



An Audit on Abdominal Trauma

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Abstract

Background: *One of the most frequently occurring surgical emergencies is Blunt Abdominal Trauma, and has a strong association with high rates of mortality or morbidity. Being the leading cause of disability it poses a huge burden on the individual and the society, both mentally and financially. Even Though Liver and Spleen are the most commonly affected organs many patients present with polytrauma without distinctive signs and symptoms. Such cases, without, proper equipments, for diagnosis, highly efficient and quick managerial techniques could even lead to fatal results.*

Materials and Methods: *A descriptive longitudinal study was carried out on three hundred and fifty one patients who presented to the hospital .with signs of trauma. The patients were studied over six months. This study aims at assessing various presentations in cases of abdominal trauma and management systems that can control these situations.*

Results: *With a high segment of as much as 32 percent, accelerating injuries was found to be the most prominent mechanism of injury. Liver was the most commonly injured organ followed by spleen. Injuries to the genitourinary system, small and large bowel as well as bony injuries were also frequently present.*

Keywords: *solid organ trauma, road traffic injuries, abdominal trauma, accelerating, injuries management.*

Introduction

Ranked fourth among the leading causes of death, Road traffic injuries account for approximately 9%

of all the deaths and 16% of all disabilities in the world. With a mortality rate of 8% abdominal trauma accounts for 13% of all injuries⁽¹⁾.

The spleen is the most commonly injured abdominal organ in the western countries, as 3.2% of all these injured patients and 50.7% of patients with blunt abdominal trauma demonstrate splenic injuries⁽²⁾. The mortality associated with these blunt injuries is 14.9 %⁽²⁾. In hemodynamically stable patients, Computed tomography (CT) reliably diagnoses solid organ injuries and evaluates the retroperitoneum pathologies. Diagnostic peritoneal lavage is a rapidly performed, invasive procedure that is considered 98% sensitive for denoting intraperitoneal bleeding⁽³⁾.

Mechanism, spectrum and outcome of solid organ injury lack adequate details and data. There are no stringent guidelines for operative and conservative management in many countries. Prehospital care, which is a significant step in management remains uncertain. Solid organ injury isolated & in combination has been sparingly described. Also there is significant loss of human and economic resources in the management of trauma. Incidence of abdominal trauma leading to solid organ injury has increased because of increase in number of motor vehicle accidents. Thus factors contributing to injuries need to be identified and care should be taken to optimize them. This study intends to describe the profile of patients with traumatic solid organ injury in a tertiary care hospital and identify the factors affecting outcome in them⁽⁴⁾.

Aims and Objectives

- To elicit mode and impact of blunt & penetrating trauma on solid abdominal viscera.
- To evaluate role of available investigations for management of solid organ injuries.
- To evaluate various modalities of treatment (operative and non-operative) as applicable for solid organ injury.

Materials and Methods

Study Setting: Department of General Surgery in a tertiary care Hospital in India.

Time Line: 6 months were allotted for selection of study subjects and collection of necessary data from them. Each subject was followed up for 6 months. Collected data was analysed and report was prepared during next 2 months.

Definition of Problem: India is declared as Trauma capital of world by WHO in 2009. Trauma is the leading cause of Death in adults <40 in India⁽⁵⁾. Incidence is increasing day by day. Modes of injury is different from West. Very less data is available on spectrum & management on abdominal trauma.

Definition of Population

All patients who presented in the department of surgery with both blunt and penetrating trauma, with solid organ injury, and or in combination with other injuries.

Study Variables

- a) Age
- b) Gender
- c) Time of admission in this hospital
- d) Time of injury
- e) Mode/ Mechanism of injury.
- f) Clinical examination findings
- g) Hemodynamic stability of patients
- h) Findings of straight X-ray abdomen –erect view
- i) Findings of FAST (Focused Assessment Sonography in Trauma)
- j) Finding of CT scan abdomen
- k) Comorbidities- Hypertension, Diabetes mellitus, Bronchial asthma, COPD, Ischemic heart disease
- l) Use of medication
- m) Site of solid organ injury
- n) Grade of organ injury
- o) Other associated organ injury if any
- p) Outcome-mortality, morbidity,

Sample Size: All cases with blunt and penetrating abdominal trauma having solid organ injury proved during laparotomy or radiologically. There were three hundred and fifty one patients in total.

