International Journal of Medical and Pharmaceutical Research
Website: https://ijmpr.in/ | Print ISSN: 2958-3675 | Online ISSN: 2958-3683
NLM ID: 9918523075206676
Volume: 4 Issue:5 (Sep-Oct 2023); Page No: 411-415

Original Article

IJMPR

A Retrospective Study of Comparison between Conservative and Operative Management in A Liver Trauma Patient at A Tertiary Healthcare Center

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ABSTRACT

Introduction: The liver is one of the most frequently damaged organs and remains the most common cause of death following blunt abdominal trauma. Currently, a conservative management constitutes the treatment of choice in patients with hemodynamic stability..

Aim and Objective: We aimed to analyze the effectiveness and morbi-mortality of both conservative and surgical treatment options.

Material and Methods: This prospective study was conducted at the Dept. of Traumatology and Surgery, MGM Hospital, Jaipur, Rajasthan, from April 2023 to July 2023. The study used non-probability consecutive sampling to select 80 liver trauma patients. The patients included were at least 18 years old and of both genders, and they were trauma patients who were hemodynamically stable at the time of presentation and voluntarily agreed to participate in the study.

Results: The study included patients with a mean age of 40.32 ± 11.5 years. The most prevalent types of extra-abdominal injuries among the patients were pancreas injuries (17.5%), CNS (Central Nervous System) injuries (57.5%), chest injuries (15%), diaphragm injuries (15%), spleen injuries (16.2%), and kidney injuries (10%). There was a significant variation (p=0.000) observed in the ICU stay and hospital stay between both study groups. We found 3.3% mortality in conservative group and 25% in operative group.

Conclusion: Conservative treatment is an adequate treatment in mild to moderate liver injury patients. Failure of conservative treatment did not show a higher incidence of complications or mortality but it should be performed in centres with experienced surgeons**.**

Key Words: *Liver injury, Conservative management, Surgical treatment.*

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INTRODUCTION

Liver injuries are common in cases of blunt or penetrating trauma, despite the liver being well-protected in the body [1]. Minor injuries typically do not require medical attention. Liver trauma is the most frequent severe abdominal injury, accounting for 20%-40% of all trauma-related fatalities [2]. The right lobe of the liver, being larger and centrally located, is often affected near the ribs. A significant majority (over 85%) of injuries occur in segments 6, 7, and 8 when broken down into liver segments. Injuries to multiple organs increase the risk of death and disability. Interestingly, bleeding from 86% of liver injuries stops by the time operational care is provided [3]. Over the past two decades, various management styles have been employed, ranging from packing to the current non operative management (NOM). CT scans are now utilized to determine the appropriate surgical procedure. Abdominal CT scans are considered highly accurate for diagnosis and grading, as they can assess bleeding severity and identify ongoing bleeding [4].

NOM has numerous advantages, including reduced intra-abdominal problems, decreased need for blood transfusions, earlier hospital discharge, and fewer unnecessary investigations. Selective NOM has shown lower mortality rates compared to surgical intervention [5]. Presently, the majority of patients (about 80% for adults and 97% for children) in specialist trauma centers are treated conservatively [6]. Most hospitalized patients with mild to severe liver damage respond well to NOM. However, NOM is only used for managing a third of serious injuries. Researchers have recommended conservative care for hemodynamically stable patients. Due to increased urbanization and motorization,

the incidence of traumatic injuries and associated adverse outcomes, including mortality, has risen significantly [7]. Nevertheless, there is a lack of regional-scale information regarding the role of NOM in liver traumatic injuries. The objective of this study was to analyze the effectiveness and morbi-mortality of both conservative and surgical treatment options.

MATERIAL AND METHODS

This prospective study was conducted at the Department of Traumatology and Surgery, MGM Hospital, Jaipur, Rajasthan, from April 2023 to July 2023, following approval from the institute's ethical review board. The study used non-probability consecutive sampling to select 80 liver trauma patients. The patients included were at least 18 years old and of both genders, and they were trauma patients who were hemodynamically stable at the time of presentation and voluntarily agreed to participate in the study. Patients with severe stomach injuries, those declared deceased at the scene, hemodynamically unstable traumatic patients requiring emergency operative management, and patients with multiple polytrauma injuries were excluded.

Data recorded for each patient included patient demographics, CT findings (if available), blood transfusion history, severity of liver damage, the approach to treatment (non-surgical vs. operational), length of hospital stay, duration of intensive care unit (ICU) stay, and fatality rates. Hemoperitoneum examination was performed using Focused Assessment with Sonography in Trauma (FAST). Liver injury severity was graded from I to VI based on abdominal CT scan examination. Patients with mild to moderate liver damage (grades I-III) were admitted to the ward, while those with severe liver injury (grade IV) were referred to the ICU for close monitoring and follow-up. An operating room was always available for patients whose health deteriorated.

