Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 10, 2023

Original research article

A prospective analysis of non-operative management of liver injury in blunt abdominal trauma

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Abstract

Background and Objective: To assess the effectiveness of conservative therapy in individuals who have suffered blunt abdominal trauma and liver damage. To establish a guideline to assist in determining when to switch from a conservative course of treatment to surgical surgery. To research the side effects of treating liver traumatic injury conservatively

Method: A prospective single centre study was performed on 60 individuals who have been diagnosed with blunt abdominal trauma and liver injury were included in the study. The incident involving the bunt injury to the abdomen is thoroughly investigated. Systematic analysis and fundamental research are conducted.

Result: In 60% (n=35) of the instances, the patients had mild hemoperitoneum, 28% (n=15) had moderate hemoperitoneum, and 12% (n=10) had severe hemoperitoneum. The bulk of them (n=20, 34%) were in Grade I according to the liver injury grading system. Grades II (n=15, 26%), III (n=15, 24%), and IV (n=8, 16%) were the most common. Out of 60 patients, 55 (92%) had conservative management, whereas two (6%) required an emergency laparotomy. Out of 55 patients, 5 died in the conservative group's group (55) while 1 died in the group receiving emergency laparotomy.

Conclusion: The ages of the patients ranged from 11 to 62, with the median age being 36 and the mean age being 35.80. There was a deviation of 12.06 standard deviations. Of the total of 60 patients, 88% were men and only 12% were women. Most of them (n=17, or 34%) were classified as having only Grade I liver injury. Grades two through four were represented as follows: thirteen (26%), twelve (24%), and eight (16%). Of the 60 patients, 55 (96%) were treated with conservative methods and 2 (4%), with emergency laparotomies. In the emergency laparotomy group, 5 patients died while only 3 of the 55 in the conservative group did.

Keywords: Blunt abdominal trauma, liver injury, liver function test, laparotomy

Introduction

Over sixteen percent of all medical costs are related to trauma, and it is the number two leading cause of hospitalisation worldwide. By 2020, injuries, not illnesses, will be the major cause of lost work time, according to the World Health Organisation. An estimated 13% of polytrauma patients with spleen injuries and 16% with liver injuries also sustain abdominal injuries. Liver failure is the leading cause of death after an abdominal injury. Improved non-management methods, diagnostic tools, and emergency care treatment can avoid between 50 and 80% of hepatic haemorrhage. The liver is the largest gland and the second-largest organ in the human body, typically weighing around 1.5 kg. Anatomically, it spans from the right upper abdomen and mid abdomen to the left upper abdomen, just above the diaphragm. It's shaped like a wedge, has a pinkish hue, and is pliable and vascularized. Right is where it widens out and left is where it tapers off [1, 2].

In contrast, Cantlie's line is used to divide the liver into two lobes of nearly equal size during surgery. The IVC fossa is linked to the gall bladder fossa via this line. This section is based on the arterial supply and portal vein. The primary hepatic vein can be found in the Cantlie's line. The ventral mesogastrium is a diverticulum that arises during intrauterine life at the intersection of the foregut and the midgut. The diaphragm develops from the cranial part of this mesogastrium, whereas the caudal part forms the septum transversum. This diverticulum also develops the bile ducts and gallbladder. Ligamentum teres hepatis is formed when the umbilical vein is cut and attached to the left portal vein. The ligamentum venosum forms the ductus vennosus by joining the left portal vein to the left hepatic vein. The liver's top surface can be gently tapped at the fifth left intercostal gap. On the right, there is no break between the anterior, posterior, and superior surfaces [2, 3].

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 10, 2023

An H-shaped fissure may appear on the underside of the liver. On the underside of the organ, an H shaped fissure may be seen. The right vertical arm of the H is made up of the inferior vena cava (IVC) in the back and the gallbladder in the front. Midway through the caudate transformation. The ligamentum teres hepatis forms the front of the H, while the ligamentum venosum forms the back. The Glisson capsule is located directly beneath the serosal layer on the liver's surface. Hepatocytes and endothelial cells make up the major capillaries of the liver. They are home to the reticuloendothelial system's Kupffer cells. The portal tract, hepatic artery branches, portal vein bile ducts, and peripheral hepatic vein tributaries are all located within a hexagonal lobule of the liver [3, 4].

The haemorrhage had stopped before surgery, according to previous research. There is a correlation between morbidity and elective, non-therapeutic surgeries. The use of CT scans has allowed for more precise patient selection for non-operative treatment. Blunt liver trauma is typically treated non-operatively today. Patients should only opt for non-operative treatment if their hemodynamics are stable and there are no contraindications to laparotomy. The techniques used during laparotomies have also gotten less complicated. In a few cases, surgical intervention is avoided in favour of sucessful trial with selective embolisation. Patients with severe injuries for whom non-operative therapy is not an option should only have surgery. Patients who don't respond to non-surgical treatment in a smaller centre should be shifted to larger ones. There are fewer data on the non-operative management of liver injuries from smaller facilities [4, 5].

