# “AN ANALYTICAL STUDY ON NONOPERATIVE MANAGEMENT OF LIVER INJURY IN BLUNT TRAUMA TO THE ABDOMEN-A PROSPECTIVE STUDY”

DISSERTATION SUBMITTED TO

**THE TAMIL NADU DR.MGR MEDICAL UNIVERSITY, TAMILNADU**

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE

DEGREE OF

**MASTER OF SURGERY**

**IN**

**GENERAL SURGERY**


**DEPARTMENT OF GENERAL SURGERY**

**GOVERNMENT MOHAN KUMARAMANGALAM MEDICAL**

**COLLEGE HOSPITAL, SALEM**

**Year : 2017-2020**

**GOVERNMENT MOHAN KUMARAMANGALAM**

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I solemnly declare that this **"AN ANALYTICAL STUDY ON NONOPERATIVE MANAGEMENT OF LIVER INJURY IN BLUNT TRAUMA TO THE ABDOMEN-A PROSPECTIVE STUDY"** was prepared by me at Government Mohan Kumaramangalam Medical College and Hospital, Salem-636030 under the guidance and supervision of **Prof.Dr.P.SUMATHI, M.S., DGO.,** Professor of General Surgery, Govt. Mohan Kumaramangalam Medical College and Hospital, Salem. This dissertation is submitted to the Tamilnadu Dr.M.G.R Medical University, Chennai-38 in fulfilment of the University regulations for the award of the degree of M.S. General Surgery (Branch I).

Place : Salem

*Signature of the Candidate*

**Dr. N.NANTHAKUMAR**

**GOVERNMENT MOHAN KUMARAMANGALAM**

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**Prof.Dr.C.RAJASEKARAN,M.S.,**
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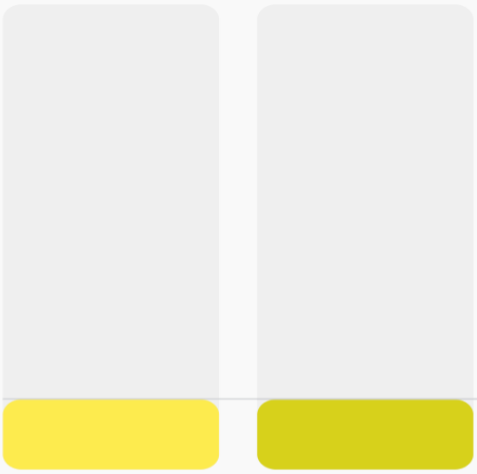

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## ACKNOWLEDGEMENT

I am extremely thankful to **Prof.Dr.THIRUMAL BABU, M.D.,DM.,** Dean, Govt. Mohan Kumaramangalam Medical College and Hospital, Salem for allowing me to utilize the hospital facilities for doing this work.

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# INTRODUCTION

## Introduction

The second most common cause of hospital admission is attributed to trauma which is approximately 16% of the healthcare costs incurred globally. A rough estimates by the World Health Organisation, trauma would become the leading cause of loss of productive years by 2020[1]. An estimate state that around 31% of the patients with poly trauma have abdominal injuries including 13% of spleen injuries and 16% of liver injuries[2,3]. The most common cause of death in abdominal injuries is liver injury. Around 50%-80% of the liver bleeding cease spontaneously and with better non-management practices, diagnostic capabilities and emergency care management, the mortality rate has decreased[4,5].

Weighing an average of 1.5 kg, liver is the largest gland in the body and the second largest organ in the body. It is anatomically located under the diaphragm in the region of the right upper abdomen and mid abdomen extending up to the left upper abdomen. It is wedge shaped with the apex to the left and the base to the right, pinkish in colour and soft in consistency with high vascularity[24]. The most commonly followed terminology for liver anatomy and resections is by the International Hepto-Pancreato-Biliary Association (IHPBA).

The liver has two lobes, the right and the left that is separated by the falciform ligament. But surgically, Cantlie's line divides the liver into right and left lobes of

almost equal sizes. This line runs from the gall bladder fossa to the IVC fossa. This division is by the arterial supply and the portal vein. The Cantlie's line contains the middle hepatic vein.

In the intrauterine life, at the junction of foregut and midgut, a ventral diverticulum grows out as the ventral mesogastrium. The caudal part of this mesogastrium forms the septum transversum while the cranial part forms the diaphragm. This diverticulum also forms the bile ducts and gall bladder. The obliterated umbilical vein forms the ligamentum teres hepatis that joins the left portal vein. The obliterated ductus venosus forms the ligamentum venosum that connects the left portal vein and left hepatic vein.

At the left fifth intercostal space, the upper surface of the liver can be percussed. The following surfaces are continuous; right, superior, posterior and anterior. These surfaces are in relation to the anterior abdominal wall and the diaphragm. The anterior surface is demarcated from the visceral surface by the presence of a sharp inferior border. This border is clinically palpable when the patient is in deep inspiration. The inferior surface is related to the following;

Hepatic flexure, Right kidney, Transverse colon, Duodenum and Stomach

The under surface of the liver is in relation to the gall bladder.

The inferior surface of the liver contains a fissure that is in the shape of H.

There is an H-shaped fissure on the inferior surface of the liver. The right vertical arm of the H is formed by the gallbladder anteriorly and the inferior vena cava (IVC) posteriorly; it is incomplete, with the caudate process between the two. The left vertical arm of the H is formed by the ligamentum teres hepatis in front and the ligamentum venosum behind.

The liver surface has the serosal covering and contains the Glisson capsule under it.

Liver contains large-diameter capillaries that contains the endothelial cells and hepatocytes. They contain the Kupffer cells of the RES (**reticuloendothelial system**).

An hexagonal lobule of the liver contains the following;

central portal tract, branches of the hepatic artery, the portal vein

bile ducts, and peripheral tributary of the hepatic vein

Bile canaliculi between hepatocytes drain into bile ductules in the portal triad. Bile ductules then form several orders of intrahepatic bile ducts, in an arrangement resembling the twigs and branches of a tree.

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The trend from operative management has shifted towards conservative management in liver injuries[6-12]. Previous studies report the cessation of bleeding by the time of operation[13]. Non-therapeutic operative procedures are correlated with morbidity[14]. The utilisation of CT scan has enabled the improved selection of patients for non-operative management[15]. Today, the non-operative management has become the prime treatment of choice for blunt liver trauma.

The non-operative management is the opted only in hemodynamically stable patients who do not have any danger signs or any indications for laparotomy. Even

in case of laparotomy, the procedures have become less extensive[16]. In few cases, instead of surgery, selective embolization is preferred and experimented with success[17].

The surgical management is reserved for patients where the injuries are extensive and non-operative management is not feasible[18, 19]. If non-operative management fails in a small center, patients should be referred to higher centers[20,21].

There are not many reports from smaller centers on non-operative management of liver traumas. Sweden has a low incidence of abdominal trauma and has a high success rate of non-operative management of liver surgeries[22,23].

# REVIEW
# OF LITERATURE

## Review of Literature

Weighing an average of 1.5 kg, liver is the largest gland in the body and the second largest organ in the body. It is anatomically located under the diaphragm in the region of the right upper abdomen and mid abdomen extending up to the left upper abdomen. It is wedge shaped with the apex to the left and the base to the right, pinkish in colour and soft in consistency with high vascularity[24]. The most commonly followed terminology for liver anatomy and resections is by the International Hepto-Pancreato-Biliary Association (IHPBA).

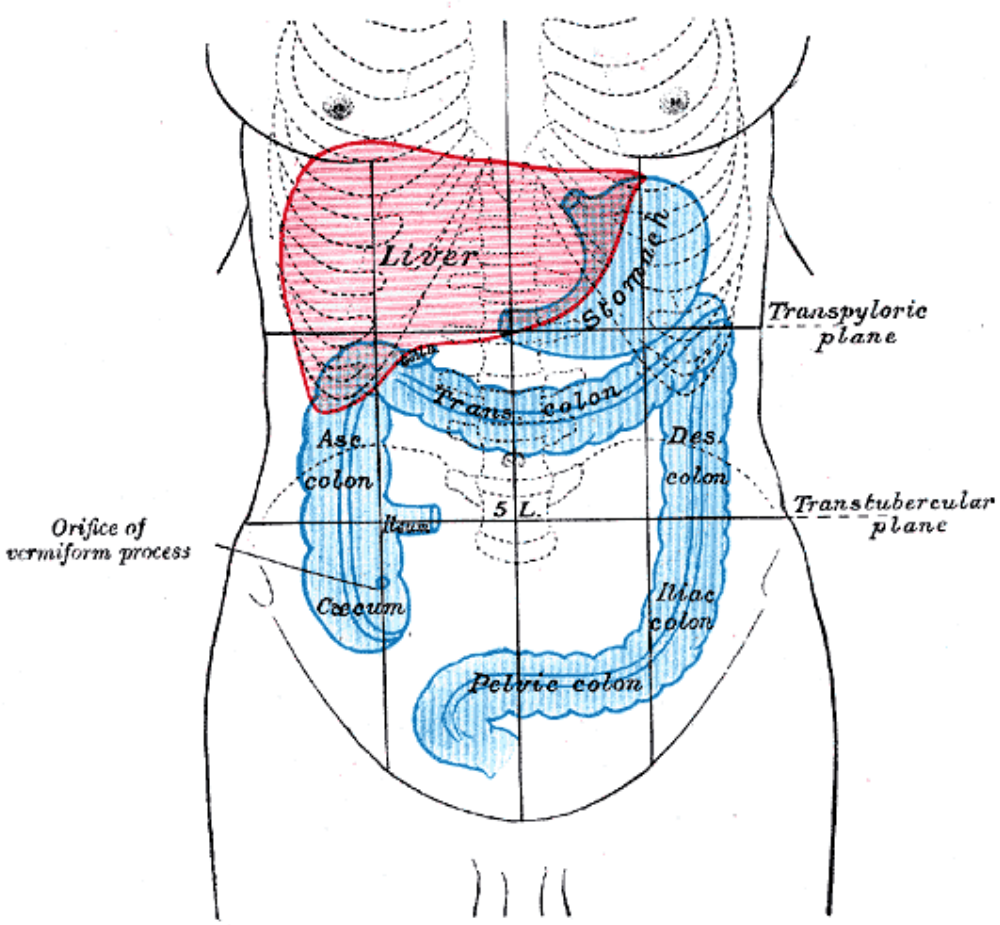


Image 1: Surface anatomy of liver

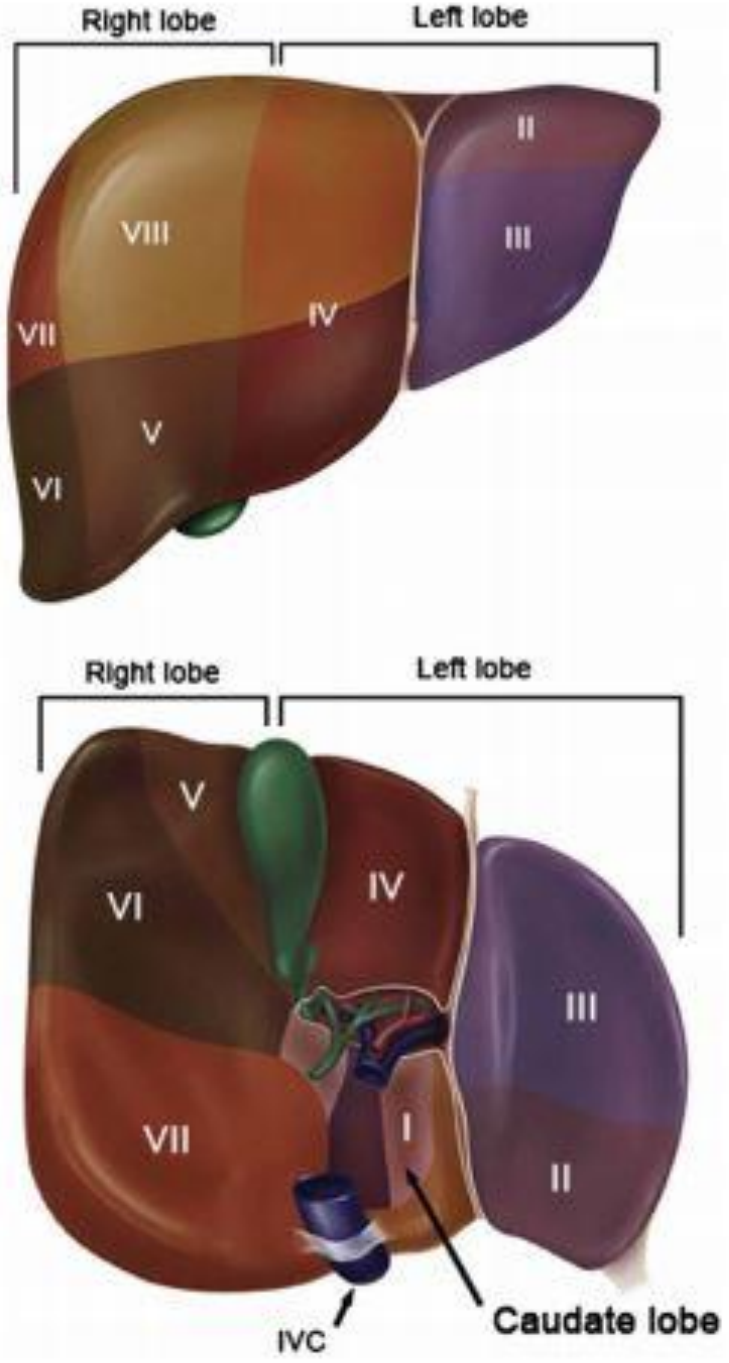


**Fig. 1.**
Anterior and posterior surfaces of liver illustrating functional division of the liver into left and right hepatic lobes with Couinaud's segmental classification based on functional anatomy. *From* Brunicardi FC, Andersen DK, Billiar TR, et al. Schwartz's principles of surgery. 9th edition. New York: McGraw-Hill Publishing; 2010. p. 31–3; with permission.

**Gross anatomy of the liver**[25]

In the intrauterine life, at the junction of foregut and midgut, a ventral diverticulum grows out as the ventral mesogastrium. The caudal part of this mesogastrium forms the septum transversum while the cranial part forms the diaphragm. This diverticulum also forms the bile ducts and gall bladder. The obliterated umbilical vein forms the ligamentum teres hepatis that joins the left portal vein. The obliterated ductus venosus forms the ligamentum venosum that connects the left portal vein and left hepatic vein.

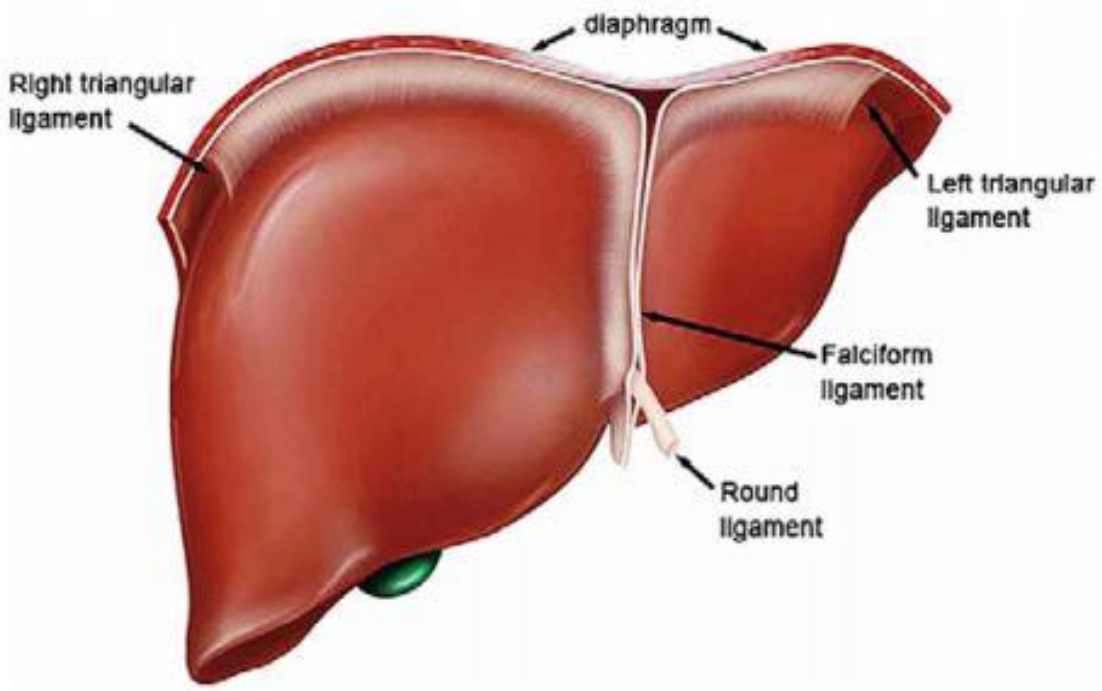


Fig. 2.
Ligamentous attachments of the liver. *From* Brunicardi FC, Andersen DK, Billiar TR, et al. Schwartz's principles of surgery. 9th edition. New York: McGraw-Hill Publishing; 2010. p. 31–2; with permission.

