

**A STUDY OF OUTCOME OF NON OPERATIVE
MANAGEMENT IN BLUNT INJURY ABDOMEN WITH SOLID
ORGAN INJURIES**



**Dissertation submitted to
THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI-600 032**

**in partial fulfillment of the regulations for the award of the degree of
M.S. GENERAL SURGERY (BRANCH I)**



**COIMBATORE MEDICAL COLLEGE,
COIMBATORE - 641 014**

MAY 2020

REGISTRATION NUMBER : 221711315

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled “ **A STUDY OF OUTCOME OF NONOPERATIVE MANAGEMENT IN BLUNT INJURY ABDOMEN WITH SOLID ORGAN INJURIES**” is a bonafide dissertation done by **DR. P.SENTHIL** in Department of General Surgery, Coimbatore Medical College and Hospital is submitted in partial fulfillment of the requirement for the Degree of M.S. General Surgery, Branch I of the Tamilnadu Dr. M.G.R. Medical University, Chennai.

Date:

DR. R. NARAYANAMOORTHY, M.S.

Associate Professor

Department of General Surgery

Coimbatore Medical College and Hospital

Coimbatore.

CERTIFICATE BY THE HEAD OF THE DEPARTMENT

This is to certify that the dissertation entitled “**A STUDY OF OUTCOME OF NONOPERATIVE MANAGEMENT IN BLUNT INJURY ABDOMEN WITH SOLID ORGAN INJURIES**” is a bonafide research work done by **DR.P.SENTHIL** in Department of General Surgery, Coimbatore Medical College and Hospital under the guidance of **DR. R. NARAYANAMOORTHY M.S., Associate Professor**, Department of General Surgery, Coimbatore Medical College and Hospital and is submitted in partial fulfillment of the requirement for the Degree of **M.S. GENERAL SURGERY, BRANCH I** of the Tamilnadu Dr.M.G.R. Medical University, Chennai.

Date :

DR. A.NIRMALA M.S.DGO

Professor & HOD

Department of General Surgery

Coimbatore Medical College & Hospital

Coimbatore.

CERTIFICATE BY THE HEAD OF THE INSTITUTION

This is to certify that the dissertation entitled “**A STUDY OF OUTCOME OF NONOPERATIVE MANAGEMENT IN BLUNT INJURY ABDOMEN WITH SOLID ORGAN INJURIES**” is a bonafide and genuine research work done by **DR. P.SENTHIL** under the guidance of **Dr.R.NARAYANAMOORTHY M.S.**, Associate Professor in Department of General Surgery, Coimbatore Medical College and Hospital and is submitted in partial fulfillment of the requirement for the Degree of M.S. General Surgery, Branch I of the Tamilnadu Dr.M.G.R. Medical University, Chennai.

Date :

DR. B. ASOKAN M.S., M.Ch (Plastic)

Dean

Coimbatore Medical College

Coimbatore.

CERTIFICATE - II

This is to certify that this dissertation work titled **“A STUDY OF OUTCOME OF NONOPERATIVE MANAGEMENT IN BLUNT INJURY ABDOMEN WITH SOLID ORGAN INJURIES”** of the candidate **Dr. P. SENTHIL** with registration Number **221711315** for the award of **M.S. Degree in General Surgery (Branch I)** in the branch of General Medicine I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **6% (Six Percentage)** percentage of plagiarism in the dissertation.

Guide & Supervisor sign with Seal

INSTITUTIONAL HUMAN ETHICS COMMITTEE
COIMBATORE MEDICAL COLLEGE, COIMBATOR - 14

EC Reg No. ECR/892/Inst/TN/2016
Telephone No: 0422 - 2574375/76
Fax : 0422 - 2574377

CERTIFICATE OF APPROVAL

To
Dr Senthil P
Post Graduate,
Department of General Surgery,
Coimbatore Medical College & Hospital
Coimbatore -18.

Dear **Dr Senthil P**

The Institutional Ethics Committee of Coimbatore Medical College, reviewed and discussed your application for approval of the proposal entitled "**A Study of outcome of Non Operative Management in Blunt Injury Abdomen with Solid Organ Injuries.**"No.0115/2017.

The following members of Ethics Committee were present in the meeting held on 30.11.2017.conducted at MM - II Seminar Hall, Coimbatore Medical College Hospital Coimbatore-18

1	Dr.S.Ramalingam MD, Dean, PSG IMS&R, Cbe	Chairman
2	Dr.Usha MD., Professor of General Medicine, CMCH, Cbe	Member Secretary
3	Dr.R.Manonmani MD., Professor of O&G, CMCH, Cbe	Clinicians
4	Dr.N.Renganathan MS., Professor of General Surgery, CMCH,Cbe	Clinicians
5	Dr.Sudha Ramalingam MD., Professor of SPM, PSG IMS&R, Cbe	Clinicians
6	Dr.R. Shanmugavadivu MD., Professor of Physiology, CMC, Cbe	Basic Medical Scientist
7	Dr.N. Shanthy MD., Professor of Pharmacology, CMC, Cbe	Basic Medical Scientist
8	Dr.A.Dhanalakshmi MD., Assoc. Professor of Pathology, CMC,Cbe	Basic Medical Scientist
9	Dr.L.Madhan MD., Professor of Pharmacology, CMC, Cbe	Basic Medical Scientist
10	Dr.N.Paramasivan MD., Professor of Pharmacology, Sri Ramakrishna Dental College, Coimbatore	Basic Medical Scientist
11	Mrs.A.Sharmila BA., BL., Advocate	Legal Expert
12	Dr.K.P.Sampath Kumar M.Pharm, Ph.D., Asst. Prof. of Pharmacy, CMC, Cbe	Scientific Member
13	Dr.G.Vani Ganesh M.Sc.,Ph.D., Tutor in Medical Surgical Nursing, CMCH, Cbe	Scientific Member
14	Mr.V. Balasubramani MA,MA,MBA,LLB,M.Phil,PG.D.M, DLLAL, Chief Executive, Avinashilingam JSS Self Finance Courses, Cbe	Social Worker
15	Mr.V.A.Shahul Hameed, +2	Lay-Person

We approve the Proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.