Material and Methods

A prospective single centre study was performed on 60 patients admitted to Department of General Surgery, Government Medical College, Nalgonda, Telangana, India, during the study period August 2022 to July 2023, who satisfied the study criteria. The history and clinical examination of the cases were performed along with routine preoperative investigations. Purpose sampling was used, and the data were statistically analysed.

Inclusion criteria

1. Patients of all ages with significant abdominal trauma who have liver injury documented by a USG/CT scan
2. Patients with stable hemodynamics and liver damage of all degrees but no signs of peritonitis

Exclusion criteria

1. Dynamic instability
2. Acute liver damage that is combined with peritonitis or any other solid organ
3. Internal abdominal haemorrhage

Result

Table 1: Age distribution of the participants

Characteristic	Age in years
Mean	36.50
Median	35.50
Mode	28[a]
Std. Deviation	11.065
Minimum	12
Maximum	63

Table 2: Latent Period

Latent time in hrs	
Mean	2.80
Median	2.20
Mode	2
Std. Deviation	1.83
Minimum	2
Maximum	5

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 10, 2023

Table 3: Liver Function Tests

	Admission	Day 3	Day 7	Chi-square analysis p-value
Elevated	0	5 (8%)	8 (13%)	8.12
Within normal limits	60	55 (92%)	52 (87%)	$p<0.05$

Table 4: Grading of liver Injury

Liver injury grade	Frequency	Percent
I	20	34.0
II	16	26.0
III	14	23.0
IV	10	17.0
Total	60	100.0

Table 5: Management

Management	Frequency	Percent
Emergency laparotomy	5	8.0
Conservatively managed	55	92.0
Total	60	100.0

Table 6: Mortality

Mortality	Frequency
Emergency Laparotomy	2 out of 5 patients
Conservative Group	5 out of 55 patients
Total	60

Discussion

Trauma accounts for around 16% of total medical expenditures, rendering it the second most prevalent factor leading to hospitalisation on a global scale. As per the World Health Organisation, it is projected that injuries will assume the foremost position as the primary cause of work time loss by the year 2020. The prevalence of abdominal injuries in individuals with polytrauma is estimated to be 31%, with 13% of these cases specifically having splenic damage and 16% including hepatic injury. Abdominal injuries frequently lead to fatality as a consequence of hepatic impairment. The implementation of enhanced non-management strategies, diagnostic tools, and emergency care protocols has resulted in a significant decrease in the fatality rate associated with hepatic bleeding incidents, ranging from 50 to 80 percent. The liver, which is the second largest organ and the largest gland in the human body, generally has an average weight of approximately 1.5 kg. Located in close proximity to the diaphragm, it extends towards the upper right quadrant of the abdomen and the central region of the upper left quadrant [5, 6].

The International Hepato-Pancreato-Biliary Association (IHPBA) has developed widely employed terminology to describe the anatomical organisation of the liver and its surgical excision. The formation of a ventral mesogastrium, which is a ventral diverticulum, occurs during the developmental stage within the uterus at the intersection between the foregut and midgut. The posterior segment of the mesogastrium gives rise to the septum transversum, whereas the anterior segment gives rise to the diaphragm. The formation of the bile ducts and gallbladder can be attributed to this diverticulum. The formation of the ligamentum teres hepatis occurs as a result of the severance of the umbilical vein, followed by its subsequent attachment to the left portal vein. The anatomical structure known as the ligamentum venosum serves to establish a connection between the left portal vein and the left hepatic vein, ultimately resulting in the formation of the ductus venosus. The formation of a ventral mesogastrium, a ventral diverticulum, occurs during the developmental stage within the uterus at the intersection of the foregut and midgut. The posterior part of the mesogastrium gives rise to the septum transversum, whereas the anterior part gives rise to the diaphragm. The formation of the bile ducts and gallbladder can be attributed to this diverticulum. The formation of the ligamentum teres hepatis occurs by the severance of the umbilical vein, followed by its subsequent attachment to the left portal vein. The anatomical structure known as the ligamentum venosum serves to establish a connection between the left portal vein and the left hepatic vein, so contributing to the formation of the ductus venosus. The upper surface of the liver can be softly percussed at the fifth intercostal gap on the left side. There is an absence of separation between the anterior, posterior, or superior surfaces on the right [6, 7].

