

## Original Research Article

# Complication rates in managing hepatic trauma: a cross-sectional study stratifying their outcomes

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## ABSTRACT

**Background:** Liver trauma is the most commonly observed injured organ in abdominal trauma. The objectives of this study was to determine and evaluate the rates of complication in the management of liver trauma

**Methods:** This cross-sectional observational study using non-probability convenient sampling technique was done at surgical unit of Liaquat University of Medical and Health Sciences, Jamshoro, for 06 months. After ethical approval from Institute's Institutional Review Board (IRB), patients presenting to surgical emergency of the hospital between ages 16 to 60 years having blunt or penetrating liver trauma within 04 hours of incident, either road traffic accident, sustaining a fall, sporting injury, knife or stab wound were include while patients of liver trauma conservatively managed or had severe co-morbid, not fit for anesthesia, with multiple organs lesions (polytrauma) and all hepatic injury patients that were hemo-dynamically stable were excluded. SPSS version 23 was used for data analysis keeping p-value <0.05 as significant.

**Results:** Among 136 patients with mean age 32.33±11.23 years, 120(88.2%) were males. 122(89.7%) of the patients were admitted due to liver trauma of blunt variety while 14(10%) with penetrating liver injury. Overall mean duration of hospital stay was 13.1±4.58 days. 41(30%) patients reported intra-abdominal sepsis, followed by recurrent hemorrhage in 33(24%) of patients while in 22(16%) of patients, biliary leakage was observed. An insignificant difference persisted in either surgical intervention in terms of the complication rates.

**Conclusions:** Higher complication rates were observed in patients with peri-hepatic packing, however outcome of both surgical techniques in terms of complication rates were found to be insignificant. Further studies are needed to shed light upon the findings or this study.

**Keywords:** Biliary leakage, Intra-abdominal sepsis, Liver trauma, Peri-hepatic packing, Recurrent haemorrhage, Suture hepatorrhaphy

## INTRODUCTION

Hepatic trauma is one of the most commonly observed organs that are injured in trauma of the abdomen.<sup>1</sup> The fact that it is located in the anterior part of abdominal cavity and fragility of its parenchyma, in addition to the easy disruption of Glisson's capsule makes liver the most vulnerable to injury in abdominal trauma.<sup>2</sup> Road traffic

accidents (RTA) are the most frequent and leading cause of blunt trauma; while sharp, knife gunshot wound (GSW) constitute majority of the number of penetrating injuries. Due to larger size of the right lobe of liver and closer proximity to ribs, it is more commonly involved in injuries. Since the regulatory, social and environmental conditions vary from country to country, the incidence of hepatic trauma also varies in-between countries.<sup>3</sup> For

instance, approximately 80-90% of total liver injuries occurring in the European countries are because of blunt trauma as the major cause of injuries are RTA, injury due to falls and sporting injuries. Similarly, Australia's situation is observed like that of the Europeans.<sup>4</sup> On the other hand, USA and South Africa have reported contradicting evidences, reporting a high rate of liver trauma cases as penetrating traumas. Until recently, studies have reported an increase in blunt to penetrating traumatic injury's ratio in such countries.<sup>5</sup> Liver trauma is linked to high mortality, but since mortality is associated with several factors, it is very difficult to prognosticate the management plans for each and every individualised patient.<sup>6</sup> Multiple factors such as the nature of liver injury, grading of liver injury, incurred injuries associated with liver trauma, the different practices and experiences in treating those patients and finally the variations in physiological characteristic of patients themselves.<sup>7</sup> The reported mortality of traumatic liver injuries all over ranges from 10-17%. Nevertheless, if juxta-hepatic venous injury, i.e. retro hepatic inferior vena caval or central major hepatic venous injury is sustained by a patients, the overall mortality increases to about 80%.<sup>8</sup> Similarly, above 80% of patients that sustain hepatic trauma, so also experience one or more than one associated injuries.<sup>9</sup> In patients with blunt liver injuries, the most often seen associated injury is to the chest, after which long bone or pelvic fractures are commonly observed, followed by intra-abdominal solid organs such as spleen and then injury to the head.<sup>10</sup> As compared to blunt trauma, in penetrating injuries, injury to the small intestine, colon, stomach, diaphragm and kidneys is often seen while the pancreas and spleen are seldom injured in penetrating trauma.<sup>11</sup> As a matter of fact, injury to any major abdominal vessels i.e. the aorta, inferior vena cava and porto-mesenteric vessels is linked to a rise of about 50 % mortality in comparison to patients that have not sustained any abdominal vessel injury.<sup>12</sup>

Managing either penetrating or blunt hepatic trauma injuries remain a substantial challenge both intra-operatively and post-operatively. One reason could be because of the liver being a highly vascular structure and secondly its strategic location which makes it difficult for management even with advanced and latest technologies.<sup>13</sup> Such difficulties tend to rise in less-resourced centres where services for intra-hospital care are inadequate. Adequate and specific diagnostic protocols aid surgeons in sharpening surgical indications.<sup>14</sup> The procedure for peri-hepatic packing is considered the best basic technique for damage control in treating cases of hepatic haemorrhages, being regarded as a cornerstone of surgical strategies in trauma of the abdomen. Even though with accurate clinical knowledge of liver anatomy, the complex injuries of the liver are best found during laparotomy.<sup>15</sup> The peri and post-operative management in liver trauma depends upon magnitude of liver parenchymal disruption and its associated vascular destruction.<sup>16</sup> Peri-hepatic packing for hepatic haemorrhages and suture hepatorrhaphy for

suturing glisson's capsule after hepatotomy with selected ligation of vessels devitalised tissue debridement and packing of liver wound including omental pedicle, are all steps in the various approach to surgical treatment of hepatic trauma.<sup>17</sup>

The objectives of this study was to determine and evaluate the rates of complication in the management of liver trauma.