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a) Hepatic flexure

b) Right kidney

c) Transverse colon

d) Duodenum

e) Stomach

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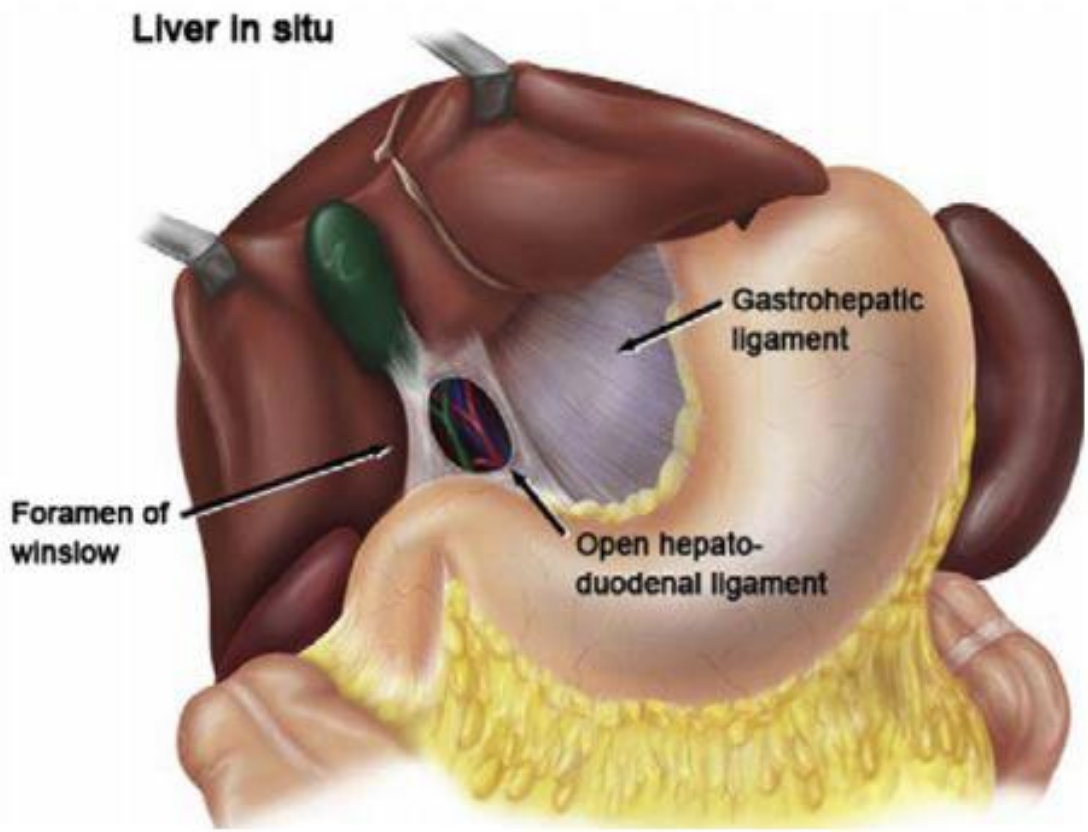


Fig. 3.
Association of stomach, porta hepatis, and hepatic flexure to the Liver. *From* Brunicardi FC, Andersen DK, Billiar TR, et al. Schwartz's principles of surgery. 9th edition. New York: McGraw-Hill Publishing; 2010. p. 31–3; with permission.

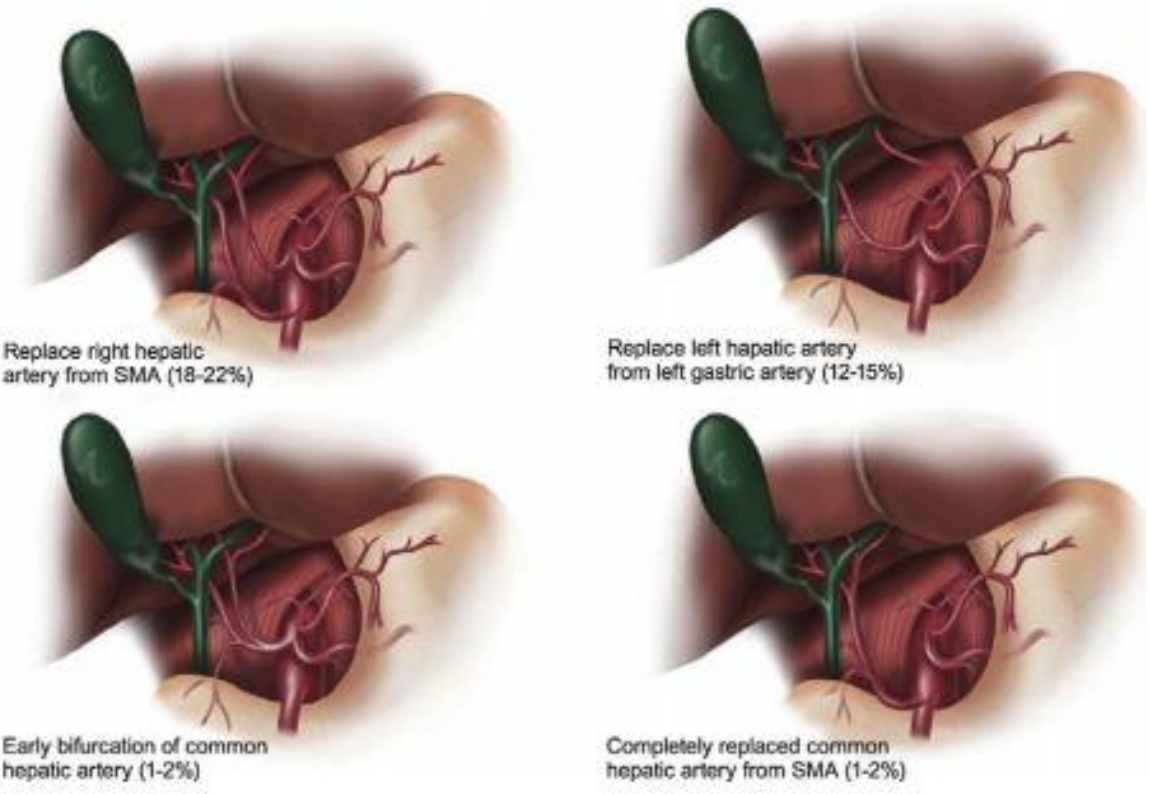


**Fig. 5.**
Common variations of hepatic vasculature. *From* Brunicardi FC, Andersen DK, Billiar TR, et al. Schwartz's principles of surgery. 9th edition. New York: McGraw-Hill Publishing. p. 31–4; 2010.

## Anatomic Divisions

The liver has two lobes, the right and the left that is separated by the falciform ligament. But surgically, Cantlie's line divides the liver into right and left lobes of almost equal sizes. This line runs from the gall bladder fossa to the IVC fossa. This division is by the arterial supply and the portal vein. The Cantlie's line contains the middle hepatic vein.

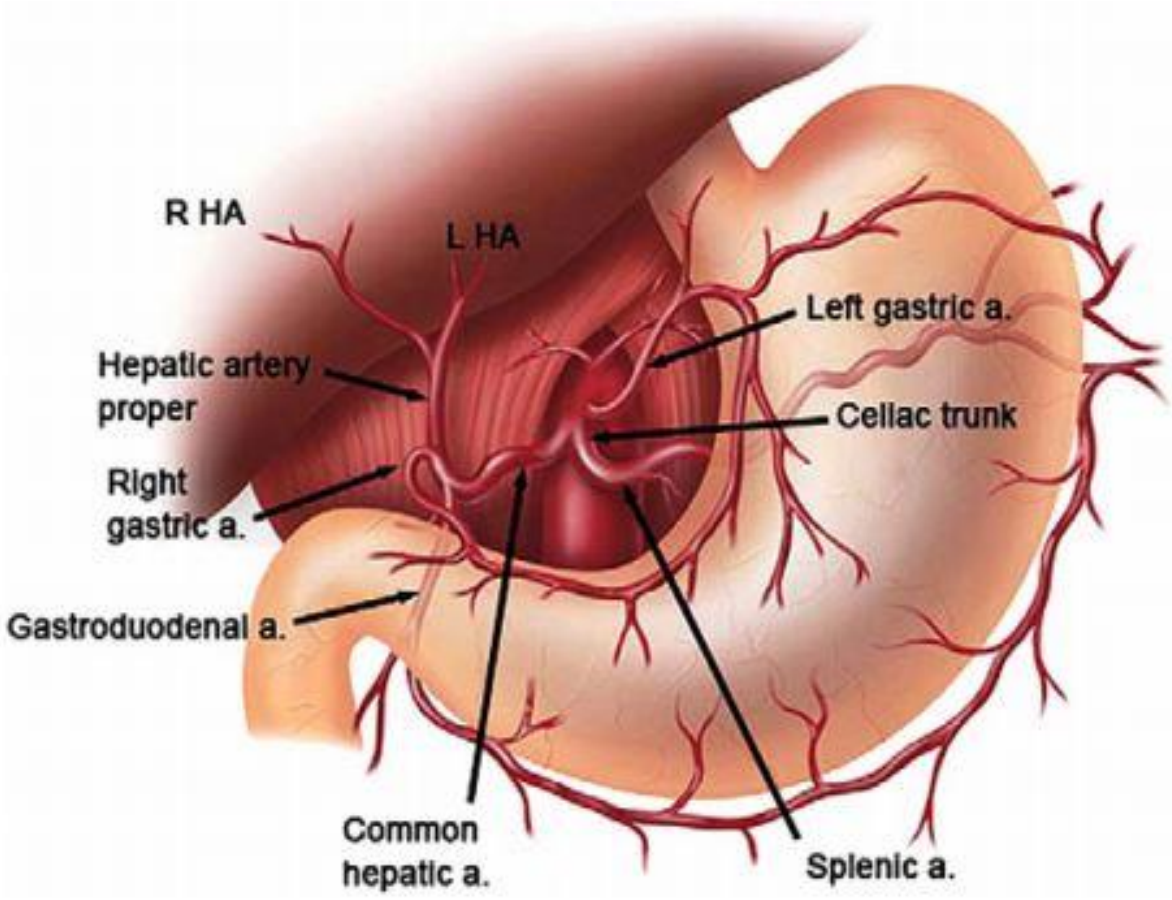


**Fig. 4.**
Common hepatic arterial configuration. HA, hepatic artery. *From* Brunicardi FC, Andersen DK, Billiar TR, et al. Schwartz's principles of surgery. 9th edition. New York: McGraw-Hill Publishing; 2010. p. 31–4; with permission.

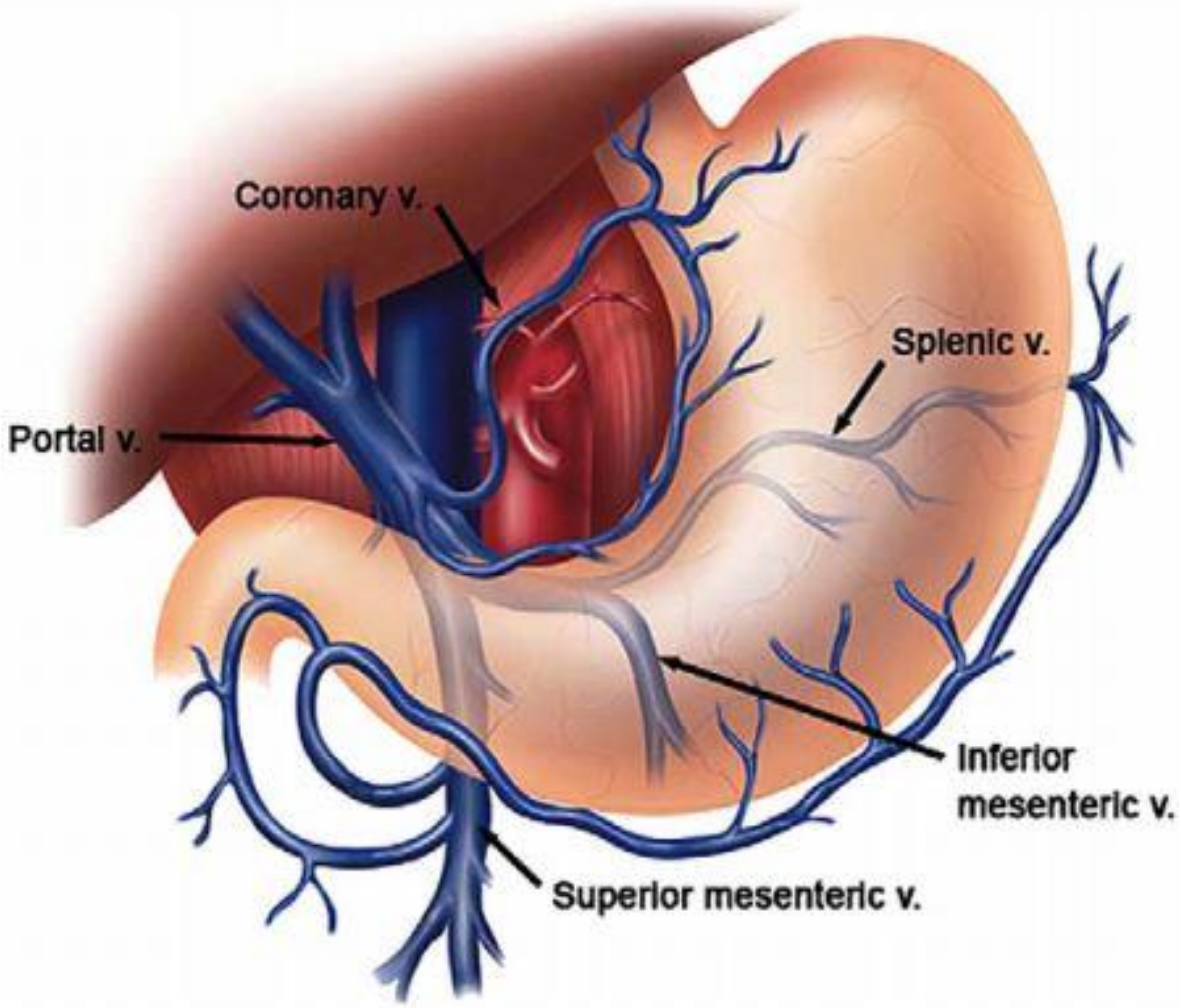


**Fig. 6.**
Portal vein and the hepatic venous vasculature inflow. *From* Brunicardi FC, Andersen DK, Billiar TR, et al. Schwartz's principles of surgery. 9th edition; McGraw-Hill Publishing. p. 31–5; 2010.

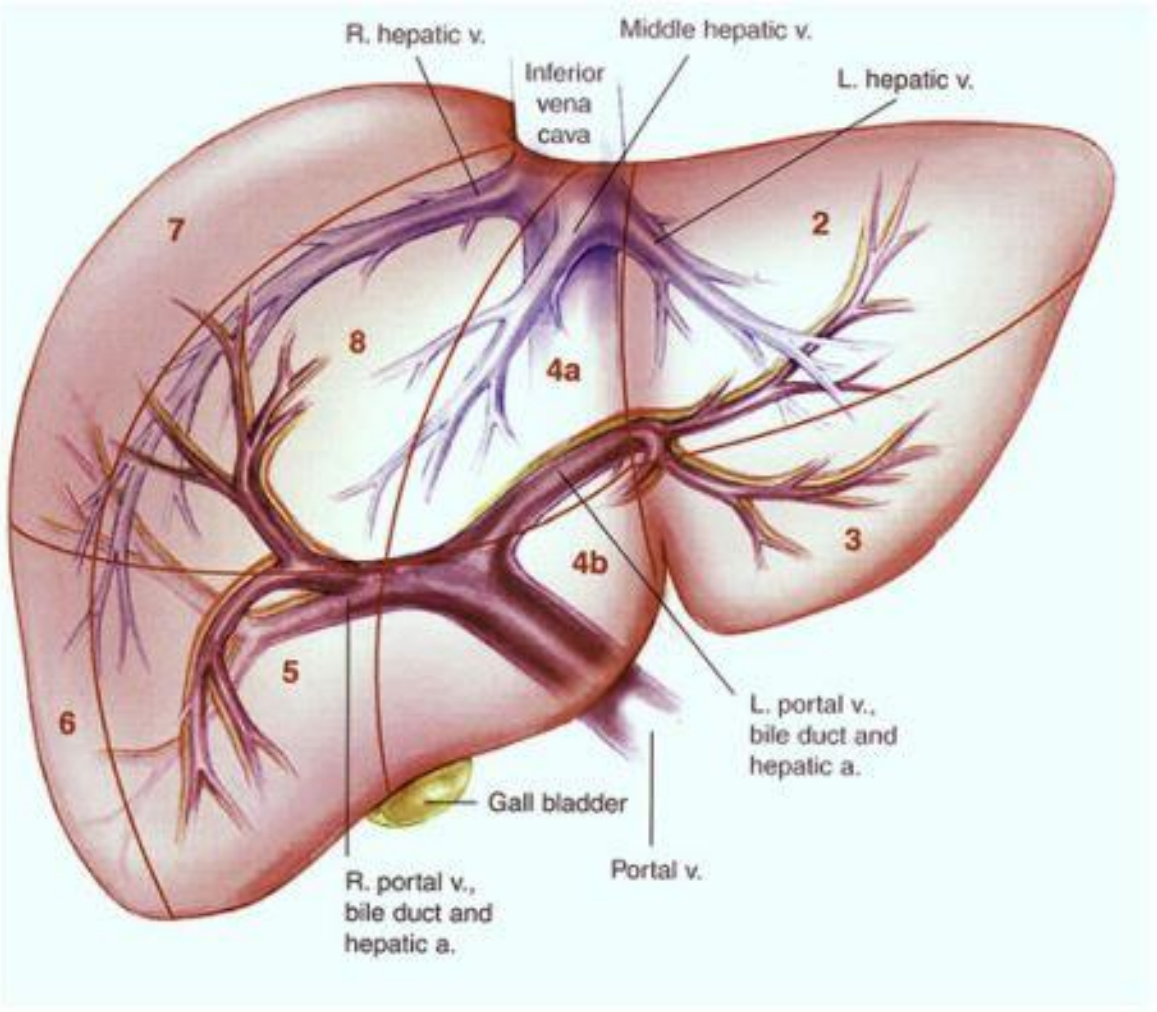


**Fig. 7.**
Intrahepatic vascular and biliary anatomy, anterior view. *Adapted from* Cameron JL, Sandone C. Atlas of gastrointestinal surgery, vol. 1. 2nd edition. Hamilton (ON): BC Decker; 2007. p. 121 [Fig. 1]; the People's Medical Publishing House—USA, Shelton, CT; with permission.

