MANAGEMENT OF LIVER TRAUMA

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ABSTRACT

AIM

To estimate the incidence of Liver Trauma injuries and grade their severity of injury. To assess the factors responsible for morbidity and mortality after Liver Trauma. To study the postoperative complications and the management of Liver Trauma.

MATERIALS AND METHODS

The present prospective study was conducted on 100 patients who were admitted to Department of General Surgery for treatment who were managed operatively or non-operatively for abdominal trauma and having liver injury forms the material of the study. This study was conducted over a span of 24 months from June 2013 to November 2015.

RESULTS

Maximum number of patients are in the age group of 21-30 years (46%). 85% patients (85/100) are males and 15% of patients (15/100) are females. Lapse time of injury and admission varied from 25 minutes to 66 hours and 30 minutes. 75 % of the patients (75/100) presented within 24 hours after injury. Death rate of patients who reached hospital after 24 hours of injury was higher than the patients who reached hospital within 24 hours of injury. 28% of patients (28/100) had associated bony injuries, out of which 5% of patients (5/100) expired due to primary haemorrhage of fractured femur. More than one segment was injured in many patients. Segment V is involved commonly making 55% (55/100) of patients. Next common segment involved is segment VII, making 39% (39/100).

CONCLUSION

Mechanism of injury is the important factor which is responsible for morbidity in liver injury. Nonoperative management proved to be safe and effective and often has been used to treat patients with liver trauma.

KEYWORDS

Liver Trauma, damage control surgery, injury.

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INTRODUCTION: The largest organ in the abdominal cavity is the liver and it is the critical organ which is often injured. The liver is the most commonly injured intra-abdominal organ and is found to be damaged in 30% of patients undergoing laparotomy for penetrating injuries and in 15–20% of laparotomies for blunt injuries[1]. The significant cause of morbidity and mortality in trauma patients is the liver injury. Since the 20th century, liver surgery has become safer with lower morbidity and mortality and this has influenced the management of liver trauma. Management of Liver Trauma may vary widely from non-operative management (NOM) with or without angioembolisation to Damage Control Surgery (DCS).[2] It is mainly cantered on stopping the bleeding by packing, Pringles, and vascular exclusion to totally replacing the liver by a liver transplant. Although blunt liver trauma accounts for 15-20% of abdominal injuries, it is responsible for more than 50% of deaths resulting from blunt abdominal trauma. The mortality rate is higher with blunt abdominal trauma than with penetrating injuries. In Europe, blunt trauma predominates[3] (80-90 percent of all liver injuries), while penetrating injuries account for 66 percent of liver trauma in South Africa and up to 88 percent in North America. Unfortunately, we don't have enough data for the Arab countries though we are one of the highest in motor vehicle accidents with more than 9000 deaths per year. As a result of this high mortality rate, emergency surgery was frequently indicated in patients with hepatic injury in the past. However, advances in diagnostic imaging, better monitoring facilities and the introduction of damage control strategy in trauma has influenced our approach in the management of liver trauma.[4] The liver is divided into left and right lobes by an imaginary plane (the principal plane) which runs between the inferior vena cava (IVC) and the porta hepatis and gallbladder. There is further subdivision into eight segments based on portal venous, hepatic arterial and bile duct anatomy, first described by Couinaud. The majority of the liver is covered by visceral peritoneum which condenses to form the diaphragmatic attachments of the coronary, left and right triangular and falciform ligaments. The vascular inflow

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to the liver is provided by the hepatic artery and portal vein, which lie with the common bile duct at the porta hepatis, and drainage is into the IVC via the three hepatic veins and also by small direct tributaries between the caudate lobe (segment 1) and the anterior surface of the IVC.

MATERIALS AND METHODS: The present prospective study was of 100 patients who admitted in Department of General Surgery for treatment who were managed operatively or non-operatively for abdominal trauma and having liver injury forms the material of the study. This study was conducted over a span of 24 months from June 2013 to November 2015.

All patients were first received at Casualty Department and general surgery of the patient was done to know the condition of the patient and injuries noted. After securing airway and breathing, an intravenous line is secured and blood is drawn and sent for blood grouping and typing, cross matching, urea and sugar, haemoglobin percentage. Initially, Ringer's lactate is infused for resuscitation. Depending on severity of injury if the patient is not responding to initial crystalloid, compatible whole blood transfusion is given which is brought after cross matching from our own blood blank. A brief history about the date and time of injury, mode of injury and complaints with special reference to pain in abdomen, vomiting and distention of abdomen is taken and site, size, shape and character of wounds are noted. Specific examination of abdomen is done with special reference to tenderness, guarding, rigidity, presence of free fluid and bowel sounds. The diagnostic tap of abdomen is done for all cases; all the patients were operated under general anaesthesia with endotracheal intubation.