Sample Design: All patients admitted with abdominal trauma [both blunt & penetrating] in department of surgery, and detected as having solid organ injury at laparotomy or radiologically were

included as study subjects. As total enumeration of all cases were done, no sampling technique needs to be adopted.

Study Design: a descriptive longitudinal study.

Study Population: All patients admitted with abdominal injury (penetrating & blunt) in a tertiary care Hospital.

Method of Data Collection

Clinical examination for assessment of hemodynamic stability of patient and injury sustained.

Interview of the patient or respondent (family members or person accompanying the patient) using predesigned proforma.

Review of imaging reports- Straight x ray, FAST, CT scan and bed head tickets.

Radiologic and/or operative intervention to find out the site of injury, for assessment of its grade and to detect associated organ injury, if any.

Parameters to be Studied

- Average age of study subjects.
- Proportion of male and female patient.
- Average gap between time of injury and presentation.
- Proportion of patients with different modes of injury.
- Proportion of patients receiving preadmission care and type of care.
- Proportion of patients with hemodynamic stability/instability.
- Proportion of patients with different imaging findings-straight x ray, FAST, CT scan.
- Proportion of patients with different site of injury.
- Proportion of patients with different grade of injury.
- Proportion of patients with other associated injury.
- Proportion of patients with different comorbidities.
- Average duration of post-operative hospital stay.

- Proportion of patients with different outcome.
- Follow up for morbidity and quality of life issues.

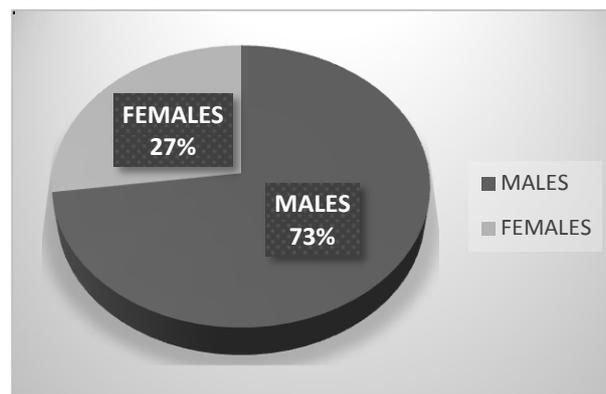
Definition of Outcome: Site and grade of solid organ injury to be correlated with mechanism of injury.

Plan for Analysis of Data: The data was collected and compiled in a Microsoft Excel sheet, and then statistical analysis was done accordingly with suitable statistical software.

Results

During the study period, a total of three hundred and fifty one patients presented to the hospital with signs of abdominal organ injuries.

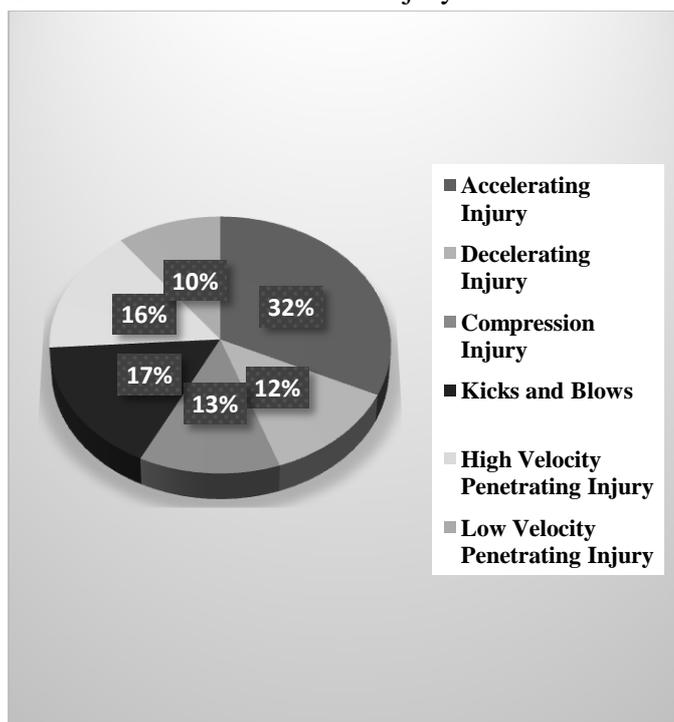
Chart no.1: Sex distribution



As seen in Chart no.1: approximately 73% of the total number of patients affected, were males (257 out of 351). The rest, almost 27% were females.

