

## Original Article

### OUTCOME AND MANAGEMENT STRATEGY OF TRAUMATIC LIVER INJURY IN A TERTIARY HOSPITAL IN BANGLADESH

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#### Abstract

**Background:** Liver remains the second most common injured organ in both blunt and penetrating trauma of the abdomen. Management of blunt or penetrating injury to the liver remains a significant challenge to trauma surgeons. Unstable patients require immediate laparotomy. Selective patients can be managed without surgery and with careful monitoring. Mortality is mainly due to damage to major hepatic blood vessels, massive parenchymal and biliary injury. Associated non-hepatic injuries contribute greatly to the overall mortality. With improved understanding of the major causes of mortality from hepatic injury, adequate resuscitation, well planned surgical intervention and better intensive care facilities have decreased mortality and morbidity

**Objectives:** Performed to assess incidence, mechanisms, management and outcome of traumatic liver injury.

**Methods:** This prospective study was performed in Dhaka Medical College Hospital between January 2013 to December 2014. Sixty patients with hepatic injury were included in the study. Data collected in data collection sheet regarding demographic data, severity of liver injury, hemodynamic status on admission, investigations reports, concomitant injuries, management scheme, and outcome of patients which were then analyzed.

**Results:** There were 39 male and 21 female patients with a mean age of 31.3 (SD=15.4) years. Road traffic accident was the most common injury mechanism (71%). 20 patients (33%) were in shock at the time of admission. 48 patients (80%) with liver injury had associated injuries of other organs. Majority of the patients (41%) were found with grade III injury. 50 patients (83%) needed surgical interventions. Most common (16%) complication was wound infection. 3 patients (5%) died in this series. 5 patients (8%) developed liver abscess on subsequent follow up.

**Conclusion:** Most of the trauma victims are young and in the active state of life. Prompt resuscitative measures, assessment of extend of hepatic injury and associated injuries, well justified surgical intervention along with critical care support can contribute greatly to the survival of victims of hepatic injury.

**Key words:** Liver trauma; damage control resuscitation; perihepatic packing, trauma surgery.

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### Introduction

The incidence of both blunt and penetrating abdominal injury is increasing and the liver is one of the organs most commonly involved in injury. Blunt liver trauma is usually due to road traffic accidents, assaults, or falls from heights and result in deceleration injuries. Decelerating injuries cause the liver to torn on its peritoneal attachments, often resulting in linear lacerations, whilst crushing injuries to the right hypochondrium may inflict deep fissured lacerations<sup>1</sup>. Occasionally, sudden compression and expansion ruptures the parenchyma whilst the capsule remains intact. High velocity projectiles, close range shotgun injuries, and crushing blunt trauma cause fragmentation of the hepatic parenchyma with laceration of vessels and massive intraperitoneal hemorrhage. Penetrating injuries such as stab or gunshot wounds cause bleeding without much devitalization of the liver parenchyma. Although some 50% of liver injuries are minor and require no active treatment<sup>1</sup>, extensive injuries continue to be a major challenge to surgical skill. Associated trauma to the hepatic veins or inferior vena cava is particularly grave, and these problems are compounded by the presence of injuries to other organs in 90% of cases<sup>1</sup>. Mortality relates not only to the extent of hepatic injury, but directly to the number of other organs involved<sup>2</sup>.

The magnitude of the injury, the management requirements, and the complexity of the surgical repair are determined by the extent, anatomical location, and mechanism of injury. Management of major liver trauma remains a significant challenge. Conservative management has traditionally been recommended for minor (type I - II)<sup>1</sup> blunt liver injuries but penetrating and major blunt liver injuries (type III - V)<sup>1</sup> have generally been managed by surgical exploration.

However, more recently, the conservative approach has been adopted for the management of type III - V injuries<sup>3</sup>.

### Materials and Methods

This is a prospective cross sectional study on 60 patients of hepatic injury who got admitted into Dhaka Medical College Hospital - over a period from January 2013 to December 2014. All the patients admitted into DMCH with hepatic injury irrespective of age and sex were included in this study.

Patients were diagnosed clinically by history and physical examination. Relevant investigations e.g. CBC, blood grouping & cross matching, USG of whole abdomen, plain X-Ray abdomen, CT scan etc. were done and recorded.

Immediately after admission patients were resusci-

tated by clearance of airway, maintenance of respiration, arrest of external bleeding and maintenance of normal circulation ( according to ATLS Protocol).