RESULTS:

	Survival	**Death**	**Total**
Age in years			
Up to 20 years	15(93.75%)	1(6.25%)	16(16%)
21-30 years	40(86.96%)	6(13.04%)	46(46%)
31-40 years	16(80%)	4(20%)	20(20%)
41-50 years	5(50%)	5(50%)	10(1%)
>51 years	3(37.5%)	5(62.5%)	8(8%)
Total	**79(79%)**	**21(21%)**	**100(100%)**
Gender			
Male	66(77.65%)	19(22.35%)	85(85%)
Female	13(86.66%)	2(13.33%)	15(15%)
Total	**79(79%)**	**21(21%)**	**100(100%)**
Relation to the time of injury to admission			
Up to 3 hours	7(87.5%)	1(12.5%)	8(8%)
>3 hrs to 9 hrs	32(84.21%)	6(15.79%)	38(38%)
>9 hrs to 24 hrs	24(82.76%)	5(17.24%)	29(29%)
>24 hrs	16(64.00%)	9(36%)	25(25%)
Total	**79(79%)**	**21(21%)**	**100(100%)**

Table 1: Shows the age distribution, sex distribution and relation to the time of injury to admission

Table-1 shows that maximum number of patients are in the age group of 21-30 years (46%). This observed difference was statistically significantly (P= 0.0084) at 95% confidence interval). 85% patients (85/100) are males and 15% of patients (15/100) are females. This observed difference was statistically not significant (P= 0.64) at 95% confidence interval). Sex does not determine the outcome of the patient. Lapse time of injury and admission varied from 25 minutes to 66 hours and 30 minutes. 75 % of the patients (75/100) presented within 24 hours after injury. Death rate of patients who reached hospital after 24 hours of injury was higher than the patients who reached hospital within 24 hours of injury. This observed difference is statistically significant (P=0.0369) at 95% confidence intervals.

Survival rate of patients who were operated before 12 hours of injury was 60% higher than patients who were operated after 12 hours injury. This observed difference was statistically significant (P<0.019) at 95% confidence interval.

Segment injured	**Survival**	**Death**	**Total**
I	0	0	0
II	4(66.67%)	2(33.33%)	6(3.49%)
III	0	2(100%)	2(1.16%)
IV	4(66.67%)	2(33.33%)	6(3.48%)
V	33(60%)	22(40%)	55(31.98%)
VI	18(69.23%)	8(30.77%)	26(15.1%)
VII	29(74.36%)	10(25.64%)	39(22.67%)
VIII	28(73.68%)	10(26.32%)	38(22.09%)
Total	**116(67.44%)**	**56(32.56%)**	**172(100%)**

Table 2: Distribution of patients in relation to injured segment

More than one segment was injured in many patients. Segment V is involved commonly making 55% (55/100) of patients. Next common segment involved is segment VII, making 39% (39/100).

Surgical haemostasis procedure	**Survival**	**Death**	**Total**
Hepatorrhaphy alone	18(100%)	0	18(20.93%)
Hepatorrhaphy with AbGel	52(100%)	2	54(62.7%)
Resectional debridement	0	4	4(4.65%)

Perihepatic packing	2(20%)	8(80%)	10(11.62%)
Total	**72(83.7%)**	**14(16.2%)**	**86**

Table 3: Distribution of patients in relation to surgical haemostasis

More than one surgical technique was used in a single to secure surgical haemostasis. 92.5% (37/40) hepatorrhaphy with or without gel foam augmentation is for surgical haemostasis. Perihepatic packing is used in 12.5% (5/40) of patients.

Type of complication	Survived	Died	Total
Respiratory	3(100%)	0	3(27.27%)
Septicaemia	0	2(100%)	2(18.18%)
Bile leak	2(100%)	0	2(18.18%)
Haemorrhage	0	0	0
Abscess	4(100%)	0	4(36.36%)
Total	**9(81.82%)**	**2(18.18%)**	**11(100%)**

Table 4: Distribution of complications among the Non-operative individuals

The complications rate when compared to operated group is less among conservatively managed individuals. Most common complication observed was abscess formation in the perihepatic area which was managed by percutaneous aspiration under ultrasound guidance. Respiratory, septicaemia, bile leak were observed as other complications in the conservatively managed patients.