MEMBER SECRETARY
INSTITUTIONAL HUMAN ETHICS COMMITTEE
COIMBATORE MEDICAL COLLEGE
COIMBATORE - 641 014.

Urkund Analysis Result

Analysed Document: NOM.docx (D57377125)
Submitted: 10/21/2019 4:14:00 PM
Submitted By: senthil.opc.cmc@gmail.com
Significance: 6 %

Sources included in the report:

INTRODUCTION-thesis.docx (D56856411)
STUDY ON BLUNT INJURY.docx (D57282218)
<https://docplayer.net/amp/141643413-A-study-on-blunt-injury-abdomen-solid-organ-injuries.html>

Instances where selected sources appear:

25

DECLARATION

I solemnly declare that the dissertation titled "**A STUDY OF OUTCOME OF NONOPERATIVE MANAGEMENT IN BLUNT INJURY ABDOMEN WITH SOLID ORGAN INJURIES**" was done by me from January 2018 to December 2018 under the guidance and supervision of **DR.R.NARAYANAMOORTHY, M.S.**, Associate Professor, Department of General Surgery, Coimbatore Medical College and Hospital. This dissertation is submitted to the Tamilnadu Dr. M.G.R Medical University towards the partial fulfillment of the requirement for the award of M.S Degree in General Surgery (Branch I).

Date:

Place: Coimbatore

Signature of the Candidate

ACKNOWLEDGEMENT

Firstly I owe my reverential gratitude to the almighty for his blessings and my parents for being on my side and helping me complete this dissertation.

I am obliged to record my immense gratitude to **DR. B. ASOKAN M.S. M.Ch (Plastic Surgery)** Dean, Coimbatore Medical College Hospital for providing me with all the facilities required to complete this study.

I am extremely thankful indebted to my respected teacher and guide **DR. R. NARAYANAMOORTHY MS**, Associate Professor, Department of General Surgery for his valuable guidance and constant help throughout this study.

I would like to express my sincere thanks to Professor and HOD **Dr. A.Nirmala M.S. DGO**, Professor **Dr. V. Lekshmi Narayani M.S.**, Associate Professor **Dr. T. Srinivasan M.S.** and Associate Professor **Dr.V.S. Venkatesan M.S.**

I am also thankful to Assistant Professors **DR. S. VEERANAN M.S.** and **DR. T. GUNALASURESH M.S.** for their help and support.

I express my gratitude to all my Professors, Assistant Professors, Staff members of Department of General Surgery and all my Postgraduates colleagues and friends for their help and co-operation during this study and preparation of this dissertaion. Lastly I express my sincere thanks to all my patients without whom this study would not have been possible.

TABLE OF CONTENTS

SL.NO.	CONTENT	PAGE NO.
1	INTRODUCTION	1
2	AIMS AND OBJECTIVES	2
3	REVIEW OF LITERATURE	3
4	MATERIALS AND METHODS	66
5	RESULTS AND DISCUSSION	72
6	CONCLUSION	89
7	BIBLIOGRAPHY	
8	APPENDICES	
9	PROFORMA	
10	CONSENT FORM	
11	MASTER CHART	

INTRODUCTION

Significant abdominal solid organ injuries are present in most of blunt injury abdomen, of which 80-90% injuries are due to Road Traffic Accidents, fall from height, assaults which leads to mortality and morbidity

Solid abdominal organs like liver, spleen, kidney are most commonly injured in blunt injury abdomen and its management will be challenging in deciding operative and non operative or conservative management. In that operative management is required only in 30 to 35% of blunt injuries abdomen. Recently there has been major shift to non-operative management of solid organ injuries from operative management in hemodynamically stable and selected patients by continuous monitoring the vitals and by highly accurate imaging modalities

This study is mainly to evaluate the effectiveness of non-operative management in low grade and high grade solid abdominal organ injuries in blunt injury abdomen and factors influencing the non-operative management and etiologies for failed non-operative management.

AIMS AND OBJECTIVES

This dissertation has been chosen to study the outcome of non-operative management in the blunt injury abdomen with solid organ injuries occurred in Government Coimbatore Medical College Hospital, Coimbatore for a period of nineteen months from January 2018 to July 2019.

This study is mainly to evaluate the effectiveness of non-operative management in low grade and high grade solid abdominal organ injuries in blunt injury abdomen and factors influencing the non-operative management and etiologies for failed non-operative management.

Aims of the study are:-

1. To find the incidence of various organs injured in blunt abdominal injuries.
2. To find the age and sex distribution
3. To study the outcome of non-operative management of different solid abdominal organ injuries
4. To find the impact of non-operative management and causes for converting into operative management and their postoperative outcome
5. To find the advantage of NOM.