## METHODS

This cross-sectional observational study using non-probability convenient sampling technique was done at surgical unit of Liaquat University of Medical and Health Sciences Jamshoro for 06 months from (1<sup>st</sup> July 2019 to 31<sup>st</sup> December 2019). After ethical approval from Institute's Institutional Review Board (IRB), patients presenting to surgical emergency of hospital between ages 16 to 60 years having blunt or penetrating liver trauma within 04 hours of incident, either road traffic accident, sustaining a fall, sporting injury, knife or stab wound were included while patients of liver trauma that were conservatively managed or had severe co-morbid, not fit for anaesthesia, with multiple organs lesions (polytrauma) and all hepatic injury patients that were hemo-dynamically stable were excluded. Informed and written consent was taken from either patient or their next of kin. Patients were operated by surgeons having at least 10 years of surgical expertise. Mid-line or roof top incision was made for exploring and visualizing right lobe of liver via large Richardson retractor by elevation of right costal margin. By dividing falciform and lateral triangle ligaments, liver was mobilized and rotated medially towards surgical field. At start of operation, haemostasis was transiently done through Pringle's manoeuvre or by manual compressing of liver surface.

For managing and controlling bleeding definitely through repair, either of two surgical techniques, i.e. peri-hepatic packing or suture hepatorrhaphy was carried out. Each patient was admitted to surgical ICU post-operatively and then shifted to surgical ward. After stabilization, patients were discharged with regular follow up advised in surgical opd. The record of patients were analysed for complications till last follow up.

For analysis of data, SPSS version 23 was used with frequency and percentages recorded for quantitative variables while mean and SD were reported for qualitative variables. Chi-square test was applied for test for significance. Statistical significance was kept at a p-value <0.05.

## RESULTS

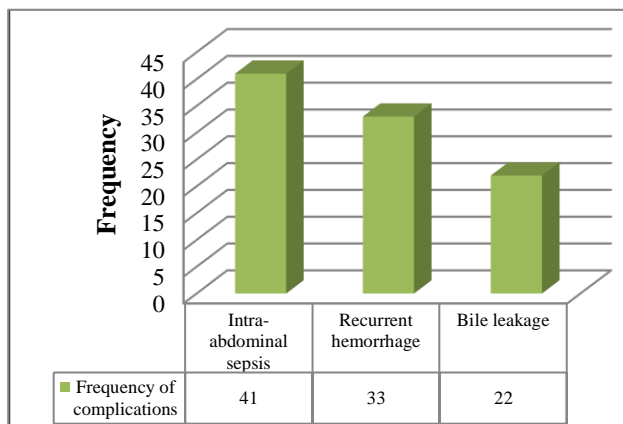
From the total of 136 patients included in the study ranging from 16 to 60 years of age, the mean age of the patients was 32.33±11.23 years. Majority of the patients, i.e. 120(88.2%) out of 136 were males while 16(11.8%)

were females with a male to female ratio of 7.5:1. Majority of the patients, 62(45.5%) were between 16 to 30 years, after which 42(31%) were between 31 to 40 years while 32(23.5%) of the patients were between 41 to 60 years of age. With regards to the type of liver trauma sustained by the patients, 122(89.7%) of the patients were admitted due to liver trauma of blunt variety while 14(10%) of the patients had experienced penetrating liver injury. Overall mean duration of hospital stay ranged from 7 to 28 days with a mean of 13.1±4.58 days (Table 1).

**Table 1: Baseline demographics of admitted surgical patients.**

Variables	Mean / Frequency	S.D / %
Mean age (years)	32.33	11.23
Gender	Males	120 88.2
	Females	16 11.8
Age range (years)	16-30	62 45.5
	31-40	41 31
	41-60	32 23.5
Type of injury	Penetrating	14 10.3
	Blunt	122 89.7
Mean duration of hospital stay (days)	13.1	4.58

Post-operative complications were reported in most of the patients. 41(30%) patients reported intra-abdominal sepsis, followed by recurrent hemorrhage in 33(24%) of patients while in 22 (16%) of patients, biliary leakage was noticed (Figure 1).