After resuscitation, further management was planned depending upon the condition of the patient. In haemodynamically unstable patients decision for laparotomy was taken. In hemodynamically stable patients conservative treatment was planned, some of these patients later needed laparotomy for gradual deterioration. Injured liver was repaired by various techniques. Associated other organ injuries were managed. Post operative complications were managed. After discharge from hospital, patients were followed up in the surgical OPD for variable period of time.

Data obtained (age, sex, mechanism of injury - blunt vs penetrating, vital signs in the emergency department, operative procedure, intra operative finding, associated injuries, length of operation, estimated blood loss, length of hospital stays, complications and outcome) were compiled, analyzed and presented in tabulated form. Finally the result of this study was compared with the data of published literature.

### Results

The ages of the patients ranged from 10 to 65 years. The highest incidence (41%) was observed in the fourth decade of life. Out of 60 patients 39 (65%) were male and 21 (35%) were female. Most of the patients (71%) were injured as a result of road traffic accidents. Among the 60 patients, 20 (33%) were in shock on admission. Most of them presented with abdominal pain, abdominal distention and signs of peritonitis. Out of 60 patients, 12(20%) had isolated hepatic injury. Rest of the patients (80%) had associated organ injuries. 40 patients (66%) had injury to the right lobe. Both lobes were involved in 8% of patients. Majority of the patients (41%) were found with grade III injury and only 5 patients had sustained grade IV injury (8%) Liver injuries were graded according to Moore et al. Out of 60 patients, 50 were operated and 10 patients were given non-operative management. Suture hepatorrhaphy was done in 30 (50%) cases, Laparoscopic drainage and control of haemorrhage was done in 5 (8%) cases, resectional debridement of devitalized hepatic parenchyma was done in 10 (16%) patients. Most common complication was wound infection (16%). There were three deaths in this series. One from septic shock following generalized peritonitis and two from acute renal failure. In subsequent follow up period, five patients (8.33%) developed liver abscess which were drained by USG guided aspiration.

**Table 1:** Age and sex distribution of the patients (n=60)

Age (years)	Male (%)	Female (%)
Up to 20 years	4(6.66%)	1 (1.66%)
21 – 30 Years	5 (8.33%)	3 (5%)
31 – 40 Years	15 (25%)	10 (16.66%)
41 – 50 Years	10 (16.66%)	6 (10%)
51 – 60 years	3 (5%)	1 (1.66%)
Above 60 years	2(3.33)	0

**Table 2:** Mechanism of injury (n=60)

Mechanism	No. of patients	percentage
Road traffic accidents		
a. Motor vehicle (Passengers)	35	58.33
b. Pedestrian struck by motor vehicles	8	13.33
Fall from height on hard blunt surface	4	6.66
Physical assault	2	3.33
Penetrating injuries	1	2
a. Stab injury	6	10
b. Bullet injury	4	6.66

**Table 3:** Clinical features.(n=60)

Symptoms and signs	No. of patients	Percentage
Pain		
Abdominal	60	100
Chest	10	16.66
Bleeding (External)		
Abdominal wall	6	10
Chest wall	4	6.66
Dyspnoea	10	16.66
Haematuria	6	10
Vomiting	5	8.33
Abdominal distension	30	50
Signs of peritoneal irritation or peritonitis. (Tenderness, rebound tenderness and abdominal muscular rigidity)	30	50
Signs of shock	20	33.33
Abrasion and laceration of skin.		
1) chest.	10	16.66
2) Abdomen.	20	33.33
Absence of bowel sounds	30	50
Signs of pneumothorax, haemothorax and haemopneumothorax	10	16.66