REVIEW OF LITERATURE

ANATOMY OF ABDOMEN

The abdomen is divided into nine regions by two horizontal lines and two vertical arbitrary lines for descriptive purposes. The horizontal lines are the trans-pyloric plane and trans-tubercular plan. Two vertical lines are right and left midclavicular line. Trans-pyloric line is at the level of pylorus of the stomach and passes through the tip of the ninth costal cartilage. Transtubercular line is passing between the iliac tubercles. Two vertical lines pass from the midclavicle downwards. These lines divide the abdomen into nine regions namely epigastrium, right and left hypochondrium, umbilical, right and left lumbar, hypogastrium, right and left iliac fossa each region has its own significance^{1,2}

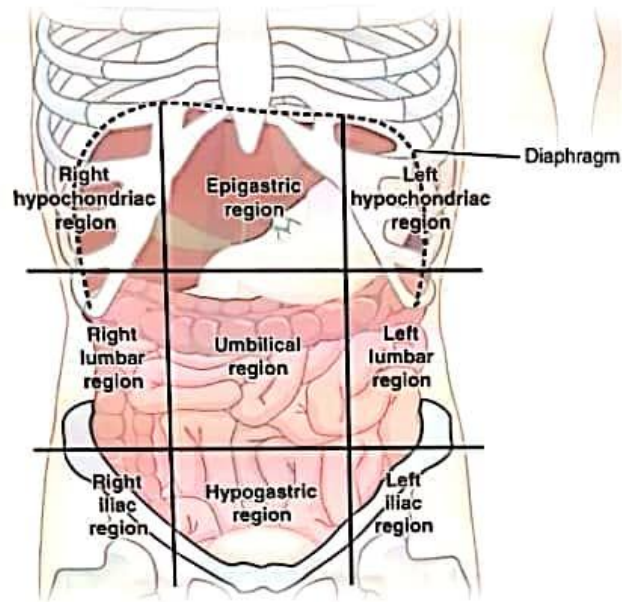


Image showing nine regions of abdomen

Organs lying in each abdominal region¹⁶

I] Right Hypochondrium

The right hypochondrium region is lies in right side of the right midclavicular line (also called right vertical line) and above the upper horizontal line also called transpyloric line.it has.

1. **Liver**
2. **Right kidney**
3. **Gall bladder**
4. **Small intestine**

5. Hepatic flexure of colon.

6. Ascending colon

II] Epigastrium

It is the region in between two vertical midclavicular lines and above transpyloric line and in between the right and left hypochondrium region. The organs which are situated are,

1. Left lobe of liver

2. Stomach

3. duodenum

4. Spleen

5. Pancreas

6. Transverse colon

7. Lower part of esophagus

III] Left hypochondrium

Located in left side of the midclavicular line and above the transpyloric line. Organs present in left hypochondrium are:

1. Spleen

2. Tail of pancreas

3. **Splenic flexure of colon.**

4. **Left kidney**

5. **Descending colon**

IV] Right lumbar region

To to the right side of the right midclavicularline and below transpyloric line. The region contains

1. **Right kidney**

2. **Ascending colon**

3. **Gall bladder**

4. **Liver**

V] Left lumbar region

It isto the region to the left side of the left midclavicular line and below transpyloric line. Organs which are present are

1. **Left Kidney**

2. **Descending colon**

VI] Umbilical region

Centre of all nine nine regions and it contains

1.**umbilicus**

2.**duodenum,ileum,jejenum**

VII]Right iliac fossa

The region lies to the right side of the right midclavicular line and below transtuberular line. Organs are

1.Appendix

2.Ceacum

3.Right ovary in females,right ovary

4.Right ureter

VIII]Left iliac fossa region

The left iliac fossa lies to the left of the left midclavicular line and below transtuberular line. Organs are:

1. Sigmoid colon.

2. Descending Colon.

3. Left ureter

4. Left Ovary and tubes

IX] Hypogastric region

It lies in between two vertical midclavicular lines and below transtuberular line and in between the right and left iliac fossa.organs are,

1. **Bladder**
2. **Sigmoid colon.**
3. **Fundus of Uterus in female**

When patients is complaining abdominal pain in particular region ,one should think about visceral organs which are present in that region first.But it also can be referred or radiating pain.Along with nine regions of abdomen ,perineum is considered as tenth region without which physical examination of abdomen will not get completed.

ANATOMY OF ABDOMINAL SOLID ORGANS

ANATOMY OF SPLEEN:¹¹

Spleen lies in left hypochondrium, protected by 9,10,11 ribs which size is about -10x7x3cm in dimension

80 to 300 g in weight

Suspended by multiple peritoneal reflections like gastrosplenic, splenocolic, splenophrenic, gastrosplenic ligaments

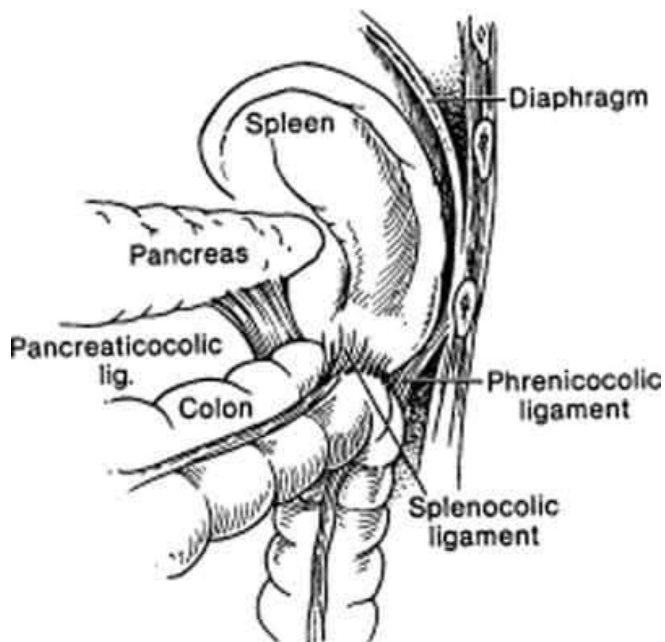


Image-showing anatomy of spleen

BLOOD SUPPLY:

Splenic artery-branch of celiac artery ,may also arise from aorta/SMA

-Blood flow:200ml/min

splenic vein join with SMV at right angles posterior to neck of portal vein.