**Figure 1: Frequency of complications of operated patients.**

In this study 116(85%) of the patients underwent peri-hepatic packing while in 20(15%) of patients, suture hepatorrhaphy was performed. Among 41 patients with intra-abdominal sepsis, 34 patients were of peri-hepatic packing while 07 patients of suture hepatorrhaphy (p-value=0.54). Among 33 patients with recurrent hemorrhage, 29 had undergone peri-hepatic packing

while 04 suture hepatorrhaphy (p-value=0.35) and from 22 patients with biliary leakage, 18 had undergone peri-hepatic packing while 04 suture hepatorrhaphy (p-value=0.51) (Table 2).

**Table 2: Complication rates according to surgical technique.**

Type of surgical technique	p-value		
Peri-hepatic packing	116 (85%)	<0.001	
Suture hepatorrhaphy	20 (15%)		
Rate of complication	Peri-hepatic Packing	Suture hepatorrhaphy	
Intra-abdominal sepsis (n=41)	34	29	0.54
Recurrent haemorrhage (n=33)	07	04	0.51
Bile leakage (n=22)	18	04	0.35

**DISCUSSION**

Due to liver’s friability of parenchyma, large size, thin capsule and relatively fixed positioning in relation to abdominal wall makes it specifically more prone to injury, more specifically blunt injury.<sup>18</sup> It is believed to be caused even by a simple compression against flexed ribs, spine or the posterior abdominal wall.<sup>19</sup> Therefore liver is the most commonly injured abdominal organ due to blunt or penetrating trauma. Since in this study most patients were males and of blunt traumatic injury, therefore most of underwent peri-hepatic packing. On the other hand, penetrating injuries usually undergo suture hepatorrhaphy as reported in studies.<sup>20</sup>

Reported complications from liver injuries are recorded around 20% in the literature and they include bile leakage leading to formation of biloma followed by abscess and sepsis as well as recurrent haemorrhages. The range of complications has been reported from as low as 20% to as high as 86%.<sup>21</sup> Likewise in this study, an overall rate of complication was 60% which is although high, but similar to that reported in literature.

Majority of the patients in this study were males owing to the fact that males are reported to be a part of road traffic accident or knife or stab injury or sporting injuries more commonly than compared with females. Similar to this study, a study by Al-aubaidi T et al, reported that majority of the patients, i.e. 54(90%) out of 60 were males while 06(10%) were females. Peak incidence of age was also similar to this study, with 47% patients in between 16-30 years. 52(87%) of the patients in the study

were admitted due to penetrating liver injury while in this study, majority of the patients were admitted due to blunt hepatic injury. 53% patients were found to have post-operative complications while in this study, 60% of patients were observed to have complications.<sup>22</sup>

Chianakwana GU et al, in another study reported that among 156 patients of liver trauma, 119(76%) were males while 37(24%) were females. Majority of the patients were of blunt injuries while others were of penetrating injuries. Commonest cause of blunt injuries were road traffic accidents followed by fall from height while the major reason for penetrating injury was of gunshot wound, followed by stab wound. The study concluded that morbidity and mortality in patients with hepatic injury might be decreased through application of prompt and appropriate management of different treatment modalities within the available resources.<sup>23</sup> This study reported similar findings to the results of the above study.

Costa G et al, reported in a study on 79 patients, majority, 66(83.6%) being males and 13(16.4%) females with an overall mean age of 38.7±16.2 years and mean length of hospital stay being 18.7±27.3 days. Majority of the patients, i.e. 60(75.9%) were of road traffic accidents with 77(97%) patients of blunt liver trauma.<sup>24</sup> Similar findings were reported in this study as well. In another study by Saaiq M et al, success rates of peri-hepatic packing were reported similar to this study.<sup>25</sup> Ali U et al, also reported around 59% patients with peri-hepatic packing to have a success rate of over 80%.<sup>26</sup> Saleh AF et al, documented a rate of 52 % complication in their study of patients having poly-trauma in addition to liver trauma.<sup>27</sup> Hareem A et al, also reported similar frequency of complications in their study.<sup>28</sup> Uravić M et al, observed a 50% rate of complications among liver trauma patients.<sup>29</sup>

Bala M in another study recorded a frequency rate of complications at 52%.<sup>30</sup> Most common complications in all the studies were intra-abdominal abscess leading to sepsis, recurrent or reactionary haemorrhage and biliary leakage. All the above complication rates are in line with the rates reported in this study. On the other hand few studies such as by Stain et al, reported a complication rate of only 12.5%, however the study was conducted in a developed area where health care facilities were far better than in the developing or under-developed areas.<sup>31</sup>

Strengths and Limitations of the study is the study reported a comprehensive overview of the baseline demographics and post-operative surgical complications in patients of liver trauma undergoing surgery, however the study was not immune from selection and observer bias and the fact that the study was carried out at a single centre having limited sample size also dampened the authenticity of the study. Furthermore, unequal ratio of patients was not only present as in terms of gender but also in terms of the type of injury sustained and surgical

intervention carried out. Therefore, further multi-centered studies on larger scale would be enlightening in attaining better and improved knowledge with regards to the management of patients having liver trauma.

## CONCLUSION

According to the results of the study, overall higher complication rates were observed in patients with peri-hepatic packing, however outcome of both surgical techniques in terms of complication rates were found to be insignificant. Further studies are needed to shed light upon the findings of this study.

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