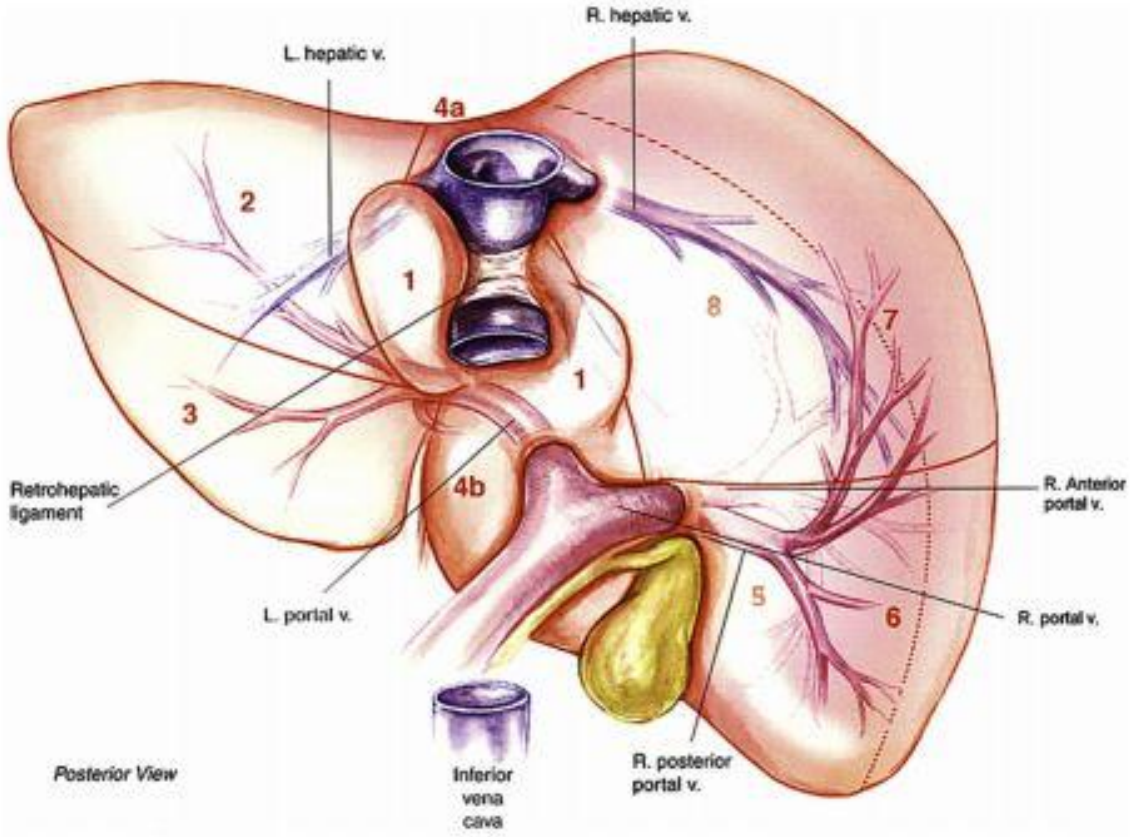


**Fig. 8.**
Intrahepatic vascular and biliary anatomy. posterior view. *Adapted from* Cameron JL, Sandone C. Atlas of gastrointestinal surgery, vol. 1. 2nd edition. Hamilton (ON): BC Decker; 2007. p. 124 [Fig. 2]; the People's Medical Publishing House—USA, Shelton, CT; with permission.

**Microscopic Anatomy**

The liver surface has the serosal covering and contains the Glisson capsule under it. Liver contains large-diameter capillaries that contains the endothelial cells and hepatocytes. They contain the Kupffer cells of the RES (**reticuloendothelial system**).

An hexagonal lobule of the liver contains the following;

- central portal tract
- branches of the hepatic artery
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- bile ducts
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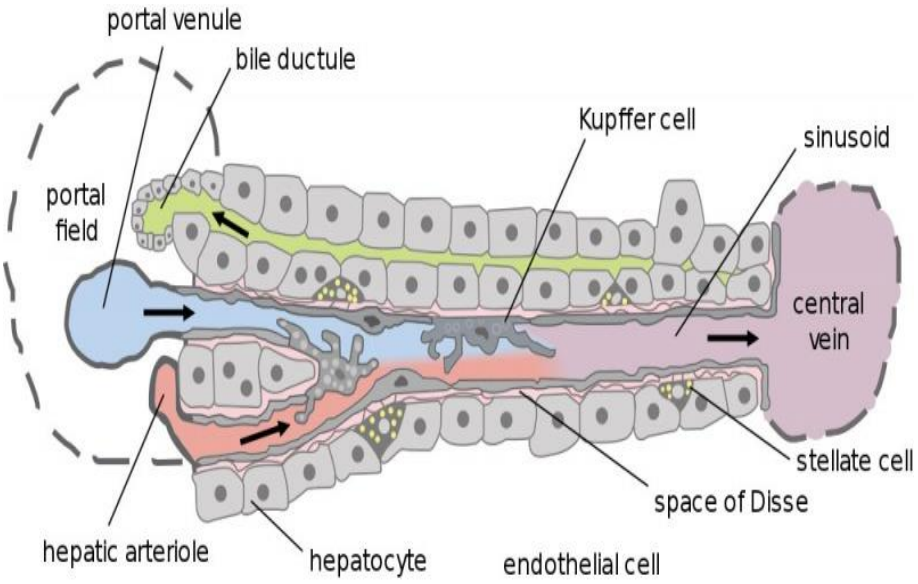
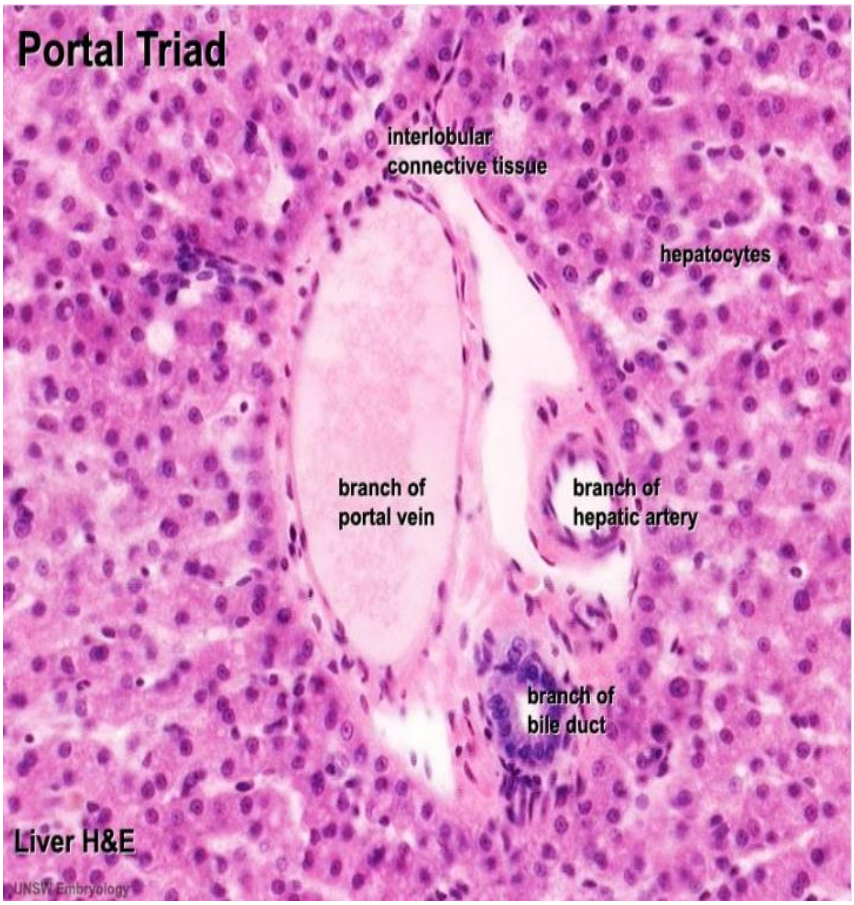
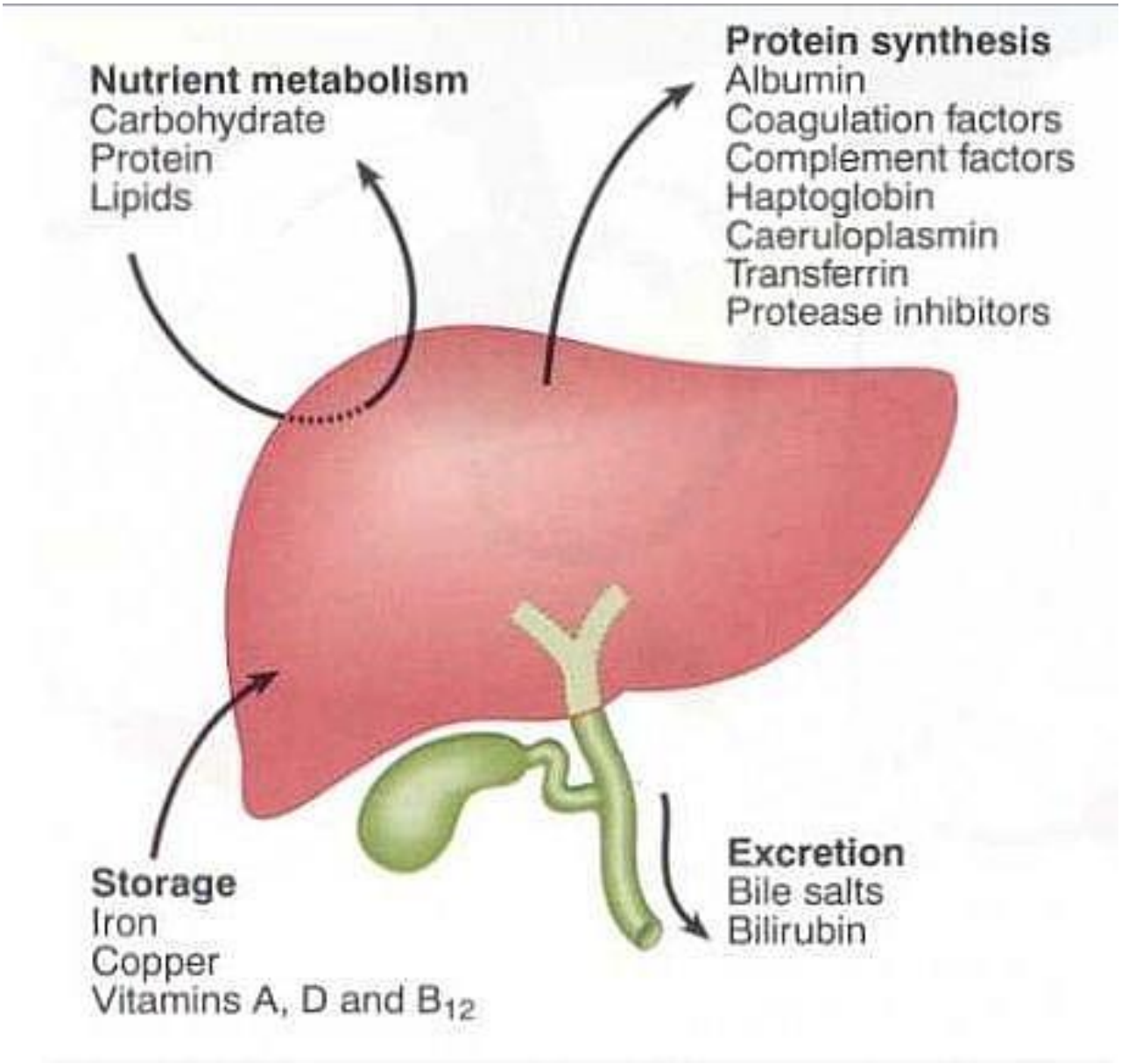

portal venule
bile ductule
Kupffer cell
sinusoid
portal field
central vein
stellate cell
space of Disse
hepatic arteriole
hepatocyte
endothelial cell

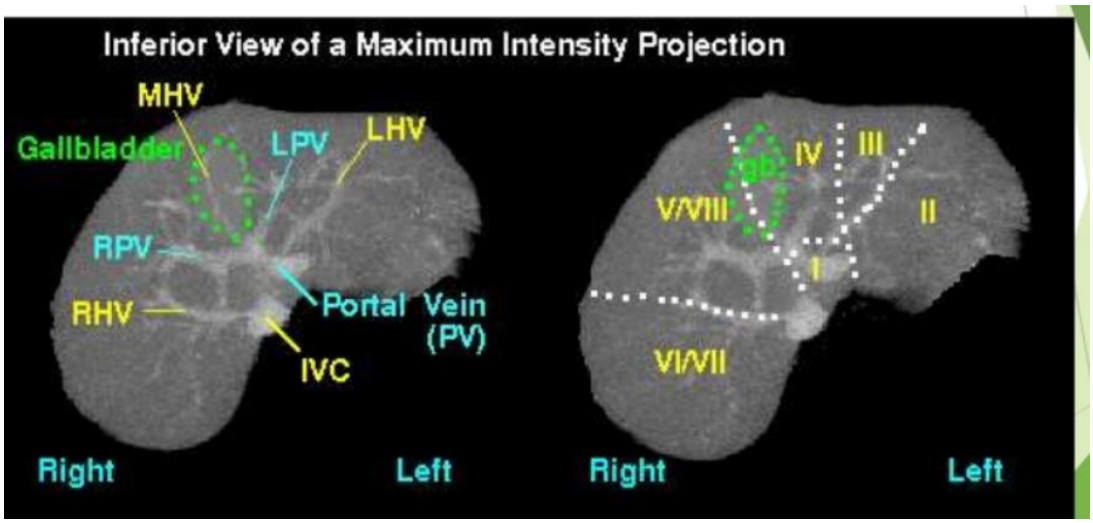

Portal Triad
interlobular connective tissue
hepatocytes
branch of portal vein
branch of hepatic artery
branch of bile duct
Liver H&E
UNSW Embryology

**Physiology of the liver**

The liver performs a range of functions that can be summarised under protein synthesis, nutrient metabolism, storage and excretion.




**Radiological anatomy of the liver**


Inferior View of a Maximum Intensity Projection
MHV
Gallbladder
LPV
LHV
RPV
RHV
Portal Vein (PV)
IVC
Right
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IV
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V/VIII
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VI/VII
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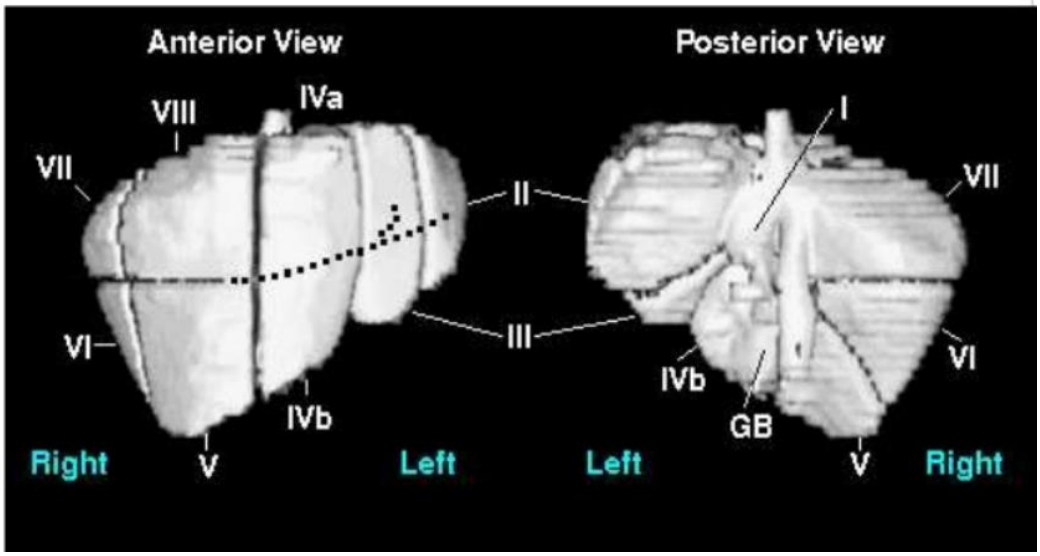
Left


Anterior View
Posterior View
VIII
IVa
VII
II
VI
III
IVb
Right
V
Left
I
VII
VI
IVb
GB
Left
V
Right

**Blunt injury of the abdomen**[26-43]

The second most common cause of hospital admission is attributed to trauma which is approximately 16% of the healthcare costs incurred globally. A rough estimates by the World Health Organisation, trauma would become the leading cause of loss of productive years by 2020. An estimate state that around 31% of the patients with poly trauma have abdominal injuries including 13% of spleen injuries and 16% of liver injuries. The most common cause of death in abdominal injuries is liver injury. Around 50%-80% of the liver bleeding cease spontaneously and with better non-management practices, diagnostic capabilities and emergency care management, the mortality rate has decreased.

The trend from operative management has shifted towards conservative management in liver injuries. Previous studies report the cessation of bleeding by the time of operation. Non-therapeutic operative procedures are correlated with morbidity. The utilisation of CT scan has enabled the improved selection of patients for non-operative management. Today, the non-operative management has become the prime treatment of choice for blunt liver trauma.

The non-operative management is the opted only in hemodynamically stable patients who do not have any danger signs or any indications for laparotomy. Even in case of laparotomy, the procedures have become less extensive[16]. In few cases,

instead of surgery, selective embolization is preferred and experimented with success.

## Grading of liver injuries

The following table shows the grading of liver injury[44].

Table 1

Grading of liver injury based on American Association of Surgery for trauma (AAST)[19]

| Grade | Type | Injury description |
|---|---|---|
| I | Hematoma | Subcapsular, nonexpanding, <10 cm surface area |
| | Laceration | Capsular tear, nonbleeding, <1 cm parenchymal depth |
| II | Hematoma | Subcapsular, nonexpanding, 10–50% surface area; intraparenchymal nonexpanding <10 cm diameter |
| | Laceration | Capsular tear, active bleeding, 1–3 cm parenchymal depth <10 cm in length |
| III | Hematoma | Subcapsular, >50% surface area or expanding; ruptured subcapsular hematoma with active bleeding; intraparenchymal hematoma >10 cm or expanding |
| | Laceration | >3 cm parenchymal depth |
| IV | Hematoma | Ruptured intraparenchymal hematoma with active bleeding |
| | Laceration | Parenchymal disruption involving 25–75% of hepatic lobe or one to three Couinaud's segments within a single lobe |
| V | Laceration | Parenchymal disruption involving >75% of hepatic lobe or >3 Couinaud's segments within a single lobe |
| | Vascular | Juxtahepatic venous injuries (i.e., retrohepatic vena cava/central major hepatic veins) |
| VI | Vascular | Hepatic avulsion |

The surgical management is reserved for patients where the injuries are extensive and non-operative management is not feasible. If non-operative management fails in a small center, patients should be referred to higher centers.

