patients were enrolled of which 9 could not be saved, inspite of all the efforts. Out of the remaining 44 patients, 21 patients were managed conservatively and discharged in a satisfactory condition. Bansod AN et al., (2018)<sup>18</sup> in their study managed 83.33% patients were managed non-operatively while conservative management failed in 15.67% and had to undergo surgery. 61% cases were managed non-operatively or conservatively and 32% had to undergo operative intervention in a study by Sisodiya S and Malpani P (2020)<sup>22</sup>. Wani MD et al., (2014)<sup>20</sup> did a study on 200 patients of which 55.5% were managed conservatively while others underwent surgery. Out of 25 patients with spleen injuries in our study, 16 (30.2%) were managed conservatively while splenectomy was done in 9 (17%). 11 (20.8%) were conservatively managed, surgical packing was done in 7 (13.2%) and repair in 3 (5.7%) patients with liver injuries. 4 (7.5%) of the kidney injury patients were management non-operatively and 1 (1.9%) underwent partial nephrectomy. Primary repair and

resection and anastomosis were the management applied in 1 (1.9%) each patients of injuries ileum. Wani MD et al., (2014)<sup>20</sup> did a study in which 26 patients had spleen injuries, liver was injured in 19 patients and kidneys got injured in 6 patients. Of the 26 spleen injuries, 84.6% patients underwent splenectomy while 15.4% patients were managed conservatively. Liver injuries were managed non-operatively in 31.57%, repair was done in 41.11%, augmented repair was done in 10.53% while resection and selective hepatic artery ligation was done in 5.26% patients. Conservative managed was applied in 66.66% of kidney injury patients while repair was done in 16.67% patients. In a study done by Agrawal C et al., (2020)<sup>27</sup> on 50 blunt abdominal trauma patients, conservative management was done in more than half of patients (64%). With respect to operative management, Bowel perforation repair was done in more than half of patients that were operated (55.55%) followed by Splenectomy (27.77%) and Peri hepatic packing for liver trauma (16.66%). Anarase S and Anarase YS (2019)<sup>28</sup> showed that the commonest procedure done was Splenectomy (34.8%).

In the present study, postoperative complications were seen in 4 patients including surgical site infection in 3 (10.3%) and re-exploration in 1 (3.4%) patients with 2.29% mortality. Wani MD et al., (2014)<sup>20</sup> did a study in which re-exploration was done in only one patient (1.45%). It was for postoperative complication of enterocutaneous fistula with 3% mortality (2.5% in operative related and 0.5% in non-operative management). Mareedu AK (2018)<sup>21</sup> did a study on 40 patients in which surgical site infection was observed in 17.5% patients, with 10% mortality. Surgical site infection has also been reported as the most common postoperative complication in studies elsewhere<sup>75,76,77</sup>. Four mortalities (5.9%) were recorded and they were all from blunt trauma. One of them was an elderly with chronic liver disease while the rest sustained multiple injuries (Olaogun JG et al., 2018)<sup>29</sup>.

### Conclusion:-

Early recognition of the diagnosis, aggressive resuscitation and early institution of surgical management is of paramount importance if morbidity and mortality associated with abdominal trauma are to be minimized. Urgent preventive measures targeting at reducing the occurrence of RTAs is necessary to reduce the incidence of these injuries in this region.

To conclude initial resuscitation measures and correct diagnosis forms the most vital part of blunt abdominal trauma management. Prompt evaluation of abdomen is mandatory to minimize preventable morbidity and mortality. Early diagnosis can decrease mortality by 50%. Mortality is related to delayed presentation and diagnosis, associated injuries and delayed surgical intervention.

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