-spleen is the most common solid organ injured in blunt injury abdomen.

FUNCTIONS OF SPLEEN²

1. It traps the blood born antigen and microbes.
2. It plays major role in mounting immune response to antigens.
3. It filters infective organisms, aged or defectively formed spherocytes,
4. It filters particulate matter from blood.
5. Old red blood cells which are destroyed in spleen and iron which is left is used for formation of new RBC
6. It forms the blood cells during foetal development.

Major filtering function performed by macrophages lining up splenic cords- traps the circulating antigens and process them and send them to white pulp

Immune response is initiated by interacting with B and T cells

ANATOMY OF LIVER^{14,16}

It is a Solid gastrointestinal organ which weighs about 1.2 - 1.6 kg weight occupies right upper quadrant of abdomen. Majority of right liver & most of left liver covered by thoracic cage .Posterior surface straddles the IVC

The liver is covered with peritoneum except for GB fossa , portahepatis, either side of IVC , (right if IVC- bare area).Peritoneal duplication on the liver surface are called ligaments. They are coronary ligaments, right & left triangular ligaments .From the center of coronary ligament , falciform ligament .

The ligamentum teres goes in the inferior edge of falciform ligament . From umbilical fissure to umbilicus falciform ligament divides into right & left lobe hepatic artery, portovenous blood enter the liver at hilum , gets branched throughout the liver, called portal pedical unit along with bile duct .

Venous drainage is by right , left , middle hepatic veins drains into suprahepatic veins

Liver is Functionally composed of eight segments , supplied by separate single portal trait (portal vein , hepatic artery , bile duct).Described by couinoid in 1957.Segments are organized into four sectors by seissurae, which has three main hepatic veins