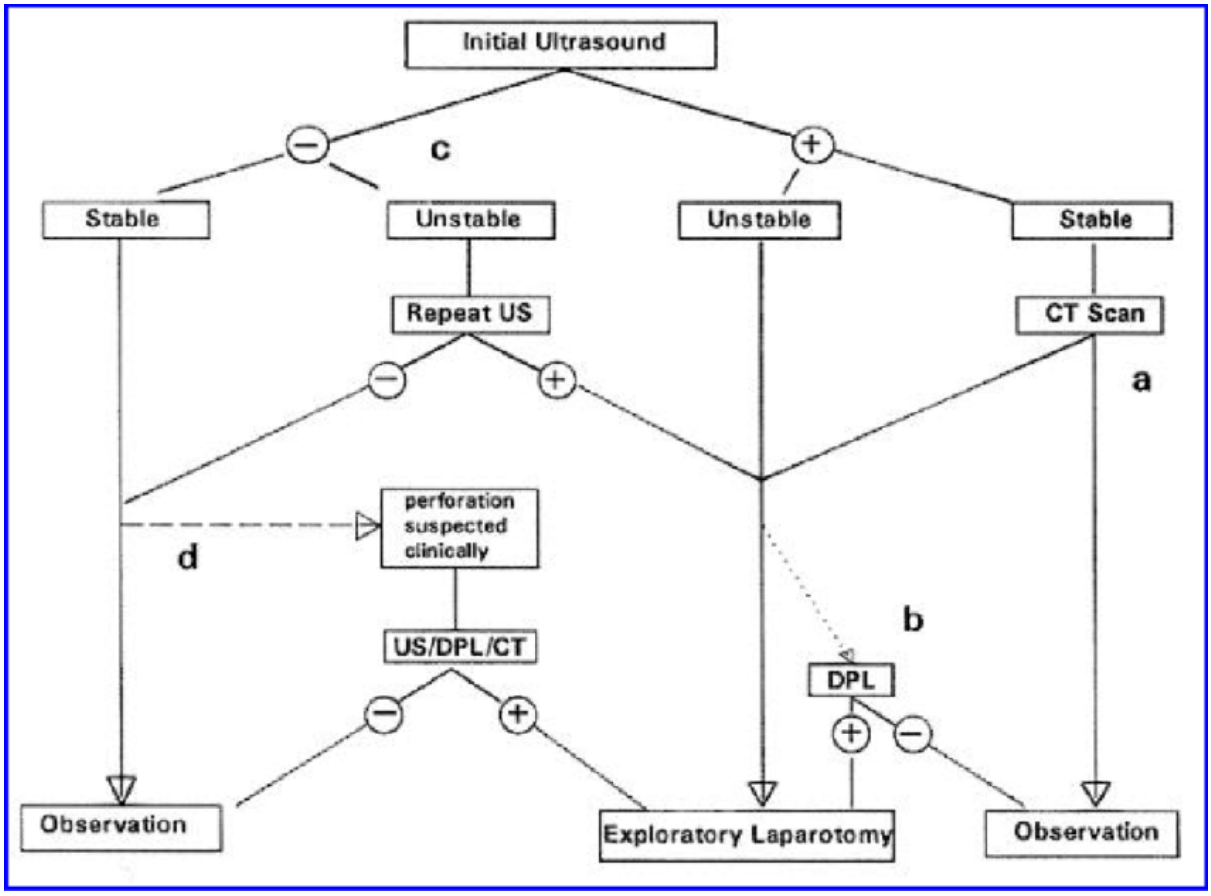
There are not many reports from smaller centers on non-operative management of liver traumas. Sweden has a low incidence of abdominal trauma and has a high success rate of non-operative management of liver surgeries.

The anterior location of the liver in the abdominal cavity makes it vulnerable to injury. Also, the Glisson's capsule is easily breakable.

**Diagnosis**

In blunt injuries of the abdomen, imaging is the main modality for diagnosis. Following modalities are used;

Ultrasonography



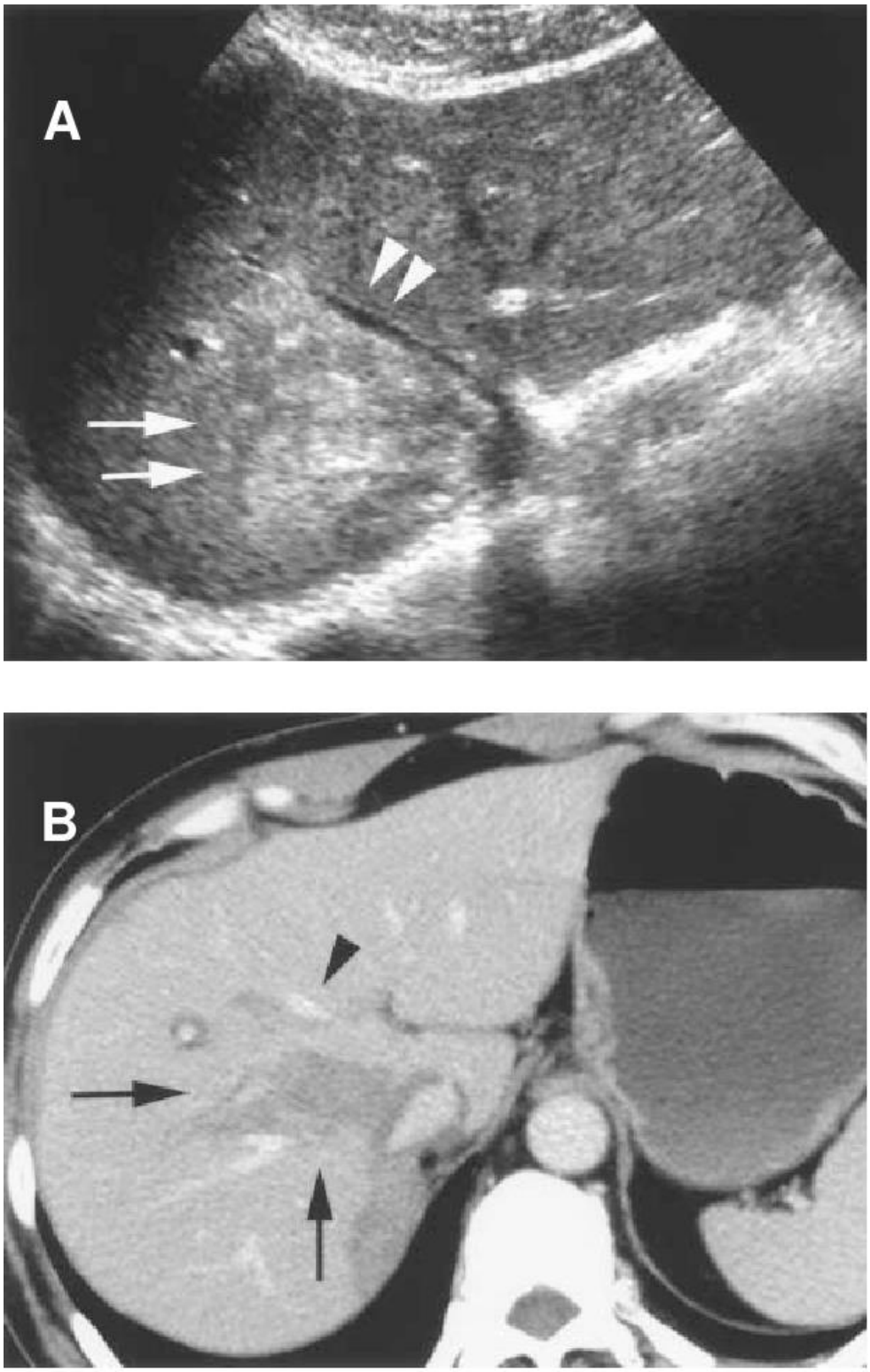



Fig 3. Injury without hemoperitoneum. (a) Transverse ultrasound image of the liver shows an irregular echogenic lesion (arrows) posterior to the middle hepatic vein (arrowheads). (b) Contrast-enhanced computerized tomography (CT) confirms laceration (arrows) posterior to the middle hepatic vein (arrowhead) extending to the inferior vena cava.

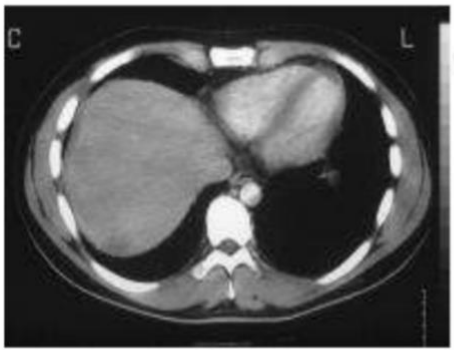
CT Scan

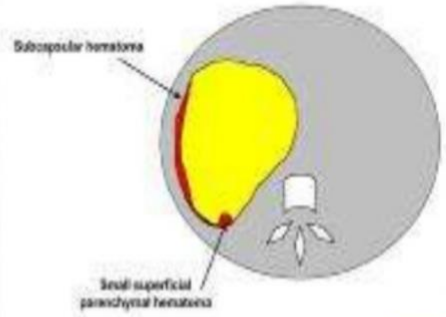
The following grading is made for blunt liver injury based on severity of findings on CT scan;

## Grade 1

I-Subcapsular hematoma<1cm, superficial laceration<1cm deep.

A stabbing injury to the RUQ of the abdomen



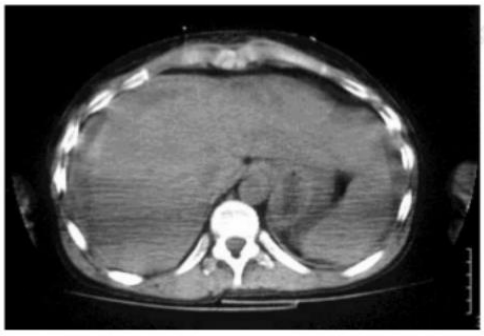


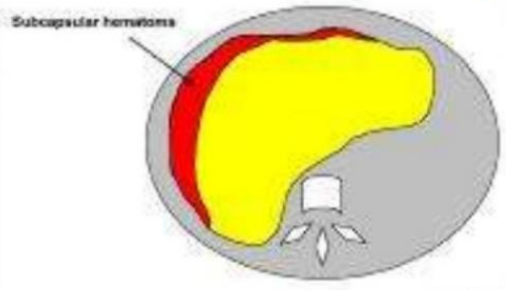

**Contrast CT demonstrates a small, crescent-shaped subcapsular and parenchymal hematoma less than 1 cm thick.**

## Grade 2

II-Parenchymal laceration 1-3cm deep, subcapsular hematoma1-3 cm thick

A blunt abdominal trauma



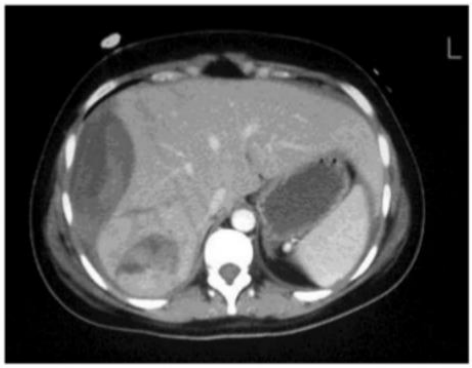


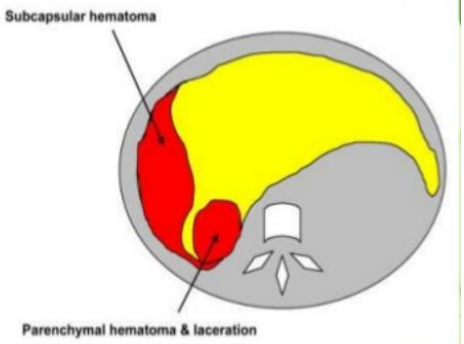

**CT scan at the level of the hepatic veins shows a subcapsular hematoma 3 cm thick.**

## Grade 3

III-Parenchymal laceration> 3cm deep and subcapsular hematoma> 3cm diameter.

A blunt abdominal trauma



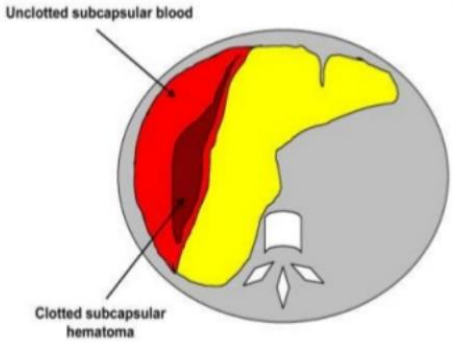



**Contrast CT shows a 4-cm-thick subcapsular hematoma associated with parenchymal hematoma and laceration in segments 6 and 7 of the right lobe of the liver..**

## Grade 4

IV-Parenchymal/supcapsular hematoma> 10cm in diameter, lobar destruction

A blunt abdominal trauma

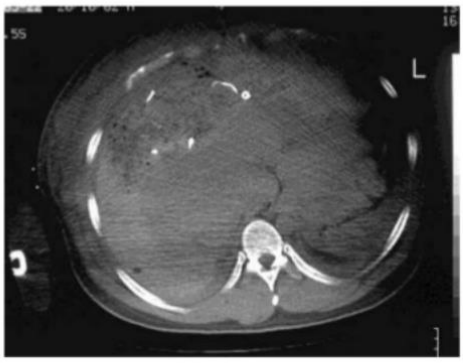


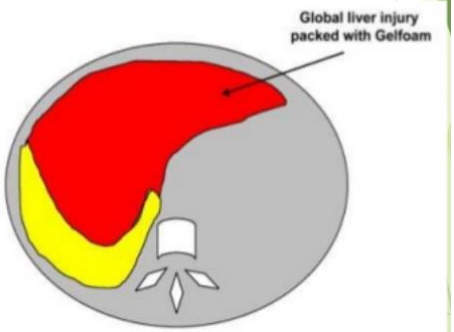

**CT scan of the abdomen demonstrates a large subcapsular hematoma measuring more than 10 cm. The high-attenuating areas within the lesion represent clotted blood**

## Grade 5

V- Global destruction or devascularization of the liver.

A motor vehicle accident

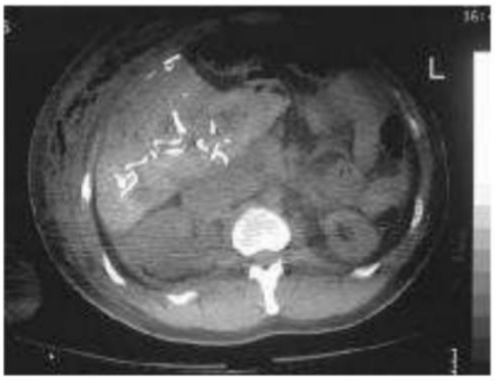


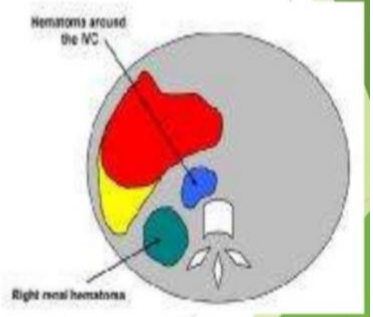



**CT demonstrates global injury to the liver. Bleeding from the liver was controlled by using Gelfoam.**

## Grade 6

VI-Hepatic avulsion






**Non-operative management**

Around 50%-80% of the liver bleeding cease spontaneously and with better non-management practices, diagnostic capabilities and emergency care management, the mortality rate has decreased.

The trend from operative management has shifted towards conservative management in liver injuries. Previous studies report the cessation of bleeding by the time of operation. Non-therapeutic operative procedures are correlated with morbidity. The utilisation of CT scan has enabled the improved selection of patients for non-operative management. Today, the non-operative management has become the prime treatment of choice for blunt liver trauma.

The non-operative management is the opted only in hemodynamically stable patients who do not have any danger signs or any indications for laparotomy. Even in case of laparotomy, the procedures have become less extensive[16]. In few cases, instead of surgery, selective embolization is preferred and experimented with success.

**Procedure**

The cases admitted in the surgical ward and trauma ward of the Department of General Surgery who are diagnosed to have blunt injury abdomen with liver trauma were included in the study. A detailed history is taken about the incident of bunt injury abdomen. Systemic examination and basic investigations done.

The following data was extracted from the patient's history, clinical examination and follow up.

1. Patient selection
2. Nature and time of accident leading to injury
3. Clinical findings
4. Laboratory investigations
5. USG abdomen findings
6. Diagnostic tests
8. Complications during hospital stay and on subsequent follow up

Patients selected for non operative/conservative was given bed rest and subjected to clinical examination including hourly pulse rate, blood pressure, respiratory rate and serial clinical examination of abdomen. FAST was used when needed for follow up.

Patients were followed up till their discharge and at periodic intervals.

**Investigations**

a. HB%, TC, DC, ESR.

b. Blood urea, Serum creatinine, Blood sugar.

c. Blood grouping and Rh typing.

d. BT, CT.

e. Urine routine examination.

f. Screening for HIV, Hbs Ag and VDRL after informed consent

g. Chest X-ray PA view.

h. x ray abdomen erect

i.Serial ultrasonography of abdomen

j. CECT abdomen and pelvis

k.Serial LFT,PT,a PTT,INR

# MATERIALS

# AND METHODS

## Materials and Methods

### Aims and objectives of the study:

1. To evaluate the efficacy of conservative management in patients with blunt trauma to abdomen with liver injury

2. To form a guideline to help decide when to abandon conservative line of treatment and opt for surgical intervention

3. To study the complications arising due to conservative management of blunt injury liver

### Study design

Prospective Single Center Study

### Place of study

GMKMC hospital

### Study period

June 2017 to October 2019

### Study population & Sampling Methodology

- Patients admitted to department of surgery GMKMCH, during study period June 2017 to October 2019, satisfying inclusion and exclusion criteria are considered into study.

- A detailed history and clinical examination of the cases are done.

- Routine preoperative investigations.

- Purpose sampling is used
- The results are analyzed statistically.

**Inclusion criteria:**

1. Patients of all age group with blunt abdominal trauma with documented radiographic evidence of injury to liver(USG/CT scan)
2. All grades of liver injury with Hemodynamically stable patients without features of peritonitis

**Exclusion criteria:**

1. Hemodynamically unstable
2. Blunt liver trauma associated with any other solid organ or peritonitis
3. Penetrating trauma to the abdomen.

**Methodology**

The material for the study is taken from the cases admitted in the surgical ward and trauma ward of the Department of General Surgery, GMK Medical College & Hospital, who are diagnosed to have blunt injury abdomen. Data will be collected with regards to age, demographic characteristics, socio economic status, detailed history and type of injuries including patient's complaints and duration of complaints. A detailed general examination is done and hemodynamic stability is ensured.

**Procedure**

The cases admitted in the surgical ward and trauma ward of the Department of General Surgery who are diagnosed to have blunt injury abdomen with liver trauma were included in the study. A detailed history is taken about the incident of bunt injury abdomen. Systemic examination and basic investigations done.