There were six main mechanisms by which they suffered trauma. These were accelerating injury, decelerating injury, kicks and blows, compression injury, high and low velocity penetrating injuries. Automobile accidents account for majority of cases that presented with accelerating injuries. Other studies have also implicated automobile accidents as the leading cause of Blunt Abdominal Trauma (6),(7).

Chart no.2: Mechanisms of Injury



From chart no.2 : It can be said that overall 32% of the total cases had a history of accelerating injury. On the other hand the least cases (35 out of 351)

were that of low velocity penetrating injury. Each of the other forms contributed to about 12-18 % of cases.

The organ most commonly affected was the liver . Two hundred and fifty four patients out of three hundred and fifty one had signs of liver injury which is almost 26% (chart : 3) . Out of this grade 4 live injury was the commonest finding. The next most common organ affected was the spleen with an incidence of 19%. The highest number of cases (64 out of 184) had signs of grade 2 Splenic trauma ,while only ten out of total patients with splenic trauma (184) had signs of grade 5 injury. Patients also presented with injury to the retroperitoneum (12%), kidney(9%) and genitourinary(7%),small intestine (8%),colon(5%),pancreas and duodenum (4%).Around 10% patients presented with pelvic fracture.

Chart no.3: Distribution of different kinds of abdominal organ injuries

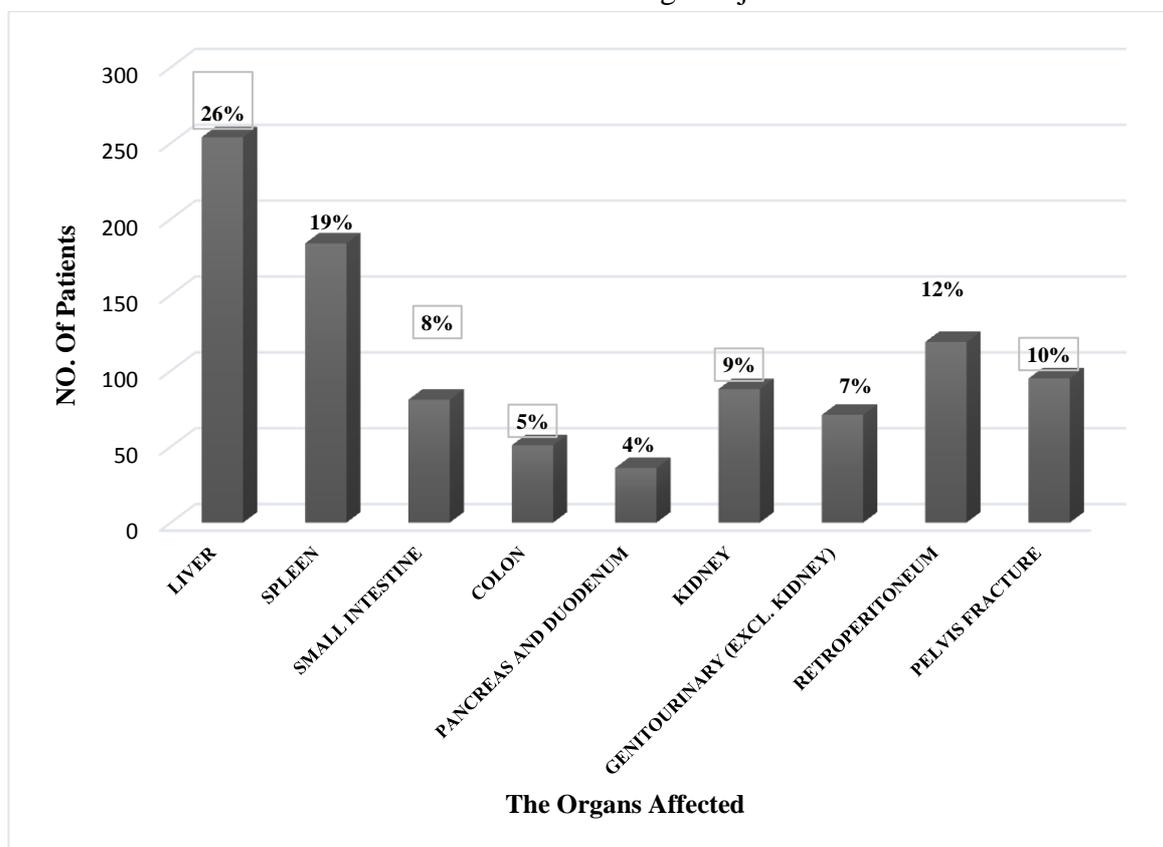


Chart no. 4: relation of each organ affected with various mechanisms of injury

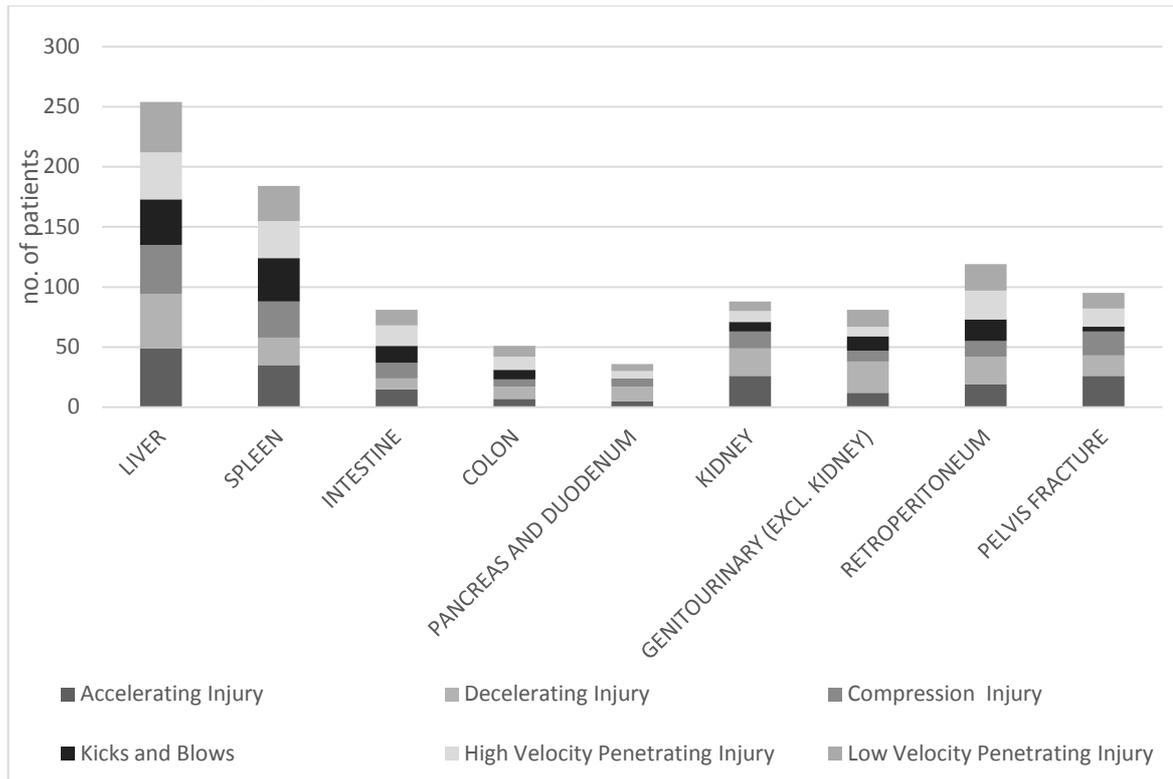


Table 1: Association of various mechanisms of injury with trauma to the Liver and Spleen