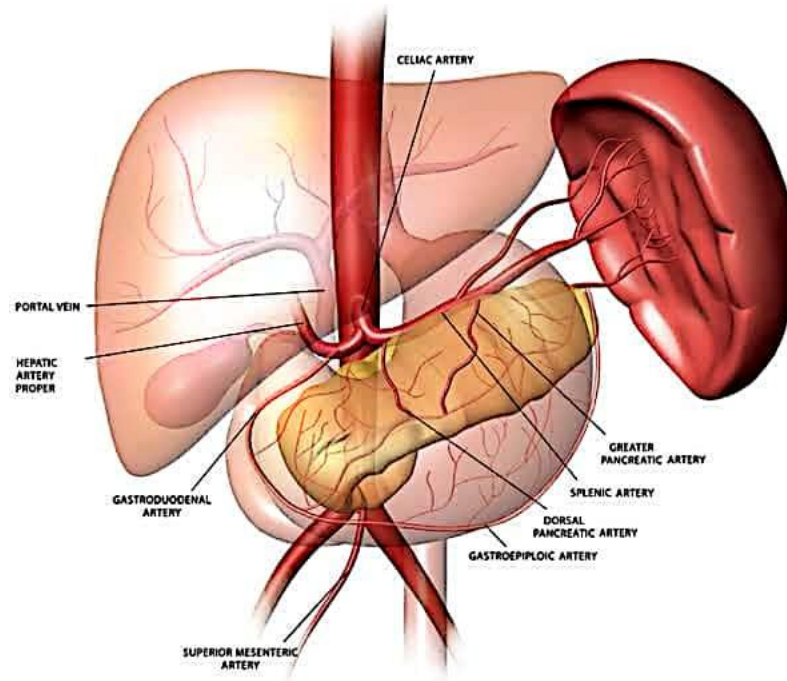


Image showing liver and spleen

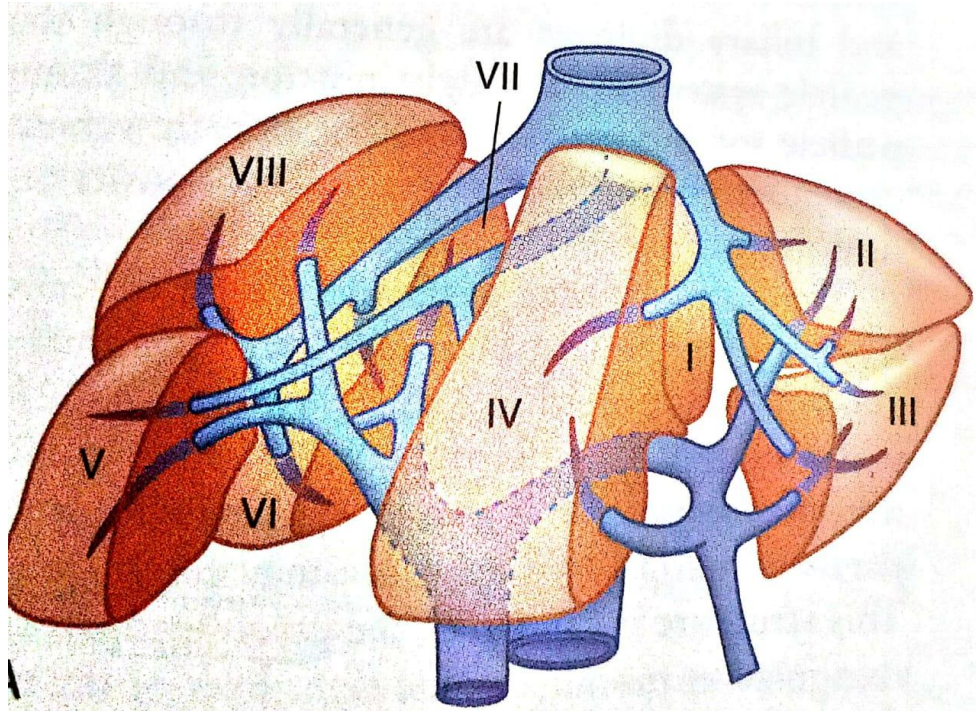


Image showing liver segments

Main fissure has main hepatic vein goes in AP direction from left side of IVC to GB fossa. The line of main fissure called Cantlie line divides liver into right & left hemi liver .

The caudate lobe is dorsal portion of liver. It lies posterior to the left portal tract inferiorly , left & middle hepatic veins superiorly.

FUNCTIONS OF LIVER²

It has wide range of functions:

I] METABOLIC

- i. carbohydrate metabolism
- ii. Lipid metabolism
- iii. Amino acid metabolism
- iv. Cholesterol synthesis
- v. Ammonia formation
- vi. Vitamins and minerals metabolism
- vii. Nucleic acid metabolism

II] SYNTHETIC FUNCTION

- i. Synthesis of albumin, globulins
- ii. Clotting factors
- iii. Transport and binding proteins

III] STORAGE FUNCTION

- i. Storage of glycogen, B12 , Vit K
- ii. Iron
- iii. copper

IV] SECRETORY-

- i. Bile acid from cholesterol
- ii. Conjugation of bilirubin

V] DETOXIFICATION

- i. Xenobiotic
- ii. Steroid
- iii. Thyroid hormone
- iv. Endogenous metabolite

VI] IMMUNOLOGICAL FUNCTION

Kupffer cells- as antigen presenting cells

VII] EXCRETORY

Excretion of exogenous dyes like rose Bengal etc

ANATOMY OF KIDNEYS¹⁶

Kidney is retroperitoneal organ situated at about the T12 to L3 vertebra

It measures 11 to 13 cm in length 6cm in width

It weighs about 130 to 175 g

It is covered by fibrous capsule, which in turn covered by renal pad of fat and all these encompassed by a tough renal fascia

Adrenal gland lies in superior aspect of each kidney

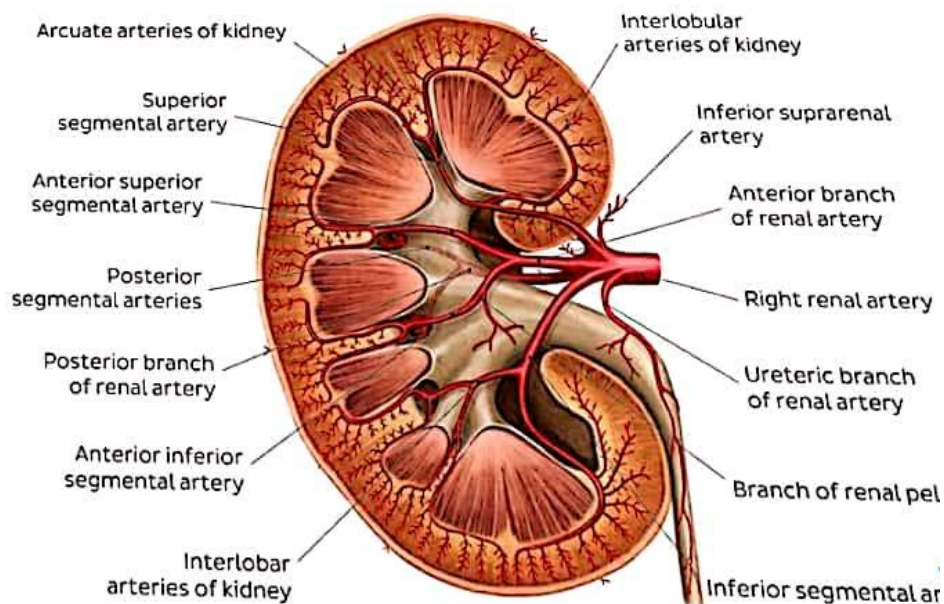


Image showing renal anatomy

On left side, it lies posterior to splenic hilum and vessels, tail of pancreas

Spleen is located anteromedial to left kidney and attached by lienorenal ligament

On the right, it is attached to liver by hepatorenal ligaments and duodenum lies medially. Hepatic flexure of colon crosses anterior to right kidney

Supplied by renal artery, branch of abdominal aorta below the superior mesenteric artery at the level of L2 vertebrae then it branches into four to five segments and supplies kidney and renal vein is 6 to 10 cm and drains into IVC

BLUNT INJURY ABDOMEN¹⁷

Injury is defined as damage to body by exchange with environmental energy, beyond the body's resistance. Abdominal trauma is classified into blunt/penetrating abdominal injury.

Causes for blunt abdominal trauma includes:

Motor vehicle accidents

Motor cycle crashes

Assaults

Pedestrian –automobile impacts

Falls

Blunt abdominal trauma can result in multiple different organ injuries.

Injuries divided into two:

SOLID ORGAN {liver, spleen, kidney}

HOLLOW ORGANS {stomach, small & large intestine, gall bladder, urinary bladder}

Solid organ injuries range from minor injuries such as hemodynamically insignificant liver, spleen, kidney, lacerations to devastating injuries requiring immediate intervention.