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g. Chest X-ray PA view.

h. x ray abdomen erect

i.Serial ultrasonography of abdomen

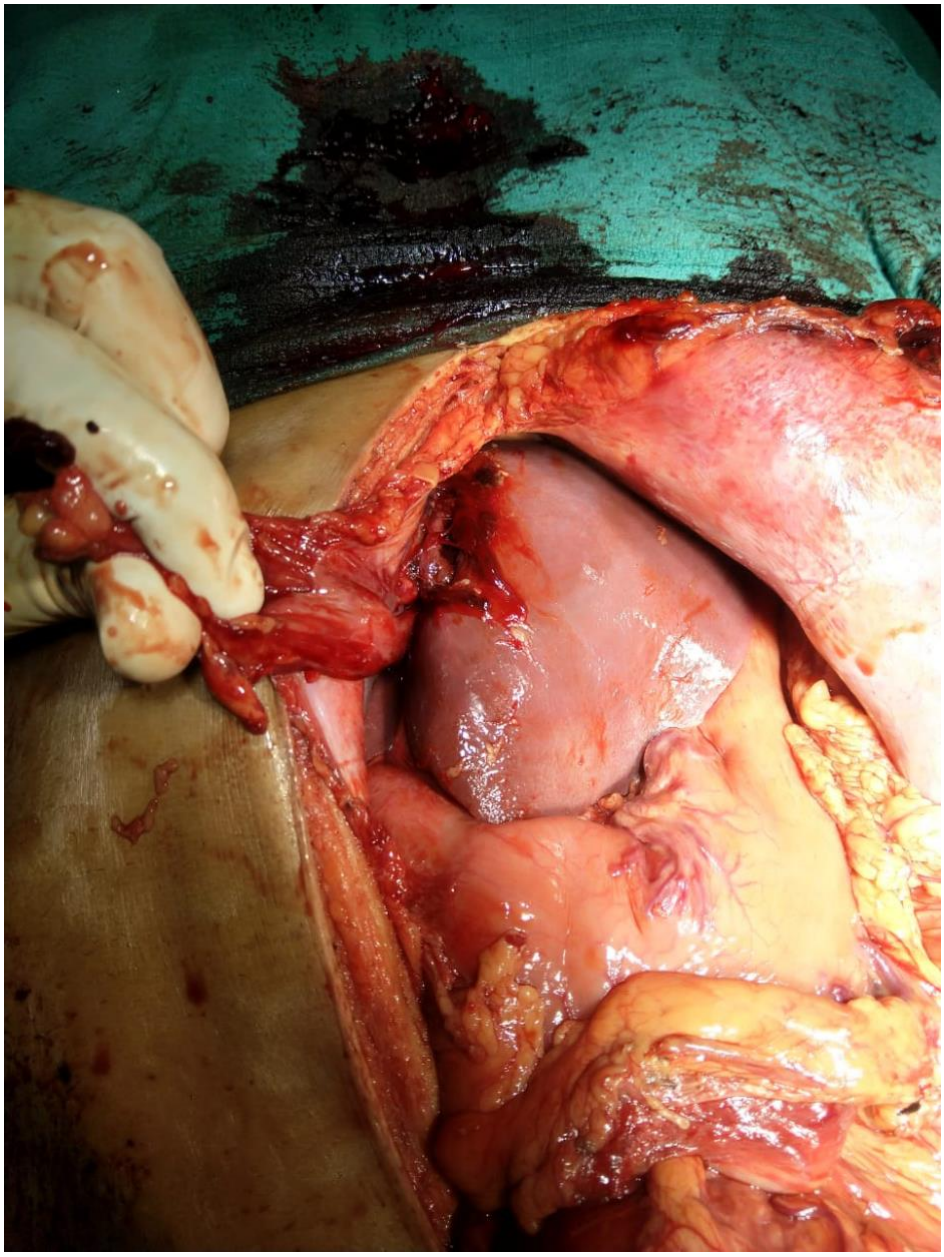
j. CECT abdomen and pelvis

k.Serial LFT,PT,a PTT,INR

**Statistical Analysis**

Data were analyzed according to history, clinical examination and investigation. Data were entered in excel sheet and analyzed using SPSS v23. Frequencies and percentage analysis were done. Cross tabulation and Chi-square analyses were done to find the relationship and association between various variables.

Images from the study



**Liver Laceration**

# RESULTS

## RESULTS

The mean age of the patients was 35.80 years with a standard deviation of 12.06 years ranging between 11 to 62 years and a median of 36 years.

Out of 50 patients, the males were in majority (n=44, 88%) while females were only 12% (n=6).

Majority of the cases were due to road traffic accidents (62%,n=31) followed by self fall (26%, n=13), fall from height (8%,n=4) and assault (4%,n=2).

The mean latent period is 2.7 hours with a standard deviation of 1.093 hours ranging between one to five hours and a median of two hours.

The mean pulse rate reduced from 95.64/ minute on day of admission to 77.64/minute on $7^{th}$ day.

The mean hemoglobin reduced from 95.64/ minute on day of admission to 77.64/minute on $7^{th}$ day.

The liver function tests shows that on the day of admission, the liver function tests were within normal limits for all patients.

On $3^{rd}$ day, the liver parameters were elevated for 10% (n=5) of the patients.

On $7^{th}$ day, the liver parameters were elevated for 20% (n=10) of the patients.

The patients presented with mild hemoperitoneum in 60% (n=30) of the cases, moderate hemoperitoneum in 28% (n=14) of the cases and severe hemoperitoneum in 12% (n=6) of the cases.

The grading of liver injury shows that majority of them were in Grade I (n=17, 34%). Grade II (n=13, 26%), Grade III (n=12, 24%) and Grade IV (n=8, 16%).

Out of 50 patients, 48 (96%) of them were managed conservatively while two of them (4%) were chosen for emergency laparotomy.

Out of 48 patients in conservative group, three of them died while in the emergency laparotomy group, one of them died.

**Age distribution of the patients**

The mean age of the patients was 35.80 years with a standard deviation of 12.06 years ranging between 11 to 62 years and a median of 36 years.

| Characteristic | Age in years |
|---|---|
| Mean | 35.80 |
| Median | 36.00 |
| Mode | 27[a] |
| Std. Deviation | 12.058 |
| Minimum | 11 |
| Maximum | 62 |

Table 1: Age distribution of the participants

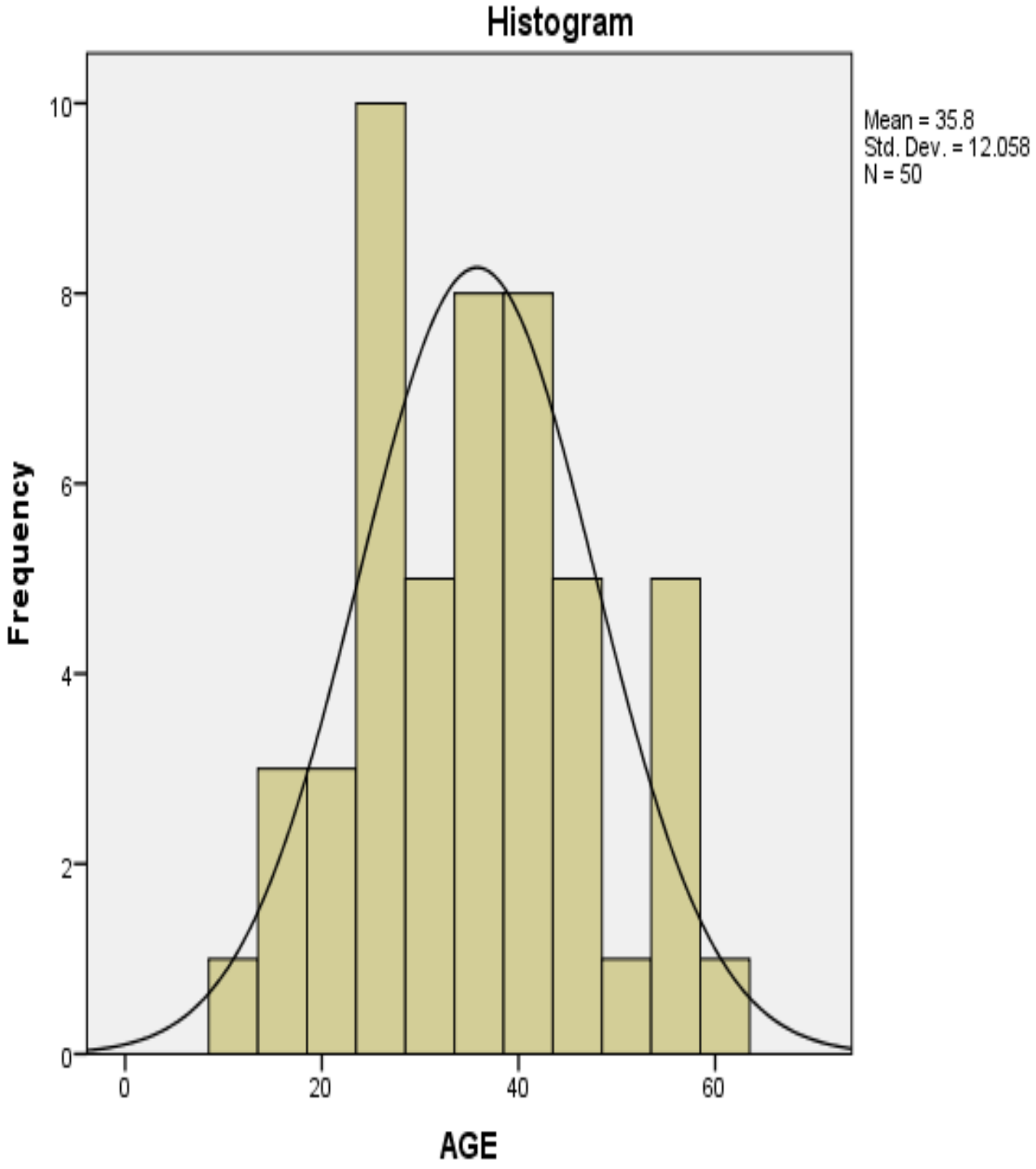



Figure 1: Age distribution of the participants

**Gender distribution of the patients**

Out of 50 patients, the males were in majority (n=44, 88%) while females were only 12% (n=6).

| Gender | Frequency | Percent |
|---|---|---|
| Females | 6 | 12.0 |
| Males | 44 | 88.0 |
| Total | 50 | 100.0 |

Table 2: Gender distribution of the participants

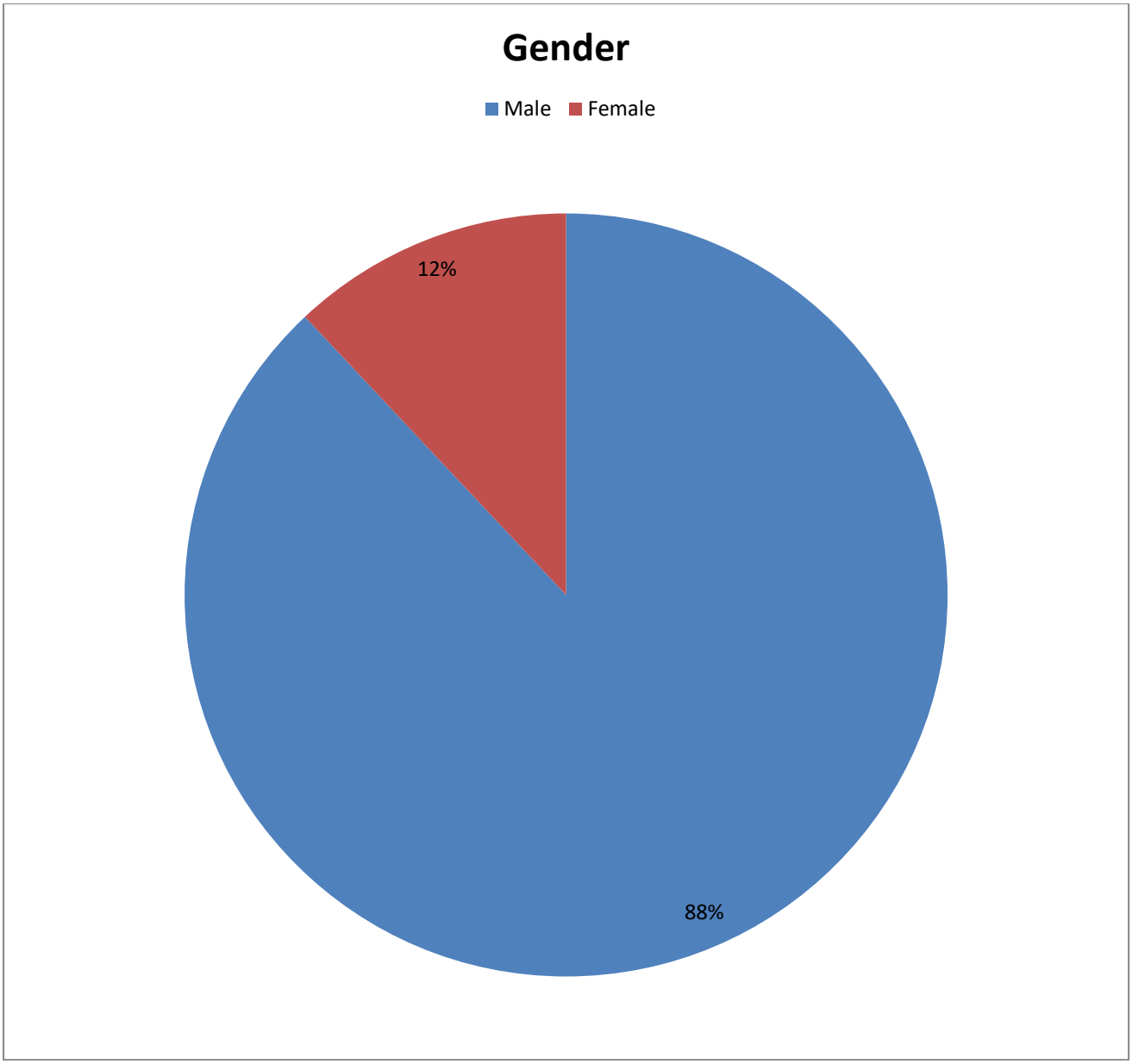



Figure 2: Gender distribution of the participants

**Mode of Injury**

Majority of the cases were due to road traffic accidents (62%,n=31) followed by self fall (26%, n=13), fall from height (8%,n=4) and assault (4%,n=2).

| Mode of Injury | Frequency | Percent |
|---|---|---|
| Assault | 2 | 4.0 |
| Fall from height | 4 | 8.0 |
| Road Traffic Accidents | 31 | 62.0 |
| Self fall | 13 | 26.0 |
| Total | 50 | 100.0 |

Table 3: Mode of injury

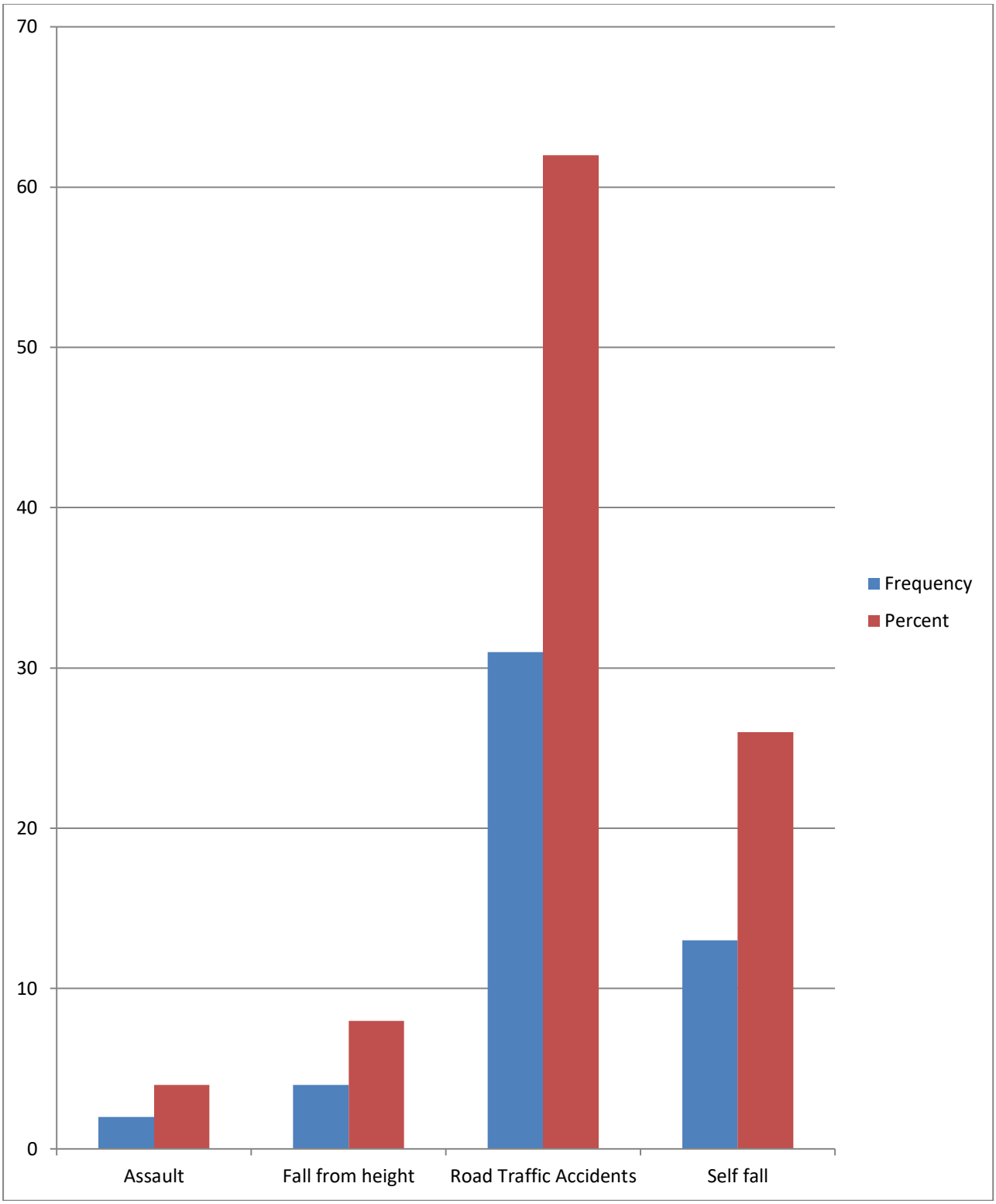



Figure 3: Mode of injury

**Latent period in hours**

The mean latent period is 2.7 hours with a standard deviation of 1.093 hours ranging between one to five hours and a median of two hours.

| LATENT PERIOD(HRS) | |
|---|---|
| Mean | 2.70 |
| Median | 2.00 |
| Mode | 2 |
| Std. Deviation | 1.093 |
| Minimum | 1 |
| Maximum | 5 |

Table 4: Latent Period

| **Latent period(hrs)** | Frequency | Percent |
|---|---|---|
| 1 | 2 | 4.0 |
| 2 | 28 | 56.0 |
| 3 | 8 | 16.0 |
| 4 | 7 | 14.0 |
| 5 | 5 | 10.0 |
| Total | 50 | 100.0 |