Conservative management was discontinued if the patient experienced tachycardia (>100 Bpm) and/or hypotension (systolic <90, diastolic <60 mmHg) within the first 48 hours of observation. Other conditions for discontinuing conservative management included increased transfusion requirement, increased abdominal pain and tenderness, expansion of a hematoma on CT, or development of a symptomatic perihepatic fluid collection, hematoma, or biloma.

Patients were followed throughout their hospitalization, and the final outcomes, such as discharge with stable condition, conversion to operative management, or death, were recorded. Based on the described criteria, the patients were divided into two groups: the Conservative group (n=60) and the Operative group (n=20).

The study used descriptive statistics to summarize the data. Categorical variables were presented as frequencies and percentages, while normally distributed numerical variables were summarized as mean ± standard deviation. Non-normally distributed numerical variables were summarized using the median and interquartile range. To analyze the significance between the two study groups, SPSS version 26 was utilized. The level of significance was set at a p-value of ≤ 0.05, indicating that any result with a p-value equal to or less than 0.05 was considered statistically significant.

RESULTS

The study included patients with a mean age of 40.32 ± 11.5 years, ranging from 16 to 82 years. The injuries were attributed to different causes, with traffic accidents accounting for 63.1% of cases, stab wounds for 10.6%, and falls for 13.3%.

The mean Injury Severity Score (ISS) of the patients was 25.8 ± 12.1 points, ranging from 4 to 54 [11]. The severity of the hepatic injuries, classified according to the HIS criteria, was as follows: grade I - 13 cases (16.25%), grade II - 19 cases (23.75%), grade III - 32 cases (40%), grade IV - 10 cases (12.5%), and grade V - 6 cases (7.5%).

Table 1: Demographic Data

Demographic Data	Conservative Group	Operative Group	P-Value
Age (in years)	40.32±11.5	39.28±9.6	
Sex (M/F)	40/20	15/5	
Associated Injury			
Chest	8(13.3%)	4(20%)	
CNS	40(66.6%)	6(30%)	
Diaphragm	9(15%)	3(15%)	
Kidney	7(11.6%)	1(5%)	
Pancreas	10(16.6%)	4(20%)	
Spleen	12(20%)	1(5%)	
ICU Stay	3.1±0.91	7.18±1.64	
Hospital Stay	7.1±1.4	12.61±2.21	

In Table 2, the most prevalent types of extra-abdominal injuries among the patients were pancreas injuries (17.5%), CNS (Central Nervous System) injuries (57.5%), chest injuries (15%), diaphragm injuries (15%), spleen injuries (16.2%), and kidney injuries (10%). Additionally, a significant proportion of patients, accounting for 74.8% of the total, presented with extra-abdominal lesions, including thoracic injuries (44-55%), bone fractures (34-42.5%), cranioencephalic trauma (19-23.7%), pelvic injuries (12-15%), and vertebral lesions (5-6.25%). These findings underscore the multisystem nature of the trauma experienced by the patients, with various organs and body systems affected.

Table 2: Associated Injury

Associated Injury	Conservative Group	Operative Group	P-Value
Chest	8(13.3%)	4(20%)	
CNS	40(66.6%)	6(30%)	
Diaphragm	9(15%)	3(15%)	
Kidney	7(11.6%)	1(5%)	
Pancreas	10(16.6%)	4(20%)	
Spleen	12(20%)	1(5%)	

Table 3 revealed that the majority of patients in both the conservative group (37%) and operative group (32%) had Liver injury grade 1 and grade 5, respectively.

Table 3: Liver Injury Grade

Initial Injury Grade	Conservative Group		Operative Group		P-Value
	No. of Patients	Percentage	No. of Patients	Percentage	
Grade 1	22	37.00	2	20.00	
Grade 2	17	29.00	3	14.00	
Grade 3	12	20.00	8	10.00	
Grade 4	7	11.00	2	24.00	
Grade 5	2	3.00	5	32.00	

In Table 4, the mean ± standard deviation (S.D) of ICU stay in the conservative group was 3.1 ± 0.91 days, while in the operative group it was 7.18 ± 1.64 days. There was a significant variation (p=0.000) observed in the ICU stay between both study groups. Similarly, the mean ± S.D of hospital stay in the conservative group was 7.1 ± 1.4 days, and in the operative group, it was 12.61 ± 2.21 days. Again, a significant variation (p=0.000) was observed in the hospital stay between both study groups. These findings indicate that the length of stay in both the ICU and hospital was significantly different between the conservative and operative treatment groups.

Table 4: ICU and Hospital Stay

Parameter	Conservative Group	Operative Group	P-Value
ICU Stay	3.1±0.91	7.18±1.64	
Hospital Stay	7.1±1.4	12.61±2.21	

Table 5 revealed that 6.6% of patients in the conservative group and 8% of patients in the operative group experienced morbidity.