Blunt trauma patients who are hemodynamically unstable, have significant intra-abdominal fluid identified on USG/CT require emergency laparotomy to manage bleeding. The presence of peritonitis is also an indication for laparotomy.

Historically, blood within abdomen mandated laparotomy, although commonly the bleeding from solid organ had stopped by the time of laparotomy. Patient's physiological state is more indicative of the need for laparotomy than the amount of injuries alone. The recognition of ongoing bleeding and cardiac stability is the key to management of many of these injuries non operatively.

MECHANISM OF INJURY^{2,13}

CRUSHING

Direct application of blunt force to the abdomen by decelerations apply a shearing force across organs with fixed attachments

PENETRATION

Secondary penetrating injury due to generated bony spicules after disruption of bony areas by blunt trauma

BURSTING

Abdominal compression which will lead to raised intraabdominal pressure which in turn will cause rupture of organs

PATHOPHYSIOLOGY IN BLUNT ABDOMINAL INJURIES

Blunt abdomen injury is mainly caused by two mechanisms

1. Compression force

Compression force when extrinsic compression against fixed object or direct blow occurs. This will cause tears or sub capsular hematomas of solid organs and also causes rupture of hollow viscus organ due to transient increase in intra luminal pressure

2. Deceleration force

Stretching and linear shearing due to deceleration force which leads to rupture of fixed organs at the junction between free and fixed part.

SPLENIC INJURY¹

The spleen is the most commonly injured abdominal solid organ. Most of low grade splenic injuries are self-limited with no evidence of ongoing bleeding. High grade injuries with hemodynamically unstable patients need splenectomy.

Pathophysiological mechanism:

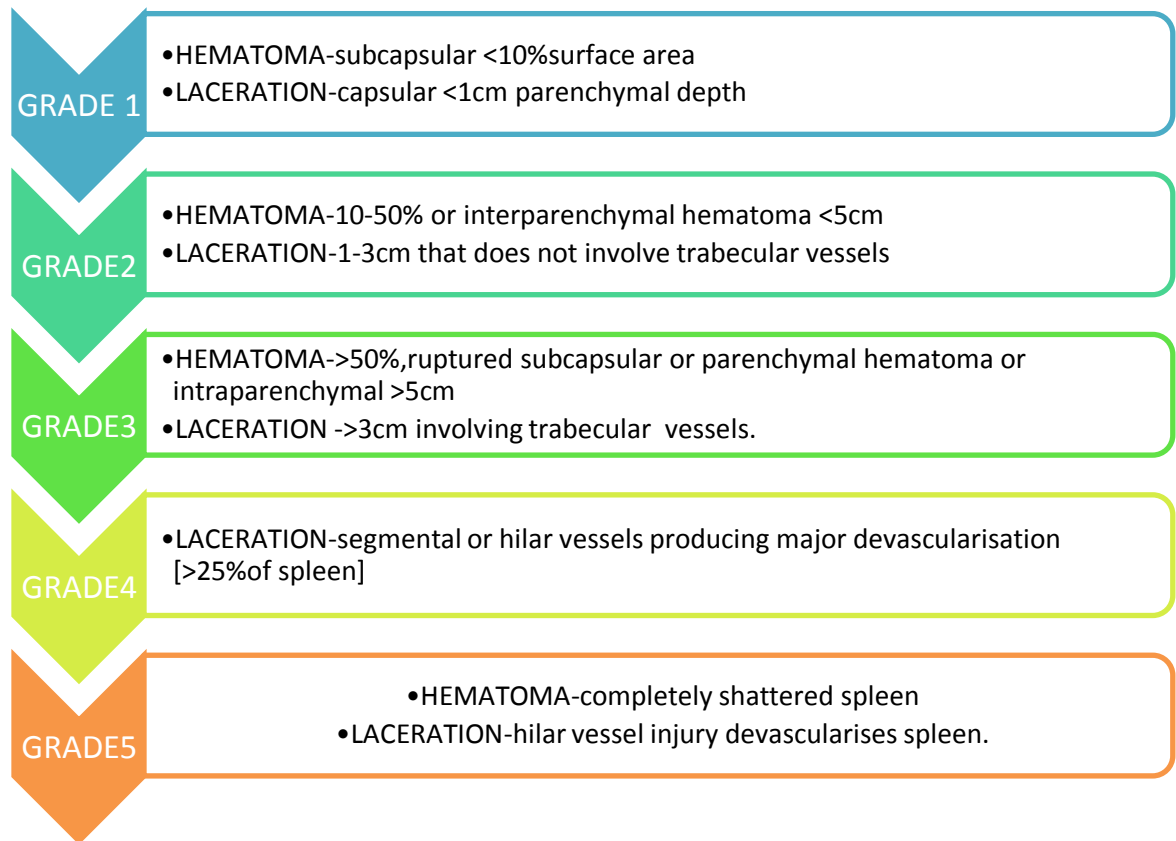
Eventhough injuries can be secondary to rapid deceleration which tears the splenic parenchyma/capsule where it usually fixed to the retroperitoneum ,Direct compression of spleen with fracture of parenchyma is common at the tissue level, and causes subcapsular hematoma.

Hemorrhage from splenic injury can occur and can be ongoing or mostly it will have stopped causing no more blood loss at the time of presentation.Injuries which have stopped bleeding can often be managed without unnecessary laparotomy and splenectomy and patient may present a delay re-initiation of hemorrhage,which is the greatest concern for patient who undergoes conservative or non-operative management.