The diaphragm is anatomically connected to the anterior abdominal wall at these specific planes. The inferior barrier effectively separates the visceral surface from the anterior surface. The manifestation of this border becomes evident in clinical settings when a patient is transported over extended distances. The inferior surface of the human body contains several organs, namely the hepatic flexure, right kidney, transverse colon, duodenum, and stomach. There exists a significant degree of closeness between the gall

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 10, 2023

bladder and the inferior surface of the liver. A discernible fissure resembling the letter "H" can be observed on the ventral surface of the liver. A hepatic fissure in the shape of the letter "H" is located on the ventral surface of the liver. The gallbladder consists of the posterior segments of the right vertical arm of the H, the anterior vena cava (AV), and the inferior vena cava (IVC). The left vertical arm of the letter H, which is comprised of the ligamentum teres hepatis anteriorly and the ligamentum venosum posteriorly, serves as an indicator that the caudate operation has reached approximately 50% completion. The Glisson capsule is positioned in close proximity to the serosal layer on the surface of the liver [7, 8].

The enormous capillaries of the liver contain both hepatocytes and endothelial cells. Kupffer cells are found in the reticuloendothelial system. Within each hexagonal lobule of the liver are the central portal tract, branches of the hepatic arteries, portal vein bile ducts, and tributaries of the peripheral hepatic veins. Surgical intervention is becoming less sought after as a therapy option for liver disease. The bleeding had ceased before the operation, according to the available evidence. There is a correlation between morbidity and elective surgical procedures. With the help of CT scans, non-operative treatment candidates can be selected with greater precision. Non-operative treatment is now the standard of care for serious liver trauma. Only patients who do not need a laparotomy because their hemodynamics are stable should choose non-operative treatment. Even when laparotomies are necessary, the procedures have become simpler. Sometimes, successful trials of selective embolisation allow doctors to avoid surgical intervention. Surgery should be reserved for patients with severe injuries where non-operative treatment is not an option. If non-surgical treatment fails in a smaller facility, patients should be transferred to a larger facility. Smaller centres have conducted fewer trials on non-operative treatment for liver damage [9, 10].

Sweden has a high success rate for non-operative liver surgery and a low rate of abdominal damage. The average age of the patients was 35.80 years, with a standard deviation of 12.06 years. The median age was 36 years. They ranged in age from eleven to sixty-two. Men made up the vast majority (n=55, 88%) of the 60 cases, while women made up only 12% (n=6). Automobile accidents accounted for the majority (62%) of events, with self-inflicted falls (26%), falls from height (8%), and assault (4%), coming in second and third, respectively. Latent durations can vary from 1 to 5 hours, with 2 being the most common. The standard variation is 1.093 hours. A median latency of 2.7 hours has been observed [11, 12].

On day one after admission, the average heart rate was 95.64 beats per minute; by day seven, it had decreased to 77.64. The average haemoglobin dropped from 95.64 to 77.64 minutes per minute the day of admission. All patients had normal liver function levels on the day they were admitted, the results showed. Ten percent (n=5) of the group had improved liver test results by day 3. Twenty percent (n=10) of the people had abnormal liver test results by day seven. Hemoperitoneum was classified as mild in 60% (n=30), moderate in 28% (n=14), and severe in 12% (n=6) of the patients. Most of them (n=17, or 34%) were found to have Grade I liver injury. The most frequent grade levels were second (n=13, 26%), third (n=12, 24%), and fourth (n=8, 16%). Only two of the sixty patients (4%) required emergency laparotomy, while the remaining 55 (96%) were handled conservatively. Five of the fifty-five patients who required emergency laparotomy ultimately passed away, while only two of the fifty-five who received conservative treatment did so [13, 14].

Conclusion

Patients' ages varied widely, from 11 to 62, with the median age being 36 and the mean age being 35.80. The range of ages varied by 12.06 years on average. The total (n=44, 88%) of the 50 patients were men, while the minority (n=6, 12%) were women. Most (62%) of the events involved motor vehicle collisions, followed by assault (2%) and self-inflicted falls (13%), and then falls from a height (8%). There is a one-to five-hour range for the mean latent period and a one-hour discrepancy for the standard deviation. On day seven, the average pulse rate reduced from 95.64 to 77.64 beats per minute. On day 7, the average haemoglobin had dropped from its initial admission level of 95.64 mcg/min to 77.64 mcg/min. All patients' liver function tests on the day of admission were within normal ranges, as shown by the test results. On day 3, liver values were elevated in 10% (n=5) of patients. On day seven, liver results were elevated for 20% of individuals (n=10). The majority of patients presented with mild hemoperitoneum (n=30), while 28% had moderate hemoperitoneum (n=14), and 12% had severe hemoperitoneum (n=6). According to the liver injury grading system, the vast majority (n=17, 34%) were in Grade I. Second grade (n = 13; 26%), third grade (n = 12; 24%), and fourth grade (n = 8; 16%). Fifty-five (96%) of the patients were treated with non-invasive methods, whereas two (4%) required emergency laparotomies. Five patients out of 55 in the conservative group died, compared to two in the emergency laparotomy group.

Funding support: Nil

Conflict of interest: Nil

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 10, 2023

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