Table 5: Latent Period Category

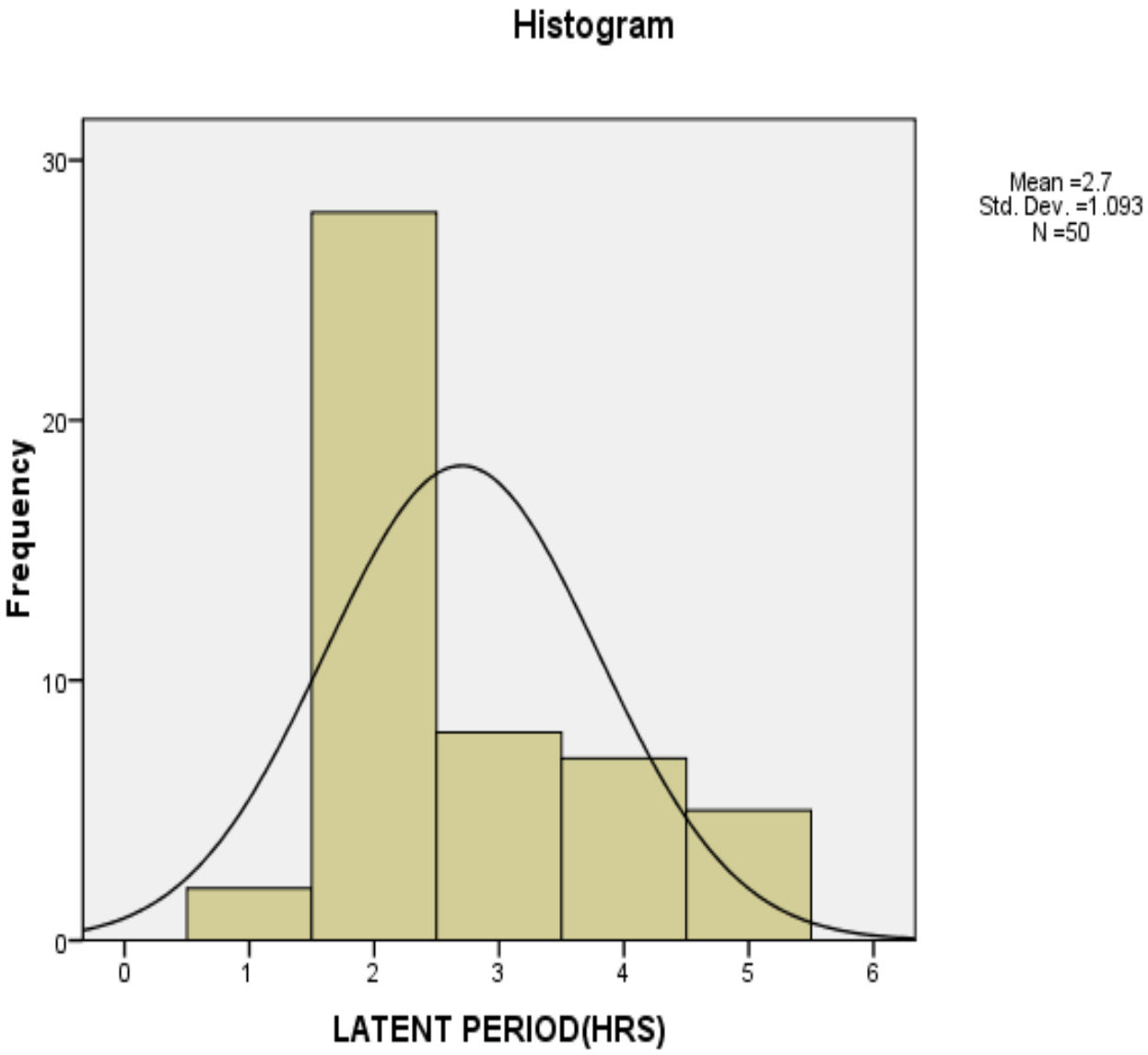



Figure 4: Latent Period Distribution

**Vital Parameters**

**Pulse Rate**

The mean pulse rate reduced from 95.64/ minute on day of admission to 77.64/minute on 7th day.

| | Pulse/min | Admission | On Day 3 | On Day 7 |
|---|---|---|---|---|
| Mean | | 95.64 | 91.44 | 77.64 |
| Median | | 94.00 | 87.00 | 80.00 |
| Mode | | 82 | 78 | 78 |
| Std. Deviation | | 12.718 | 20.504 | 22.193 |
| Minimum | | 78 | 0 | 0 |
| Maximum | | 118 | 124 | 118 |

Table 6: Pulse Rate

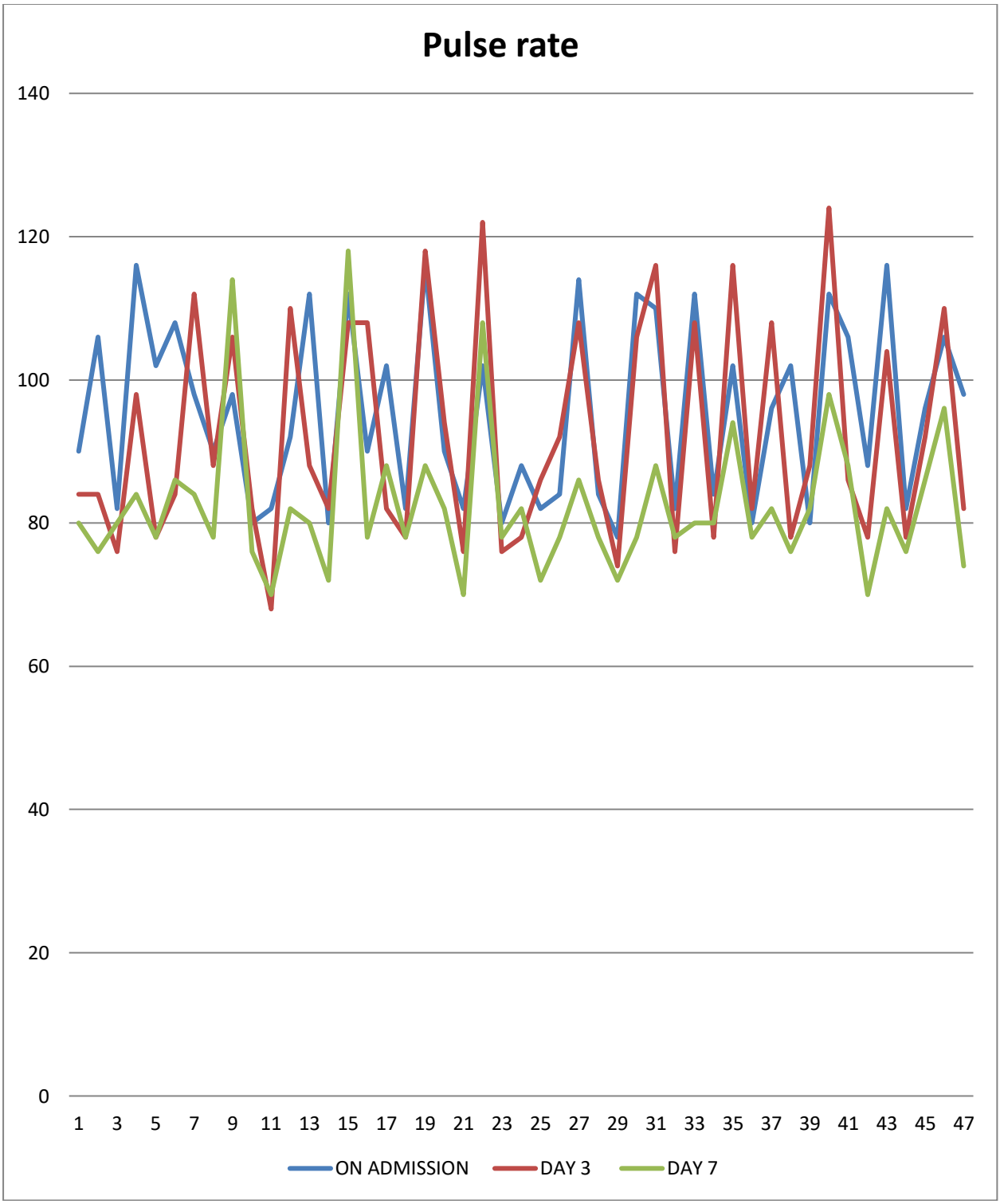



Figure 5: Pulse Rate

**Hemoglobin**

The mean hemoglobin reduced from 95.64/ minute on day of admission to 77.64/minute on 7th day.

| Hemoglobin (mg/dl) | Admission | On Day 3 | On Day 7 |
|---|---|---|---|
| Mean | 10.45 | 10.22 | 10.37 |
| Median | 10.95 | 10.50 | 11.00 |
| Mode | 11 | 9 | 10[a] |
| Std. Deviation | 1.191 | 2.036 | 2.861 |
| Minimum | 8 | 0 | 0 |
| Maximum | 15 | 13 | 14 |

Table 7: Hemoglobin

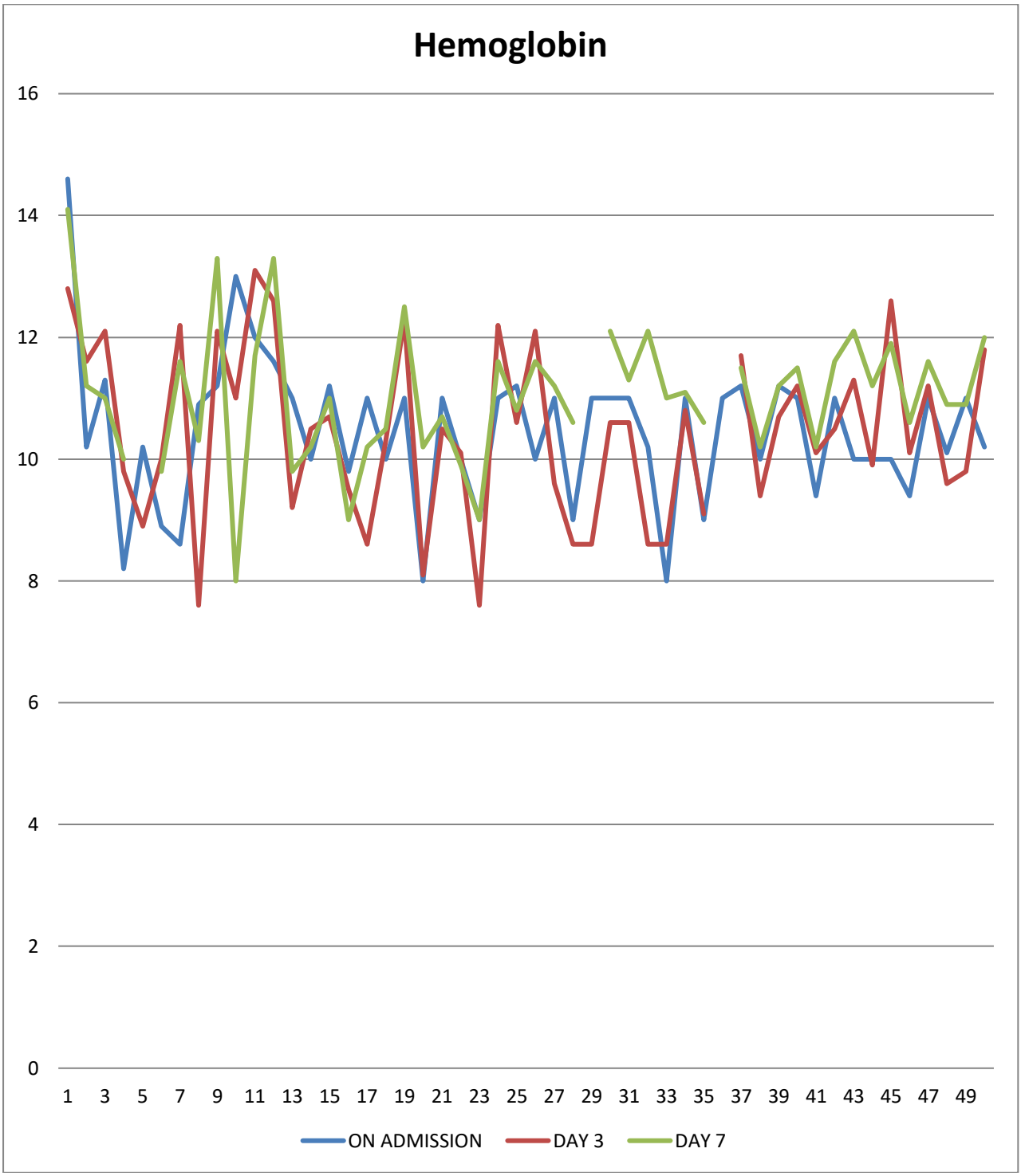



Figure 6: Hemoglobin

**Liver function tests**

The liver function tests shows that on the day of admission, the liver function tests were within normal limits for all patients.

On 3rd day, the liver parameters were elevated for 10% (n=5) of the patients.

On 7th day, the liver parameters were elevated for 20% (n=10) of the patients.

| | Admission | Day 3 | Day 7 | Chi-square analysis p-value |
|---|---|---|---|---|
| Elevated | **0** | **5 (10%)** | **10 (20%)** | **8.19** **P<0.05** |
| Within normal limits | **50** | **45 (90%)** | **40 (80%)** | |

Table 8: Liver Function Tests

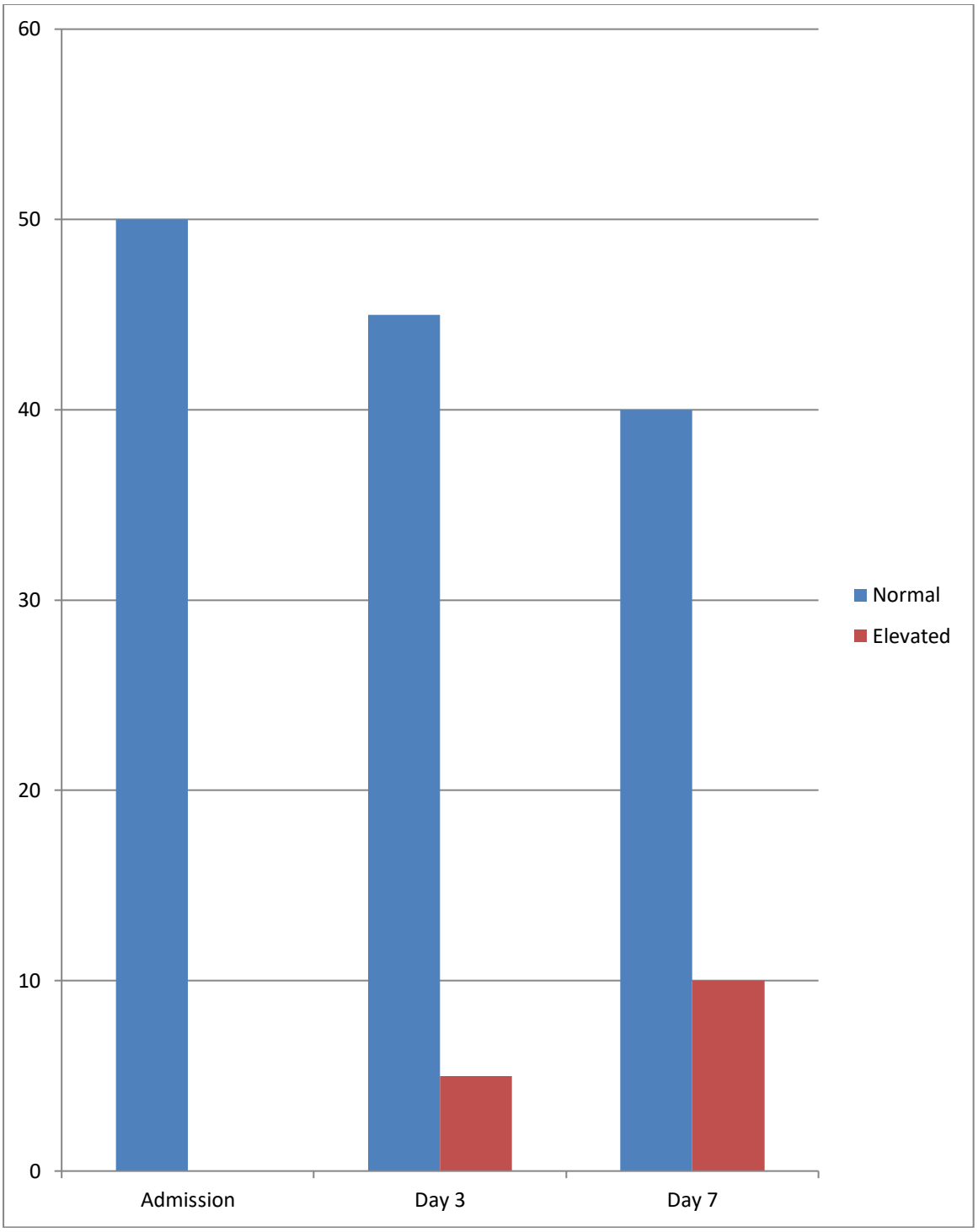



Figure 7: Liver Function Tests

**Ultrasound findings**

The patients presented with mild hemoperitoneum in 60% (n=30) of the cases, moderate hemoperitoneum in 28% (n=14) of the cases and severe hemoperitoneum in 12% (n=6) of the cases.

| Hemoperitoneum | Frequency | Percent |
|---|---|---|
| Mild | 30 | 60.0 |
| moderate | 14 | 28.0 |
| Severe | 6 | 12.0 |
| Total | 50 | 100.0 |