Unstable patients with intra abdominal fluid on USG/CT planned for emergency exploration and patient may have a splenic injury identified ,since the spleen being the commonly bleeding organ,will undergo splenectomy

Splenic injury appears as disruption in normal parenchyma along with surrounding hematoma and free abdominal blood on abdominal CT with IV contrast study.Active bleeding also can be visualized by

extravasation of contrast material. Splenic injuries are classified by the AAST injury scoring scale, which grades injuries on the basis of parenchyma, subcapsular abnormality and presence of vascular involvement.



AAST SPLEEN INJURY SCALE

Many blunt splenic trauma patients can be managed without laparotomy and splenectomy with careful selection of patients if applied. It is applicable only to patients who are stable and have no evidence of ongoing blood loss considered for conservative management/non-

operative management. But unstable bleeding patient should undergo splenectomy and the majority of patients are no longer bleeding at presentation and do benefit from avoiding an unnecessary operation.

By monitoring the patients physiological status, it is possible to identify those who have a hemostatic splenic injury and who are appropriate candidate for non-operative management, which does not mean that there is lack of intervention provided. In fact NOM for splenic injury will be very intensive. It is necessary to have the appropriate treatment plan and care model to provide the ongoing surveillance required to manage a blunt splenic injury without splenectomy and patient must have no physiological indication on ongoing bleeding.

For non-operative management, Hemodynamic stability should be maintained without any ongoing intravascular volume support. Physiological stability includes a normal BP, normal pulse without tachycardia, no physical examination finding of indicative of shock and absence of metabolic acidosis.

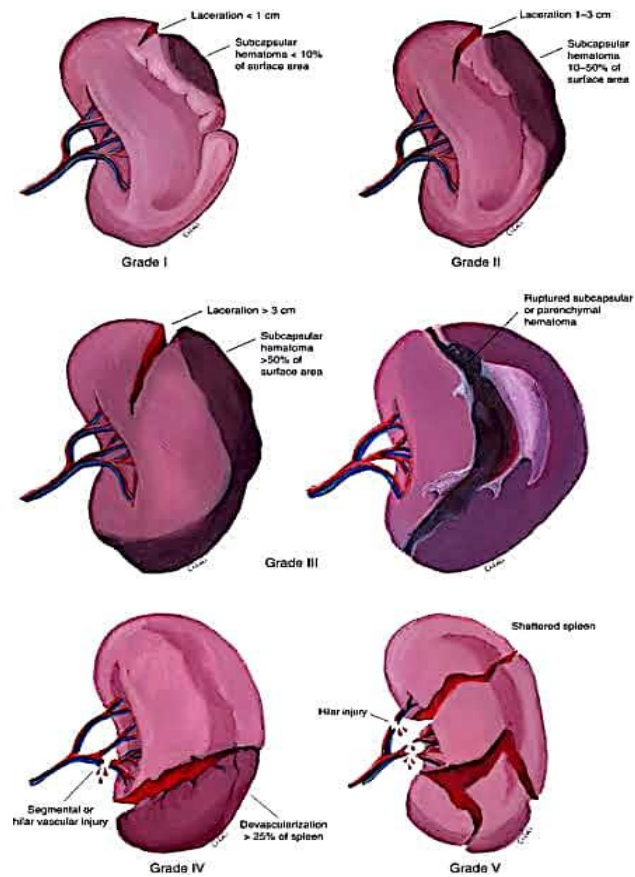


Image showing grades of splenic injury⁷

As actual blood loss may not be recognized till intravascular equilibrium occurs, Care must be in initial Hemoglobin level. A great work has been performed in an attempt to identify which patient with splenic injury safely can be managed non operatively.

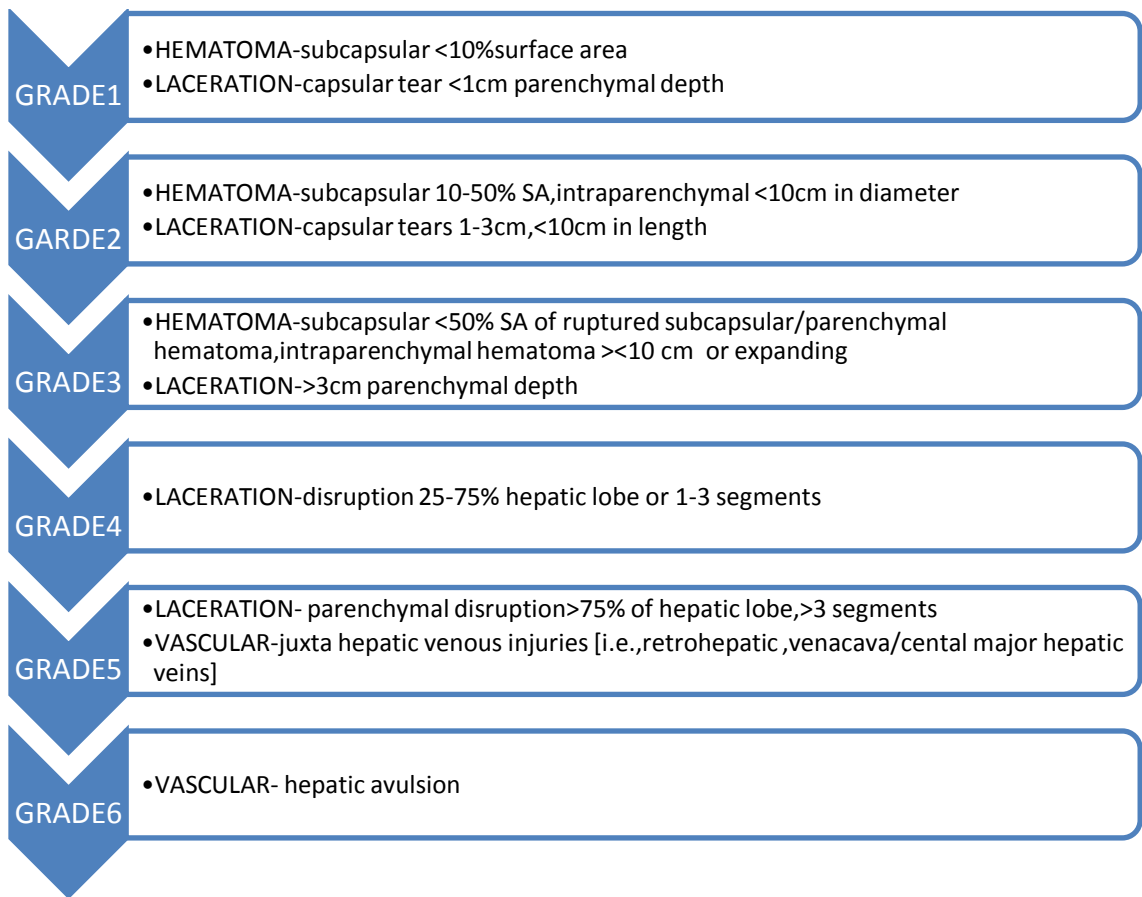
Grade of injury at the time of presentation is extensively considered, but age alone is not a contraindication to manage splenic injury non operatively .With setting of instability at time of admission or after failed