MECHANISM OF INJURY	ORGANS AFFECTED									
	LIVER	SPLEEN								
	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5
Accelerating Injury	7	11	14	17	0	6	16	7	3	3
Decelerating Injury	5	10	15	9	6	4	10	6	3	0
Compression Injury	9	6	7	12	7	8	7	8	5	2
Kicks and Blows	9	10	9	5	5	10	11	7	7	1
High Velocity Penetrating Injury	4	5	9	14	7	5	10	8	5	3
Low Velocity Penetrating Injury	11	9	7	9	6	8	10	6	4	1
TOTAL	45	51	61	66	31	41	64	42	27	10
	254	184								

Table 2: Association of various mechanisms of injury with trauma to Intestine, Colon, Pancreas and duodenum, Kidney, Genitourinary, Retroperitoneum and Pelvis Fracture

MECHANISM OF INJURY	ORGANS AFFECTED								
	INTES TINE	COLO N	PANCREAS AND DUODENUM	KIDN EY	GENITOURIN ARY (EXCL. KIDNEY)	RETROPERITONEUM			PELVIS FRACTURE
						ZONE 1	ZONE 2	ZONE 3	
Accelerating Injury	15	7	5	26	12	3	9	7	26
Decelerating Injury	9	10	12	23	16	6	12	5	17
Compression Injury	13	6	7	14	9	7	6	0	20
Kicks and Blows	14	8	0	8	12	8	7	3	4
High Velocity Penetrating Injury	17	11	6	9	8	10	8	6	15
Low Velocity Penetrating Injury	13	9	6	8	14	9	8	5	13
TOTAL	81	51	36	88	71	43	50	26	95

Discussion

Although majority of the patients presented with pain abdomen and vomiting and had generalized abdominal tenderness and guarding, yet 63.5% cases had no visible external abdominal injury and on laparotomy 72.5%, of these patients had definite visceral injury. This emphasizes the importance of careful and continuing observation of patients with Blunt Abdominal Trauma (BAT). It is in this group of patients that abdominal paracentesis may provide accurate and reliable information in the detection of intraperitoneal hemorrhage and visceral disruption. In this study, abdominal paracentesis revealed hemoperitoneum in 40 cases, a finding subsequently confirmed on laparotomy in all such cases. Paracentesis can be performed rapidly without delay and requires no specialized equipment⁽⁸⁾ and many studies have emphasized its use. Associated orthopedic injuries, were encountered frequently. Care of the injuries in any of the systems may take precedence over abdominal trauma. Failure to recognize an extra abdominal injury may contribute to the patient's death when a relatively simple procedure might otherwise have saved the patient's life⁽⁷⁾.

The subtlety with which organ injury can exist along with abdominal trauma is exemplified by the fact that 63.5% patients who did not have any visible external sign of internal injury were explored and 72.5% of these had an injury which required repair. Proper management of these patients requires careful initial evaluation followed by a period of observation⁽⁹⁾. Diagnostic procedures should be limited to those examinations that have proven effective in BAT and should not delay laparotomy in an unstable patient. One should not jeopardize the care of a seriously injured patient by obtaining examinations of low yield. Utilization of this time to initiate resuscitative measures and to prepare for abdominal exploration is of much greater benefit to the patient⁽¹⁰⁾. In this study, Liver was found to be the organ most frequently injured. This is contrary to the study by Davies et al where spleen was found to be injured most frequently.

In a study it was discovered that, in approximately 70 % cases of traffic accidents, blunt liver injuries occur⁽¹¹⁾. In the case of polytraumatized patients with open or blunt abdominal trauma, the liver is the most frequently injured abdominal organ. Thirty-one percent of polytrauma patients have abdominal injuries, and lesions to the liver are found in 16 % of patients⁽³⁾. The main cause of liver injury-related death is uncontrolled bleeding, and it is associated with a mortality rate of 54 %⁽¹²⁾.