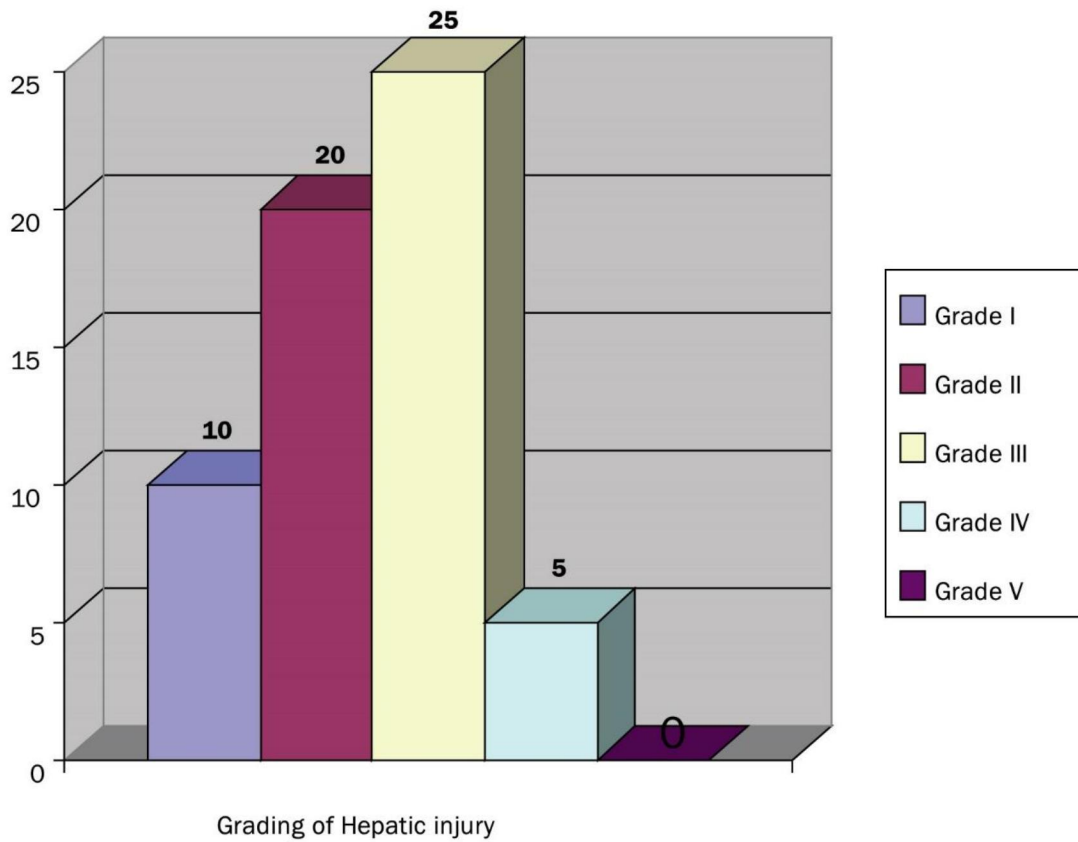
**Table 4:** Organ injured

Name of organ	Number and percentage
Liver injury only	12 (20%)
Liver injury associated with injuries to other organs	48 (80%)

**Table 5:** Injured lobes of liver (n=60)

Lobes	No. of patient	percentage
Right lobe	40	66.66
Left lobe	15	25
Both lobes	5	8.33

**Fig. 1:** Grading of hepatic injury.



**Table 6:** Operation on hepatic injuries (n= 60)

Procedure	No. of patients	Percentage
1) Suture hepatorrhaphy	30	50
2) Resectional debridement	10	16.66
3) Use of pedicled omentum into bleeding fracture site	3	5
4) Perihepatic packing		
5) Laparoscopic drainage and control of haemorrhage	2	3.33
5) Non-operative management	5	8.33
	10	16.66

**Table 7:** Associated injured organs (n=60)

Name of organs	No. of patients	Percentage
Jejunum	10	16.66
Gall bladder	2	3.33
Common bile duct	1	1.66
Kidney	5	8.33
Duodenum	8	13.33
Stomach	6	10
The diaphragm	6	10
Colon	7	11.66
Jejunum or Ileum	15	25
The mesentery	5	8.33
Spleen	2	3.33
Pancreas	2	3.33
Fracture of upper limb bone	6	10
Fracture of lower limb bone	5	8.33
Fracture of ribs	6	10
Soft tissue injury (head, neck & limb)	15	25

**Table 8:** List of complications (n=60)

Name of complications	No. of patients	Percentage
Post operative pneumonia	5	8.33
Pleural effusion	5	8.33
Subphrenic abscess	6	10
Minor wound infection	10	16.66
External biliary fistula	4	6.66
Irreversible shock	2	4
Septic shock due to generalized peritonitis.	1	1.66
Acute renal failure	2	3.33
Death	3	5

**Discussion**

Liver is the organ most commonly injured after abdominal trauma. Management strategies for hepatic injury have changed over the years, but all have had the primary goal of reducing morbidity and mortality which most commonly results from bleeding and later sepsis. Fortunately, the majority of blunt liver injuries are not severe and are amenable to non-operative management. Early diagnosis is very important in lowering the mortality from liver injury. Mechanism of injury varies from developing to developed countries and from rural to urban area.

In a study on 105 consecutive cases with liver trauma observed that the maximum incidence was between age group of 21 to 40 years and age range was 1-72 years<sup>4</sup>. Another study found that the patient's age ranged from 15 to 94 years (Median 26 years)<sup>5</sup>. In present study age of the patients ranged from 10-65 years (median 28 years) and the highest incidence (68%) was found in persons between the age of 21-40 years. There are variations of age ranges in different corners of world as in present series but the median age and age of maximum incidence are almost same in all studies.