Table 9: Ultrasound findings

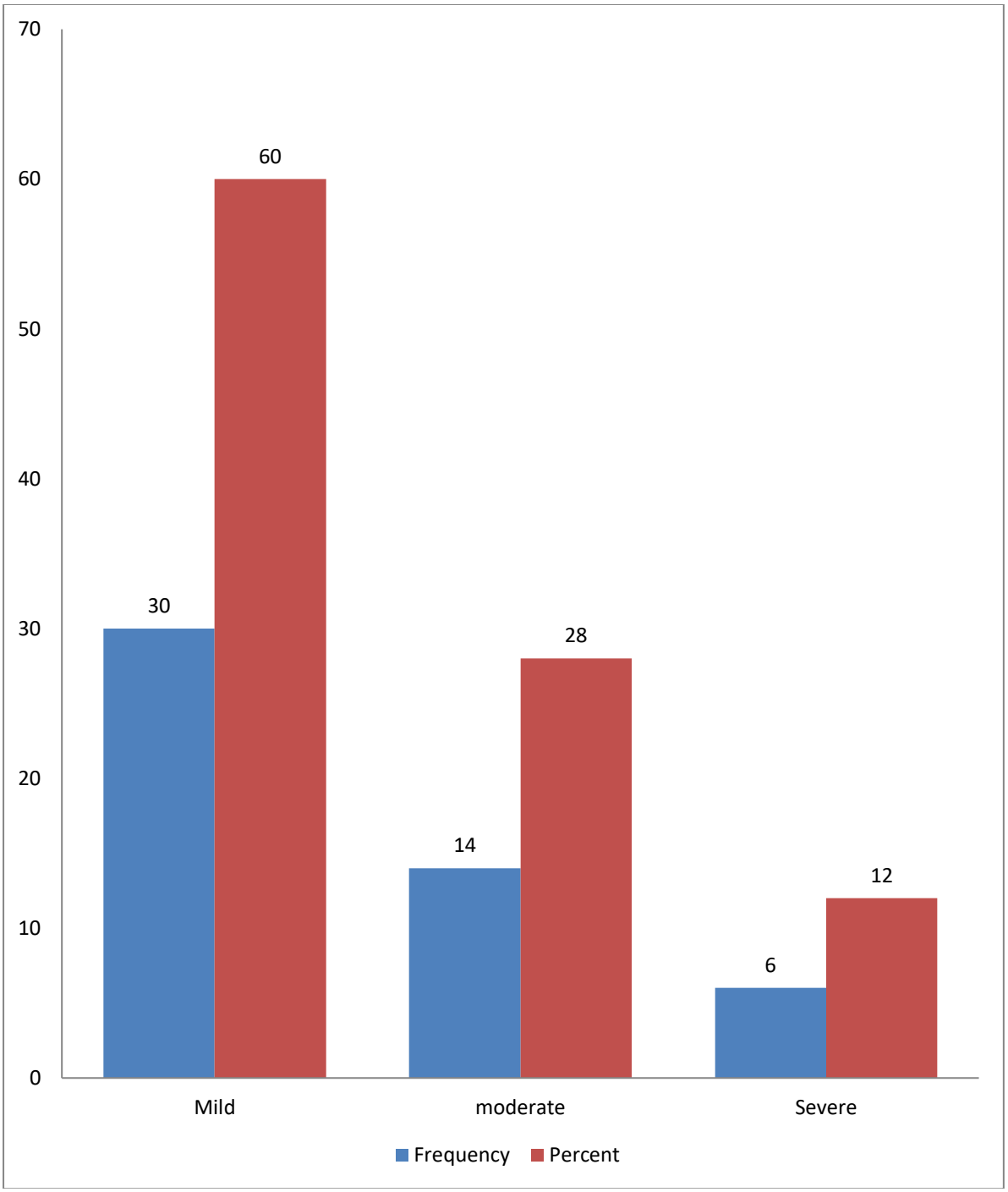



Figure 8: Ultrasound findings

**Grading of liver Injury**

The grading of liver injury shows that majority of them were in Grade I (n=17, 34%). Grade II (n=13, 26%), Grade III (n=12, 24%) and Grade IV (n=8, 16%).

| CECT-GRADE OF LIVER INJURY | Frequency | Percent |
|---|---|---|
| I | 17 | 34.0 |
| II | 13 | 26.0 |
| III | 12 | 24.0 |
| IV | 8 | 16.0 |
| Total | 50 | 100.0 |

Table 10: Grading of liver Injury

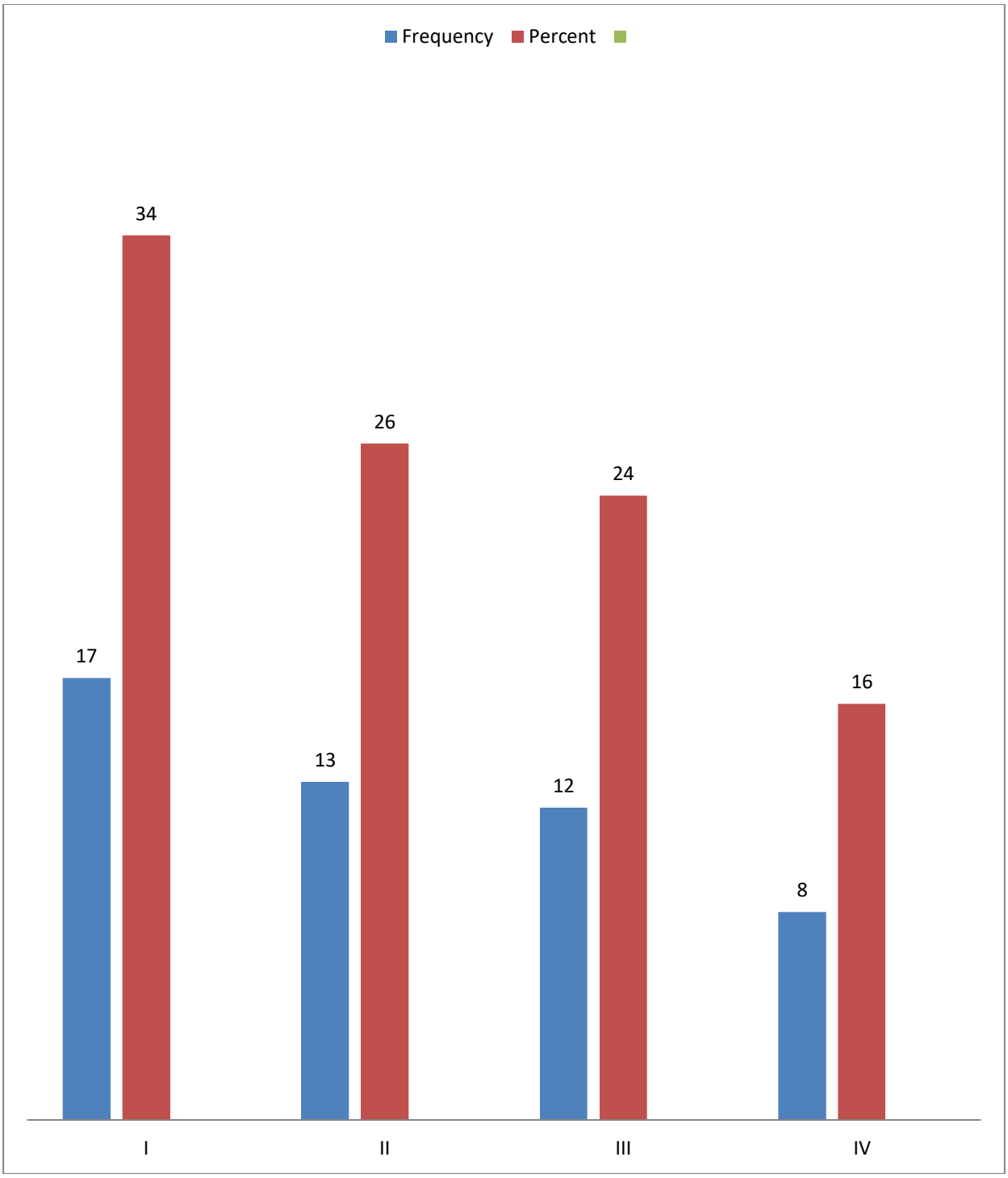



Figure 9: Grading of liver Injury

**Management**

Out of 50 patients, 48 (96%) of them were managed conservatively while two of them (4%) were chosen for emergency laparotomy.

| Management | Frequency | Percent |
|---|---|---|
| EMERGENCY LAPAROTOMY | 2 | 4.0 |
| CONSERVATIVELY MANAGED | 48 | 96.0 |
| Total | 50 | 100.0 |

Table 11: Management

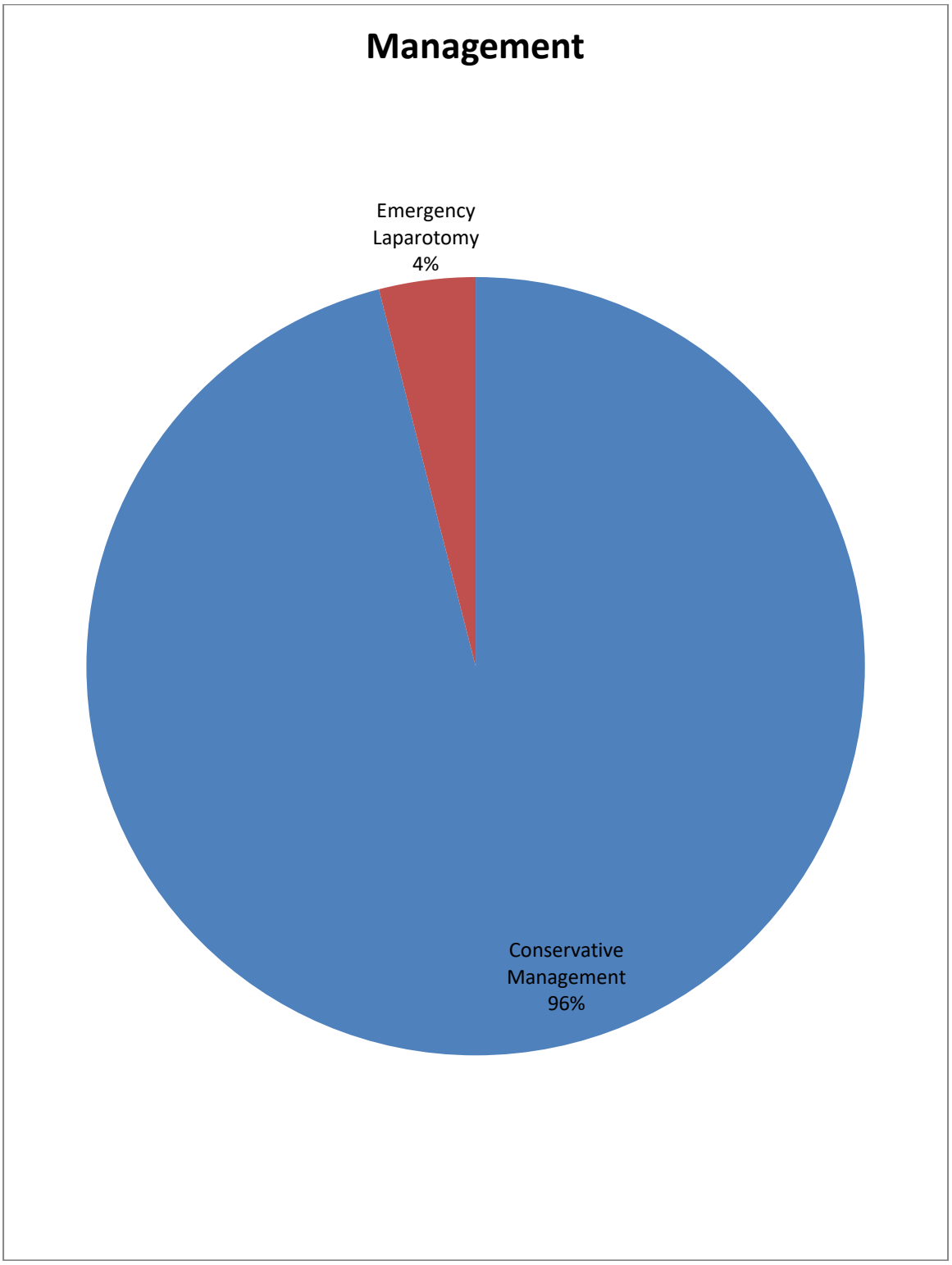



Figure 10: Management

**Mortality**

Out of 48 patients in conservative group, three of them died while in the emergency laparotomy group, one of them died.

| Mortality | Frequency |
|---|---|
| Emergency Laparotomy | 1 out of 2 patients |
| Conservative Group | 3 out of 48 patients |
| Total | 50 |

Table 12: Mortality

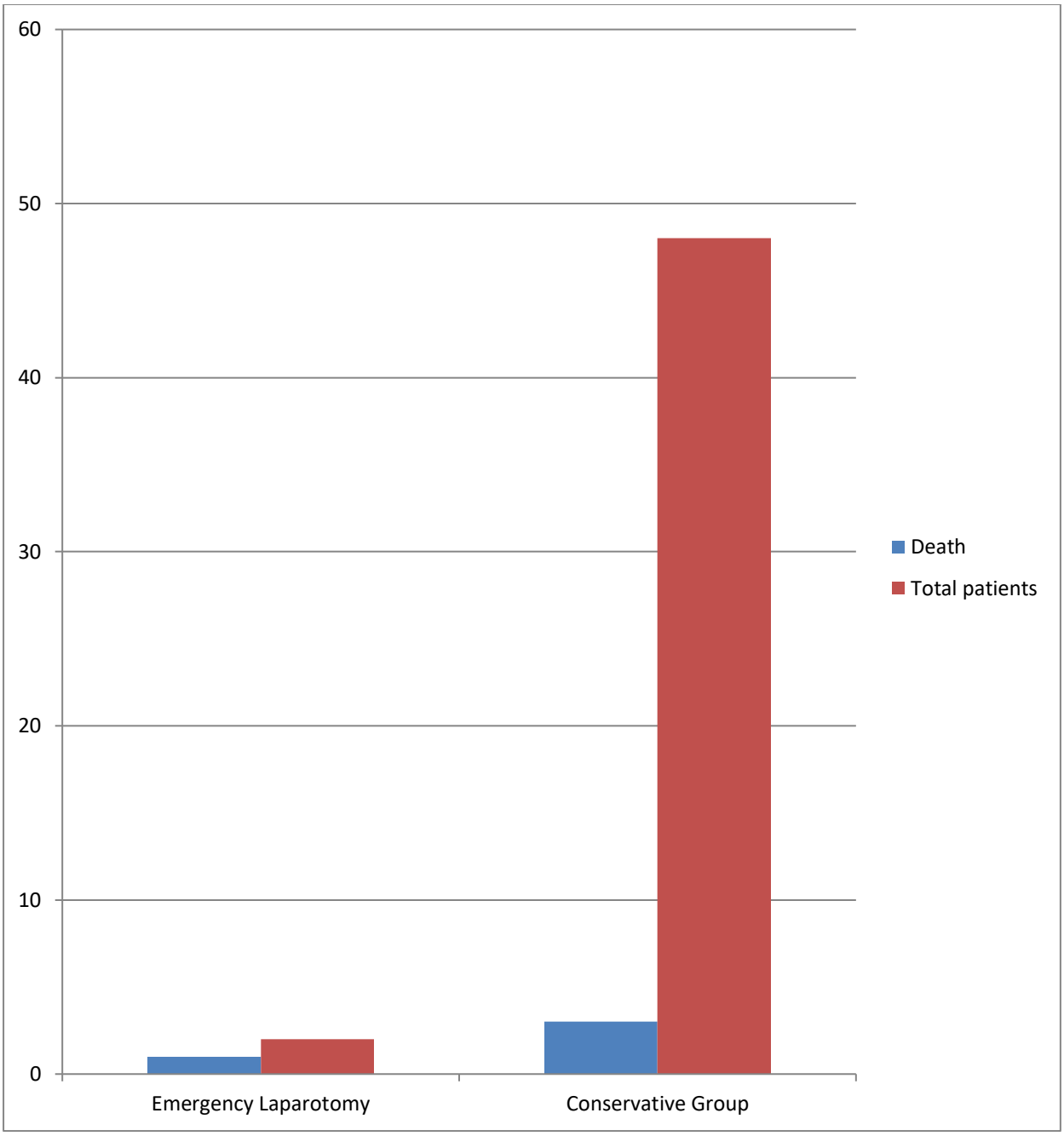



Figure 11: Mortality

# DISCUSSION

## Discussion

The second most common cause of hospital admission is attributed to trauma which is approximately 16% of the healthcare costs incurred globally. A rough estimates by the World Health Organisation, trauma would become the leading cause of loss of productive years by 2020[1]. An estimate state that around 31% of the patients with poly trauma have abdominal injuries including 13% of spleen injuries and 16% of liver injuries[2,3]. The most common cause of death in abdominal injuries is liver injury. Around 50%-80% of the liver bleeding cease spontaneously and with better non-management practices, diagnostic capabilities and emergency care management, the mortality rate has decreased[4,5].

Weighing an average of 1.5 kg, liver is the largest gland in the body and the second largest organ in the body. It is anatomically located under the diaphragm in the region of the right upper abdomen and mid abdomen extending up to the left upper abdomen. It is wedge shaped with the apex to the left and the base to the right, pinkish in colour and soft in consistency with high vascularity[24]. The most commonly followed terminology for liver anatomy and resections is by the International Hepto-Pancreato-Biliary Association (IHPBA).

In the intrauterine life, at the junction of foregut and midgut, a ventral diverticulum grows out as the ventral mesogastrium. The caudal part of this mesogastrium forms the septum transversum while the cranial part forms the diaphragm. This

diverticulum also forms the bile ducts and gall bladder. The obliterated umbilical vein forms the ligamentum teres hepatis that joins the left portal vein. The obliterated ductus venosus forms the ligamentum venosum that connects the left portal vein and left hepatic vein.

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At the left fifth intercostal space, the upper surface of the liver can be percussed. The following surfaces are continuous; right, superior, posterior and anterior. These surfaces are in relation to the anterior abdominal wall and the diaphragm. The anterior surface is demarcated from the visceral surface by the presence of a

sharp inferior border. This border is clinically palpable when the patient is in deep inspiration. The inferior surface is related to the following;

Hepatic flexure, Right kidney, Transverse colon, Duodenum and Stomach

The under surface of the liver is in relation to the gall bladder.

The inferior surface of the liver contains a fissure that is in the shape of H.

There is an H-shaped fissure on the inferior surface of the liver. The right vertical arm of the H is formed by the gallbladder anteriorly and the inferior vena cava (IVC) posteriorly; it is incomplete, with the caudate process between the two. The left vertical arm of the H is formed by the ligamentum teres hepatis in front and the ligamentum venosum behind.

The liver surface has the serosal covering and contains the Glisson capsule under it.

Liver contains large-diameter capillaries that contains the endothelial cells and hepatocytes. They contain the Kupffer cells of the RES (**reticuloendothelial system**).

An hexagonal lobule of the liver contains the following;

central portal tract, branches of the hepatic artery, the portal vein

bile ducts, and peripheral tributary of the hepatic vein

The trend from operative management has shifted towards conservative management in liver injuries[6-12]. Previous studies report the cessation of bleeding by the time of operation[13]. Non-therapeutic operative procedures are correlated with morbidity[14]. The utilisation of CT scan has enabled the improved selection of patients for non-operative management[15]. Today, the non-operative management has become the prime treatment of choice for blunt liver trauma.

The non-operative management is the opted only in hemodynamically stable patients who do not have any danger signs or any indications for laparotomy. Even in case of laparotomy, the procedures have become less extensive[16]. In few cases, instead of surgery, selective embolization is preferred and experimented with success[17].