DISCUSSION: Few studies have shown the management of liver trauma. Mallikarjun et al[5] have conducted a prospective study which consisted of 50 patients with aim of presenting the incidence of liver injury and grade of liver injury. The results obtained were the incidence of Liver Trauma is 22.3%. The most common age group involved in the injury were younger age group (21- 40 years). Males were involved more in liver injury. Duration between incidence of injury and admission was highly significant. Patients who presented within 2 hours of injury experienced minimal complications. The lapse time from injury to surgery is highly significant (P<0.019). Survival rate of patients who were operated within 12 hours of injury was 69% higher than the patients who were operated after 12 hours of injury. Associated injuries were present in less than 50% of the patients and 10% of patients (9/50) expired of associated injuries, still the diagnostic tool for evaluating liver injury. Right lobe was the commonly injured lobe and Grade I and Grade II Liver injuries are the common injuries presented with (56%). (P<0. 00025). Patients with Grade V and Grade VI liver injuries had 50% mortality. In stable patients kept on conservative management, 1 patient developed biliary leak, 2 developed liver abscess and the other affected with atelectasis. A B Cresswell et al[6] conducted a study which concluded that the major causes of death in liver injury are uncontrolled haemorrhage early in the clinical course, and sepsis with multiple organ failure in the longterm. The majority of liver injuries can be managed non-operatively and grade of injury was not useful in selecting patients for, or predicting outcome of non-operative management. The initial management of liver injuries was effective trauma resuscitation and prompt transfer of unstable patients to the operating room, where correctly performed perihepatic packing can be a lifesaving, temporising measure. The effective surgical management of complex hepatic injuries was best provided in a dedicated specialist centre with access to the appropriate surgical, radiological and critical care expertise. High energy deceleration injuries resulting in significant juxta-hepatic vascular and caval injuries are accompanied by an extremely high mortality rate despite aggressive surgical intervention, but there is no clear role for acute liver transplantation in these cases at present. Chrysostomoskepertis et al[7] conducted a retrospective study on children below 15 years of age who had sustained abdominal trauma were included and the study results obtained were out of a total of 436 patients, 34 were identified to have liver trauma including one death. The median age was 5.89 and the range 1 to 14 years. Boys accounted for 76.4% (n=26), and the most common cause was motor vehicle injuries, accounting for 41.17% (n=14). 9 children underwent surgery (2.94%) (n=1). Head injuries were the most common associated injuries and mortality rate was 2.94%. This study concluded that the liver is the second most commonly injured intra-abdominal organ and non-operative management is the preferred treatment for haemodynamically stable patients. Diagnosing associated injuries ultrasound remained less reliable than CT scan which remained as a diagnostic modality to rule out other injuries. The non-operative group were regularly followed up by ultrasound and CT imaging techniques. Right lobe of the liver is more involved because of more voluminous portion of liver parenchyma; posterior superior hepatic segments are proximal to fixed anatomical structures such as ribs and spine that may have an important role in determining of the lesion. This finding coincides with that in studies done by Devi Th, Meera et al, Romano Let al. [8] Grade I, II and III had good outcome and grades IV, VI contributed to much of the mortality. (P= 0.0025) According to Kozar RA et al,[9] more complications are noted in high-grade liver injuries. Damage control surgery is preferred over anatomical resection according to Nasim Ahmed et al [10] and SA Badger et al[4] due to increased mortality associated with resectional techniques. In studies by Osama Hegazy et al[11] and Wagih Mommtaz Ghnam et al,[12] similar techniques were used for operative management. Hepatorrhaphy was the major surgical technique devised in all the above studies. Resectional debridement was not used as a technique in study by Osama Hegazy et al.[11] Thiago Messias Zago et al[13] conducted a retrospective study of patients over 13 years of age admitted to a university hospital from 1990 to 2010, submitted to surgery or non-operative management (NOM). The results obtained were 748 patients were admitted with liver trauma. The most common mechanism of injury was penetrating trauma (461 cases, 61.6%), blunt trauma

occurring in 287 patients (38.4%). According to the degree of liver injury (AAST-OIS), blunt trauma was dominantly observed Grades I and II; and in penetrating trauma, Grade III. NOM was performed in 25.7% of patients with blunt injury. As for surgical procedures, suturing was performed more frequently (41.2%). The liver-related morbidity was 16.7%. The survival rate for patients with liver trauma was 73.5% for blunt and 84.2% for penetrating trauma. Mortality in complex trauma was 45.9%. This study concluded that trauma remains more common in younger populations and in males. There was a reduction of penetrating liver trauma. NOM proved safe and effective, and often has been used to treat patients with penetrating liver trauma. Morbidity was high and mortality was higher in victims of blunt trauma and complex liver injuries.

CONCLUSION: Liver trauma remains highly prevalent among the young and male population. Morbidity was high and mortality was higher in victims who had associated injuries. The mechanism of injury is the important factor which is responsible for morbidity in liver injury. Non-operative management proved to be safe and effective and often has been used to treat patients with liver trauma.

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