Table 5: Morbidity

Morbidity	Conservative Group		Operative Group		P-Value
	No. of Patients	Percentage	No. of Patients	Percentage	
Yes	4	6.66	8	40	
No	56	93.33	12	60	
Total	60	100	20	100	

In table 6, we found 3.3% mortality in conservative group and 25% in operative group.

Table 6: Mortality

Mortality	Conservative Group		Operative Group		P-Value
	No. of Patients	Percentage	No. of Patients	Percentage	
Yes	2	3.33	5	25	
No	58	96.6	15	75	
Total	60	100	20	100	

DISCUSSION

Among solid organs, the liver ranks second in terms of the rate of damage. Due to its anatomical location, liver injuries often lead to fatal hemorrhage. Sudden trauma is the primary cause of liver damage [8, 9]. Over the last decade, the incidence of liver damage in India has increased, corresponding to the growing frequency of car accidents. In the current study, a significant majority of patients with liver damage were men (66.5%). Furthermore, more than 75% of adult patients were treated with non-operative management (NOM).

Over the past 15 years, there has been a progressive change in the approach to treating liver damage. The catalyst for this shift was an initial publication in 1990, which drew inspiration from the practices of pediatric surgeons. These surgeons demonstrated the feasibility of non-operative management (NOM) in hemodynamically stable patients with liver and spleen injuries [10]. This groundbreaking work paved the way for a new approach to managing liver damage, emphasizing the potential benefits of NOM in appropriate cases.

Opting for non-operative management (NOM) reduces the occurrence of unnecessary surgeries and lowers the risk of death and other adverse outcomes [11]. Fortunately, the majority of liver injuries (75%) are classified as minor, falling within grade III or below [12]. Traditionally, medical professionals have employed liver sutures, diathermy, or hemostatic medications to control bleeding in these cases, resulting in optimal levels of NOM. However, a significant challenge arises when determining whether to operate on the remaining 25% of patients with severe liver damage [13].

A study conducted by Bernardo C G et al [14] reported that mortality rates remained similar in both periods of the study (13.6% in the first period vs. 14.5% in the second period, $p = 0.532$). However, the occurrence of morbidity related to surgery and medical complications decreased since 2000, with surgical morbidity declining from 38.4% to 29.4% ($p = 0.369$), and medical morbidity dropping from 14.7% to 3.6% ($p = 0.028$). Overall, general morbidity decreased in the second period of the study ($p = 0.015$). These findings suggest advancements in treatment approaches have led to improved patient outcomes, with reduced complications and improved survival rates over time.

In the research conducted by Beardsley and Gananadha [12], failure of non-operative management (NOM) occurred in approximately 25% of patients, primarily due to liver necrosis, bile leak, rebleeding, or secondary sepsis. In our own analysis, 10 patients (6.7%) experienced NOM failure, with most cases attributed to damage to other organs. Similar findings were observed in an Albanian study [15], which reported a success rate of 83% for NOM. Additionally, in another Turkish trial, 192 patients (63% stable, 37% unstable) underwent NOM, while 108 opted for surgery. Among the fatalities, 13% of patients had severe liver damage grades and hemodynamic instability upon admission [16]. These results highlight the importance of carefully considering the appropriateness of NOM in patients with liver injuries, particularly in cases of severe damage and unstable hemodynamic status.

In the study by Carrillo et al. [17] biliary leak was identified as the primary cause of morbidity in 10 participants. Additionally, 2.8% of patients were diagnosed with complicated blunt hepatic injuries. In another research conducted by Bala et al., which analyzed 398 patients with liver injuries, only 16 of them encountered issues, such as biloma and bile leak [18]. The treatment for bile leak included drainage and endoscopic retrograde cholangiopancreatography (ERCP). In some cases, pseudoaneurysms may rebleed, necessitating emergency angioembolization.

Previously reserved for patients with mild liver damage (grade III or less), non-operative management (NOM) is now widely considered the preferred treatment for patients with stable hemodynamic status, regardless of liver injury grade or the quantity of hemoperitoneum estimated by CT. While 79% of grade IV patients were successfully treated with NOM in the present research, 76% of grade V patients required surgical intervention due to the restricted expertise of the medical team. The surgical approach aims to control blood loss, stop bile leakage, remove necrotic tissue, prevent infection, and drain the abdominal cavity [19].

CONCLUSION

Conservative treatment of hepatic injury is suitable for patients who exhibit hemodynamic stability. However, in cases of grade V injuries, there is a significant risk of conservative treatment failure, and we believe that these patients should undergo surgical treatment following diagnosis. It's important to note that failure of conservative treatment does not necessarily lead to an increase in the incidence of complications or mortality in centers equipped with adequate infrastructure for monitoring and/or continued intensive therapy, and with immediate access to surgical intervention if required. In such centers, patients can be managed effectively with appropriate medical support, ensuring their safety and well-being.

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