The surgical management is reserved for patients where the injuries are extensive and non-operative management is not feasible[18, 19]. If non-operative management fails in a small center, patients should be referred to higher centers[20,21].

There are not many reports from smaller centers on non-operative management of liver traumas. Sweden has a low incidence of abdominal trauma and has a high success rate of non-operative management of liver surgeries[22,23].

The mean age of the patients was 35.80 years with a standard deviation of 12.06 years ranging between 11 to 62 years and a median of 36 years.

Out of 50 patients, the males were in majority (n=44, 88%) while females were only 12% (n=6).

Majority of the cases were due to road traffic accidents (62%,n=31) followed by self fall (26%, n=13), fall from height (8%,n=4) and assault (4%,n=2).

The mean latent period is 2.7 hours with a standard deviation of 1.093 hours ranging between one to five hours and a median of two hours.

The mean pulse rate reduced from 95.64/ minute on day of admission to 77.64/minute on $7^{th}$ day.

The mean hemoglobin reduced from 95.64/ minute on day of admission to 77.64/minute on $7^{th}$ day.

The liver function tests shows that on the day of admission, the liver function tests were within normal limits for all patients.

On $3^{rd}$ day, the liver parameters were elevated for 10% (n=5) of the patients.

On $7^{th}$ day, the liver parameters were elevated for 20% (n=10) of the patients.

The patients presented with mild hemoperitoneum in 60% (n=30) of the cases, moderate hemoperitoneum in 28% (n=14) of the cases and severe hemoperitoneum in 12% (n=6) of the cases.

The grading of liver injury shows that majority of them were in Grade I (n=17, 34%). Grade II (n=13, 26%), Grade III (n=12, 24%) and Grade IV (n=8, 16%).

Out of 50 patients, 48 (96%) of them were managed conservatively while two of them (4%) were chosen for emergency laparotomy.

Out of 48 patients in conservative group, three of them died while in the emergency laparotomy group, one of them died.

# SUMMARY
# AND CONCLUSIONS

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# LIMITATIONS

**Limitations**

Following limitations were encountered in the study;

1) The sample size is small

2) The groups are unequal that affects the comparability

3) The study is short term

4) The study is single centric

# RECOMMENDATIONS

## Recommendations

The following recommendations are made;

1) A larger sample size should be studied

2) Multicentric studies should be done

3) Randomised trials are better for generalisability of the results

4) Long term cohort studies can be preferred over cross-sectional studies

# PATIENT CONSENT FORM

**STUDY TITLE:**

"**AN ANALYTICAL STUDY ON NONOPERATIVE MANAGEMENT OF LIVER INJURY IN BLUNT TRAUMA TO THE ABDOMEN-– A PROSPECTIVE STUDY"**

Department of General surgery, GMKMCH

PARTICIPANT NAME : AGE : SEX:

I.P. NO :

I confirm that I have understood the purpose of surgical/invasive procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the possible complications that may occur during and after medical procedure. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

I hereby consent to participate in this study.

Time :

Date : Signature / Thumb Impression Of

Patient

Place :

Patient’s name:

Signature of the investigator:

_____

Name of the investigator : _____

**PROFORMA**

**"AN ANALYTICAL STUDY ON NONOPERATIVE MANAGEMENT OF LIVER INJURY IN BLUNT TRAUMA TO THE ABDOMEN-– A PROSPECTIVE STUDY"**

**CASE OF BLUNT INJURY ABDOMEN**

**Name: Age/Sex:**

**Address: Occupation:**

**Religion: O.P No: I.P No:**

**Mode of injury: Date & time of injury:**

**Date & time of admission:**

**Time lapse from trauma to hospital:**

**B. CHIEF COMPLAINTS:**

**Duration of symptoms:**

C.PAST HISTORY:

1. DM 2.TB 3.EPILEPSY

4.CARDIAC DISEASES 5.PREVIOUS SURGERY

6. HYPERTENSION 7.JAUNDICE/HEPATITIS

D.PERSONAL HISTORY:

SMOKER /ALCOHOLIC /TOBACCO CHEWER

E.INITIAL ASSESSMENT OF PATIENT

1.Vitals:

PR :

BP :

RR :

SPO2 :

Temperature :

2.GENERAL SIGNS:

General Condition: Peripheral Signs Of Shock:

Tongue

Skin

Icterus

Cyanosis

Lymphadenopathy:

Lungs:

Hematuria:

Oliguria:

**K.SYSTEMIC EXAMINATION:**

CVS

RS

CNS

**ABDOMEN:-**

**EXTERNAL GENITALIA:**

**PER RECTAL EXAMINATION:**

**CLINICAL DIAGNOSIS**

**INVESTIGATIONS**

A. HB%

B. GROUPING & TYPING

C. BT/CT

D. PCV

E. HBSAG HIV

F. ECG

G. URINE: Macro

Micro

Albumin

Sugar

H. BLOOD:

RBS

BLOOD UREA

SER.CREATININE

I. CHEST X RAY PA VIEW

J. X-RAY ABDOMEN ERECT

K. ABDOMEN & PELVIS USG:

L.CECT ABDOMEN AND PELVIS;

**CONSERVATIVE MANAGEMENT:**

1. Duration of hospital stay

2. Any complications

3. Serial USG/CT SCAN in follow up

4. Conservative to laparotomy

# MASTER CHART

| .NO | NAME | AGE | SEX | IP NO | MODE OF INJURY | LATENT PERIOD (HRS) | BLOOD PRESSURE | | | PULSE RATE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ON ADMISSION | DAY 3 | DAY 7 | ON ADMISSION | DAY 3 | DAY 7 |
| 1 | BALAJI | 23 | M | 83934 | RTA | 2 | 120/90 | 120/90 | 120/80 | 14.6 | 12.8 | 14.1 |
| 2 | RAMESH | 36 | M | 17355 | SELF FALL | 1 | 100/70 | 110/70 | 110/80 | 10.2 | 11.6 | 11.2 |
| 3 | GUNASEKARAN | 40 | M | 19484 | RTA | 3 | 120/80 | 120/80 | 120/80 | 11.3 | 12.1 | 11 |
| 4 | KARTHI | 16 | M | 14587 | RTA | 1 | 110/70 | 100/70 | 100/70 | 8.2 | 9.8 | 10 |
| 5 | SENTHIL | 54 | M | 11521 | RTA | 5 | 100/70 | 90/60 | NIL | 10.2 | 8.9 | NIL |
| 6 | ANGAYEE | 43 | F | 11125 | RTA | 2 | 110/70 | 120/70 | 120/70 | 8.9 | 10 | 9.8 |
| 7 | MOORTHI | 36 | M | 33650 | FALL FROM HEIGHT | 2 | 120/70 | 120/80 | 110/70 | 8.6 | 12.2 | 11.6 |
| 8 | RAJA | 26 | M | 36481 | ASSAULT | 4 | 130/80 | 110/60 | 120/80 | 10.9 | 7.6 | 10.3 |
| 9 | CHINNAPILLAI | 37 | M | 33400 | RTA | 5 | 110/70 | 110/70 | 120/70 | 11.2 | 12.1 | 13.3 |
| 10 | UDHAYAKUMAR | 27 | M | 33290 | SELF FALL | 4 | 120/70 | 100/70 | 90/60 | 13 | 11 | 8 |
| 11 | SAKTHIVEL | 43 | M | 5958 | SELF FALL | 2 | 120/70 | 120/70 | 120/70 | 12 | 13.1 | 11.7 |
| 12 | SETHU | 14 | M | 4431 | RTA | 3 | 130/80 | 130/80 | 130/80 | 11.6 | 12.6 | 13.3 |
| 13 | CHANDRAMOHAN | 58 | M | 38086 | RTA | 2 | 110/70 | 100/60 | 110/70 | 11 | 9.2 | 9.8 |
| 14 | MICHAEL | 29 | M | 3507 | RTA | 3 | 130/80 | 130/80 | 120/70 | 10 | 10.5 | 10.2 |
| 15 | LOGESH | 33 | M | 45791 | RTA | 2 | 110/70 | 100/70 | 110/70 | 11.2 | 10.7 | 11 |
| 16 | GOVINDASAMY | 39 | M | 33821 | RTA | 5 | 110/70 | 110/70 | 90/60 | 9.8 | 9.5 | 9 |
| 17 | CHINNAGOUNDER | 46 | M | 33720 | RTA | 2 | 130/70 | 100/70 | 110/70 | 11 | 8.6 | 10.2 |
| 18 | KUMAR | 23 | M | 31037 | FALL FROM | 2 | 120/70 | 110/70 | 110/70 | 10 | 10.3 | 10.5 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | HEIGHT | | | | | | | |
| 19 | SANGEETHA | 35 | F | 37255 | RTA | 4 | 110/70 | 120/80 | 120/80 | 11 | 12.3 | 12.5 |
| 20 | SEKAR | 27 | M | 58391 | RTA | 2 | 110/70 | 100/70 | 110/70 | 8 | 8.1 | 10.2 |
| 21 | KARUPAIYA | 57 | M | 61599 | SELF FALL | 2 | 110/70 | 100/70 | 110/70 | 11 | 10.5 | 10.7 |
| 22 | KRISHNA | 46 | M | 68262 | SELF FALL | 3 | 130/70 | 120/80 | 120/80 | 10 | 10.1 | 9.9 |
| 23 | VENKATESH | 26 | M | 64037 | RTA | 2 | 110/70 | 100/70 | 100/70 | 9 | 7.6 | 9 |
| 24 | KANGATHARAN | 35 | M | 23932 | SELF FALL | 4 | 110/70 | 110/70 | 110/70 | 11 | 12.2 | 11.6 |
| 25 | RAMESH | 39 | M | 28612 | RTA | 2 | 120/70 | 120/70 | 120/80 | 11.2 | 10.6 | 10.8 |
| 26 | SATHISH KUMAR | 27 | M | 31141 | RTA | 2 | 130/70 | 130/70 | 130/80 | 10 | 12.1 | 11.6 |
| 27 | MUNIYAPPAN | 24 | M | 36684 | RTA | 3 | 110/70 | 100/60 | 110/70 | 11 | 9.6 | 11.2 |
| 28 | RAJAMANIKAM | 46 | M | 22020 | SELF FALL | 2 | 100/60 | 100/60 | 110/70 | 9 | 8.6 | 10.6 |
| 29 | PALANIYAMMAL | 48 | F | 63795 | FALL FROM HEIGHT | 4 | 110/70 | 90/60 | NIL | 11 | 8.6 | NIL |
| 30 | GANGATHARAN | 33 | M | 2864 | RTA | 3 | 110/70 | 110/70 | 120/80 | 11 | 10.6 | 12.1 |
| 31 | MOHAMMAD ISMAIL | 41 | M | 1585 | SELF FALL | 2 | 120/70 | 110/70 | 120/80 | 11 | 10.6 | 11.3 |
| 32 | AZHAR MAHAMMAD | 58 | M | 27683 | RTA | 2 | 120/80 | 100/60 | 110/70 | 10.2 | 8.6 | 12.1 |
| 33 | SATHISH KUMAR | 42 | M | 27786 | SELF FALL | 2 | 120/70 | 100/70 | 110/70 | 8 | 8.6 | 11 |
| 34 | KUMAR | 46 | M | 28614 | RTA | 2 | 110/70 | 110/70 | 110/70 | 11 | 10.8 | 11.1 |
| 35 | PERUMAL | 33 | M | 27452 | FALL FROM HEIGHT | 4 | 120/70 | 100/70 | 110/80 | 9 | 9.1 | 10.6 |
| 36 | KUMAR | 25 | M | 23452 | RTA | 2 | 90/60 | | | 11 | | |
| 37 | SATHISH KUMAR | 49 | M | 23932 | RTA | 2 | 130/80 | 130/80 | 130/80 | 11.2 | 11.7 | 11.5 |
| 38 | SIVARAMAN | 62 | M | 1288 | RTA | 3 | 110/70 | 100/60 | 110/70 | 10 | 9.4 | 10.2 |
| 39 | MAYAKANNAN | 55 | M | 14167 | SELF FALL | 2 | 130/80 | 120/80 | 120/80 | 11.2 | 10.7 | 11.2 |
| 40 | RAMESH | 25 | M | 10252 | RTA | 5 | 110/70 | 100/60 | 110/60 | 11 | 11.2 | 11.5 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | KAMAL | 33 | M | 4981 | SELF FALL | 2 | 110/70 | 110/70 | 110/70 | 9.4 | 10.1 | 10.2 |
| 42 | SAVITHRI | 37 | F | 5299 | RTA | 2 | 130/70 | 120/80 | 120/80 | 11 | 10.5 | 11.6 |
| 43 | DHAVAMANI | 28 | F | 95004 | RTA | 2 | 110/70 | 100/60 | 110/70 | 10 | 11.3 | 12.1 |
| 44 | RAJ KUMAR | 23 | M | 9603 | RTA | 4 | 110/70 | 110/80 | 120/80 | 10 | 9.9 | 11.2 |
| 45 | JAGANATHAN | 39 | M | 91587 | ASSAULT | 2 | 120/70 | 120/70 | 120/70 | 10 | 12.6 | 11.9 |
| 46 | MURUGAN | 27 | M | 91133 | SELF FALL | 3 | 100/60 | 100/60 | 120/80 | 9.4 | 10.1 | 10.6 |
| 47 | PERUMAL | 36 | M | 88743 | RTA | 2 | 130/70 | 120/80 | 120/80 | 11 | 11.2 | 11.6 |
| 48 | DHANAKODI | 37 | F | 86607 | RTA | 5 | 100/60 | 100/60 | 110/60 | 10.1 | 9.6 | 10.9 |
| 49 | SENTHIL | 17 | M | 79419 | RTA | 2 | 110/60 | 110/60 | 110/80 | 11 | 9.8 | 10.9 |
| 50 | VIGNESH | 11 | M | 78456 | SELF FALL | 2 | 130/70 | 130/70 | 120/80 | 10.2 | 11.8 | 12 |

| S. NO | NAME | HAEMOGLOBIN | | | USG | CECT-GRADE OF LIVER INJURY | CONSERVATIVELY MANAGED WELL | SURGICAL INTERVENTION | DEATH |
|---|---|---|---|---|---|---|---|---|---|
| | | ON ADMISSION | DAY 3 | DAY 7 | | | | | |
| | | | | | | | | | |
| 1 | BALAJI | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 2 | RAMESH | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 3 | GUNASEKARAN | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 4 | KARTHI | WNL | WNL | WNL | 2 | III | CONSERVATIVELY MANAGED | NIL | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | SENTHIL | WNL | WNL | MILD ELEVATED | 3 | IV | | EMERGENCY LAPROTOMY | YES |
| 6 | ANGAYEE | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 7 | MOORTHI | WNL | WNL | WNL | 3 | III | CONSERVATIVELY MANAGED | NIL | |
| 8 | RAJA | WNL | MILD ELEVATED | WNL | 2 | III | CONSERVATIVELY MANAGED | NIL | |
| 9 | CHINNAPILLAI | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 10 | UDHAYAKUMAR | WNL | WNL | MILD ELEVATED | 1 | IV | CONSERVATIVELY MANAGED | NIL | YES |
| 11 | SAKTHIVEL | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 12 | SETHU | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 13 | CHANDRAMOHAN | WNL | WNL | MILD ELEVATED | 2 | III | CONSERVATIVELY MANAGED | NIL | |
| 14 | MICHAEL | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 15 | LOGESH | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 16 | GOVINDASAMY | WNL | WNL | MILD ELEVATED | 3 | IV | CONSERVATIVELY MANAGED | NIL | YES |
| 17 | CHINNAGOUNDER | WNL | MILD ELEVATED | MILD ELEVATED | 2 | III | CONSERVATIVELY MANAGED | NIL | |
| 18 | KUMAR | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 19 | SANGEETHA | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 20 | SEKAR | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 21 | KARUPAIYA | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 22 | KRISHNA | WNL | WNL | WNL | 2 | I | CONSERVATIVELY | NIL | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | MANAGED | | |
| 23 | VENKATESH | WNL | WNL | MILD ELEVATED | 2 | IV | CONSERVATIVELY MANAGED | NIL | |
| 24 | KANGATHARAN | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 25 | RAMESH | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 26 | SATHISH KUMAR | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 27 | MUNIYAPPAN | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 28 | RAJAMANIKAM | WNL | MILD ELEVATED | WNL | 2 | IV | CONSERVATIVELY MANAGED | NIL | |
| 29 | PALANIYAMMAL | WNL | MILD ELEVATED | MILD ELEVATED | 3 | IV | CONSERVATIVELY MANAGED | NIL | YES |
| 30 | GANGATHARAN | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 31 | MOHAMMAD ISMAIL | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 32 | AZHAR MAHAMMAD | WNL | WNL | WNL | 2 | III | CONSERVATIVELY MANAGED | NIL | |
| 33 | SATHISH KUMAR | WNL | WNL | WNL | 2 | III | CONSERVATIVELY MANAGED | NIL | |
| 34 | KUMAR | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 35 | PERUMAL | WNL | WNL | WNL | 2 | III | CONSERVATIVELY MANAGED | NIL | |
| 36 | KUMAR | WNL | | | 3 | IV | | EMERGENCY LAPROTOMY | |
| 37 | SATHISH KUMAR | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 38 | SIVARAMAN | WNL | MILD ELEVATED | MILD ELEVATED | 2 | IV | CONSERVATIVELY MANAGED | NIL | |
| 39 | MAYAKANNAN | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 40 | RAMESH | WNL | WNL | MILD ELEVATED | 2 | III | CONSERVATIVELY MANAGED | NIL | |
| 41 | KAMAL | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 42 | SAVITHRI | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 43 | DHAVAMANI | WNL | WNL | WNL | 2 | III | CONSERVATIVELY MANAGED | NIL | |
| 44 | RAJ KUMAR | WNL | WNL | WNL | 1 | II | CONSERVATIVELY MANAGED | NIL | |
| 45 | JAGANATHAN | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 46 | MURUGAN | WNL | WNL | WNL | 2 | II | CONSERVATIVELY MANAGED | NIL | |
| 47 | PERUMAL | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |
| 48 | DHANAKODI | WNL | WNL | MILD ELEVATED | 1 | III | CONSERVATIVELY MANAGED | NIL | |
| 49 | SENTHIL | WNL | WNL | WNL | 3 | III | CONSERVATIVELY MANAGED | NIL | |
| 50 | VIGNESH | WNL | WNL | WNL | 1 | I | CONSERVATIVELY MANAGED | NIL | |

USG 1 – Mild,2-Moderate,3-Severe hemoperitoneum