In present series most of patients were male (88%) and only 12% were female. Less common occurrence among females may be clue to fact that females in our country are less outgoing as chances of wounding is very limited. Now, the trend is slowly changing. Value of study of David v. Feliciano is nearer to the present series (91.20% compared to 88%)<sup>6</sup>.

Liver injury is diagnosed in cases with blunt trauma based on physical examination along with abdominal paracentesis, serial HCT value and ultrasonography<sup>4</sup>. They found 35% of patients arrived in emergency in a state of shock (40 of 105 patients). In this study, most common clinical findings were shock (38%), abdominal pain of varying severity, tenderness of abdomen, rigidity and intestinal ileus. In addition to the clinical findings diagnostic abdominal tap was performed in 4 cases (8%) and diagnostic laparoscopy 4 cases (8%) and ultrasonography- the FAST exam(Focused Assessment with Sonography in Trauma) in 31 cases. During the period of study emergency CT scan was not available in this hospital so CT evaluation was not performed.

Feliciano et al used full length midline laparotomy incision, enabling the surgeon to perform a full laparotomy and also to gain adequate access to the liver<sup>6</sup>. In present study the same incision was used. A

study showed in about consecutive 105 patients management where 80% patients with liver injury could be managed by simple procedure c.g suture hepatorrhaphy as in present study 76%<sup>4</sup>.

Perihepatic packing was employed only when conventional methods failed to control bleeding from wide area of hepatic surface. Since 1975, there have been a few publications on the use of perihepatic packing primarily with dry laparotomy pads to control bleeding from exposed hepatic surfaces or suture line. Feliciano et al<sup>7</sup> recommended perihepatic packing in presence of oozing from raw hepatic surface or coagulopathies. He showed judicious use of perihepatic packs lead to survival rate of 60% to 90%. Recent publications showed that total duration of liver packing does not increase in septic complication or bile leaks<sup>8</sup>. In present series perihepatic packs were used in 2 (4%) patients with oozing from diffuse hepatic area. A study suggested to take 1st relook laparotomy after 48 hours. In this study packs were removed after 3 days in a planned reexplorations & abdomen then drained with wide bore drain tube<sup>8</sup>.

Drainage after hepatic trauma has been controversial for over 80 years. Recent reports have strongly suggested that drainage is not essential in management of patients sustaining minor or modest hepatic trauma<sup>1</sup>. In present study, wide bore drainage tubes were used as a routine. This procedure was adopted due to quick identification of complications as high incidence of infections and lack of emergency investigative scans in post operative period in our hospital. Drain tubes were placed appropriately depending upon organ involved in injury. In present series perihepatic abscess developed in 3 patients only.

Three patients died in present study, all had multiple organ injury. This observation also shows that mortality following hepatic injury have direct relation to the increase number of associated organ injury. Other study had drawn similar conclusion after managing 446 patients with hepatic injury<sup>10</sup>.

In study on 82 cases reported pulmonary complications 20%, sepsis 14%<sup>5</sup>. The leading complication in present study was pulmonary complication (24%) & wound infection in 20% patients. Incidence of bile peritonitis is only 6%.

In present study there were 3 deaths (6%). All had multiple organ injury. 2 patients had non recordable blood pressure on admission and the shock could not be over come despite 18 and 22 units of whole blood

transfusion. Those patients died in ICU within few hours after surgery. Another patient developed generalized peritonitis and died due to septicemic shock after 2 weeks following operations.

In recent years the treatment of abdominal injuries has evolved and a nonoperative approach has been adopted in an increasing number of selected patients but there are potential risks to this strategy in terms of delayed hemorrhage necessitating laparotomy<sup>11</sup>. Much has been written in recent journals about the role of laparoscopy in blunt abdominal trauma. Most of the patients in our study underwent laparotomy. The current recommendation of non operative management based on haemodynamic stability applies to appropriately configured centers where the skills and resources necessary for emergency hepatic surgery are available constantly<sup>11</sup>.

### Conclusion

Clinical examination and simple procedures are sufficient for the diagnosis of hepatic injuries in most cases. Associated organ injuries have direct relation to the morbidity and mortality of hepatic trauma. High degree of suspicion, early diagnosis and treatment is the key to reduce the mortality and morbidity. Non-operative management of liver injury can be safely accomplished in haemodynamically stable patients, with the possible benefit of a shorter hospital stay. Current recommendation of non operative management of blunt liver trauma is based on haemodynamic stability and can be attempted in highly specialized hepatobiliary centre.

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