But in this study complications like sub phrenic abscess developed in only 1 case and there were 2 deaths, mostly related to poor pre-operative general condition of the patient. This indicates that timely surgical intervention may be of great help in dealing with a traumatized liver. The 6 patients of splenic injury in his study recovered uneventfully. Kidney and urinary bladder injuries were frequently associated with pelvic fractures and retroperitoneal bleeding⁽⁷⁾ patients of renal injury died which was attributable to associated severe crush injury and retroperitoneal hemorrhage. Nephrectomy was done in 1 case of extensive renal laceration and the patient recovered uneventfully, otherwise renal injuries were treated conservatively. In patients with urinary bladder injury, laparotomy followed by pair of the bladder was carried out and the patients recovered uneventfully. Majority of the patients of stomach, small and large gut injuries were treated with suture repair but in 1 case, resection of the injured bowel was carried out, death occurred in 2 patients of ileal injury due to shock. Only 2 duodenal injuries were recognized and the patients recovered uneventfully after undergoing debridement, primary repair and drainage. Post operative complications like wound sepsis, sub phrenic abscess, shock were encountered in only 5 cases. Mortality was seen in 7 cases. Majority of the deaths were related to associated injuries such as head injury, multiple fractures and poor pre-operative general condition such as shock, tachycardia and associated medical diseases. The figure can be reduced by early diagnosis, adequate patient resuscitation and early surgical intervention . Most of the patients presented to us in less than 24

hours (76.92%) of time gap. Most common operative procedure undergone was splenectomy(69%).

Most common operative procedure undergone was splenectomy (69%). NOM of blunt abdominal injuries is well established and strategies based on hemodynamic stability and CT scan findings are now being widely used in the treatment of solid organ injuries including liver, spleen, kidneys, pancreas and pelvic injuries⁽¹³⁾. In BAT including severe solid organ injuries, selective NOM has been the standard of care⁽¹⁴⁾. Appropriate NOM of injured children reduces the risks of blood transfusion and length of hospital stay compared with the surgical group⁽¹⁵⁾. If the decision has been made to observe the patient by NOM, the patient should be admitted to higher level of care for at least 48-72 hours with close monitoring on vital signs, hematocrit and repeated clinical examination. Imaging is essential in early decision making. Few centers have interventional radiologists available round the clock. Focused Assessment with Sonography in Trauma (FAST) examination of pericardial, perihepatic, peri splenic and pelvic areas help in early detection of clinically significant abdominal injury⁽¹⁶⁾. FAST examination can be performed repeatedly and is an excellent adjuvant to physical examination in NOM. A trial revealed that a FAST-based algorithm for BAT was more rapid, less expensive and as accurate as an algorithm that employed CT or diagnostic peritoneal lavage (DPL)⁽¹⁶⁾. Computed tomography (CT) can provide reliable information on hemoperitoneum, extent of solid organ injuries, retroperitoneal organ injuries, most cases of hollow viscus perforation and ongoing bleeding by means of radiographic blush⁽¹³⁾. Though hepato-splenic injuries still remain the most common solid organ injuries in BAT, liberal use of high resolution imaging techniques such as CT scan revealed that the liver is the commonest solid organ injured and not the spleen as popularly believed. In the modern setup, the worldwide laparotomy rate for BAT is only about 20%⁽¹⁷⁾. Deceleration and compression injuries cause an energy transfer from the impact which

causes damage to the solid organ and thus intraperitoneal bleeding, these mechanisms cause a passage of shearing force which causes a relative motion in between the mobile and fixed structures. This results in tearing of blood vessels. Penetrating injuries resulting from stabbing, bullets, and fragments cause haemorrhage from vessels and organs in the abdomen, and sepsis as gut contents leak into abdominal cavity from hollow viscous perforation. It's never safe to assume that gunshot wounds follow the straight path as there are signs of cavities that lie beyond the tract of the missile. Retroperitoneal injuries take long to become clinically apparent and thus are diagnosed late. Urine is non-irritant to the abdominal cavity so the bladder injuries aren't diagnosed until late. Before clinical signs come into picture, large volumes of blood can be sequestered into the abdominal cavity. The main dangers of abdominal trauma are sepsis and hemorrhage. While the latter is responsible for early deaths, sepsis causes deaths after 48hrs.

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