conservative management and when spleen rebleeds after a particular period of stability, immediate Operative management is required.

LIVER INJURY^{1,13,4}

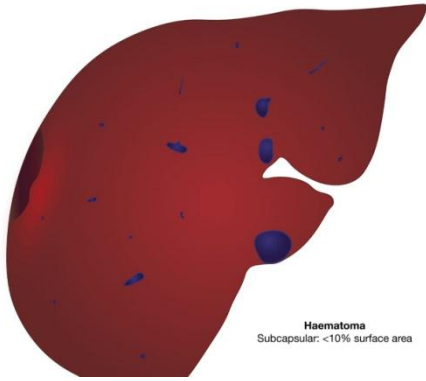
Mechanism of blunt injury to liver includes shearing forces which causes tear in hepatic tissue and disrupt vascular and ligamentous attachments and compression with direct parenchymal damage

Liver injuries are most commonly diagnosed on entering the abdomen in unstable patient explored for free fluid on usg. If patients don't require immediate operation, should be imaged with abdominal CT enhanced with IV contrast agent, since CT is capable of providing excellent anatomic detail and have to be monitored closely

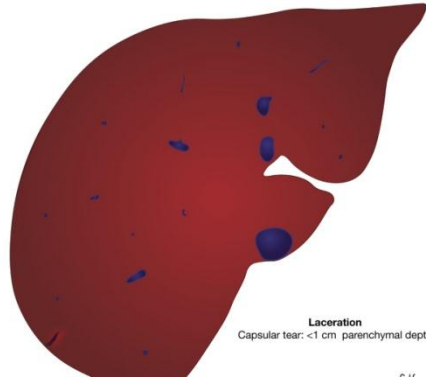


AAST LIVER INJURY SCALE⁷

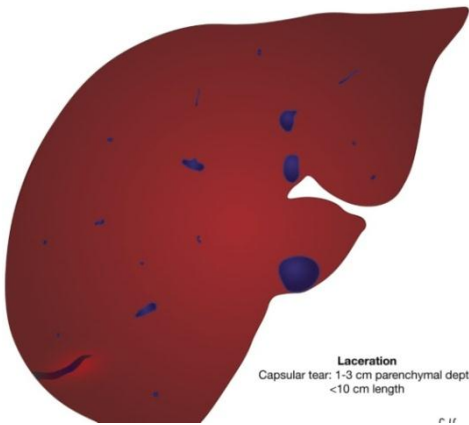
Grade I



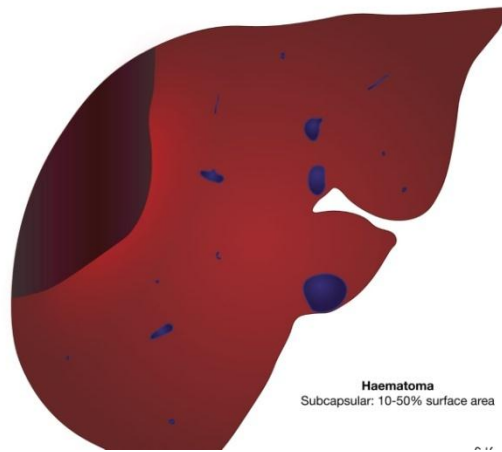
Grade I



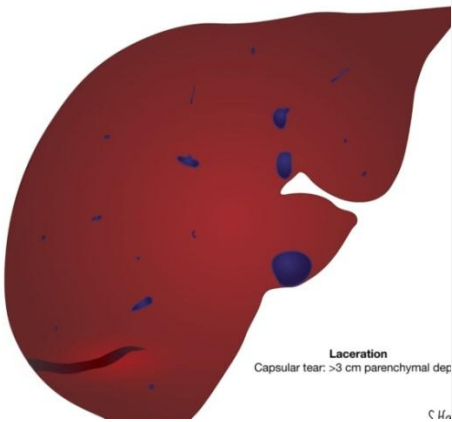
Grade II



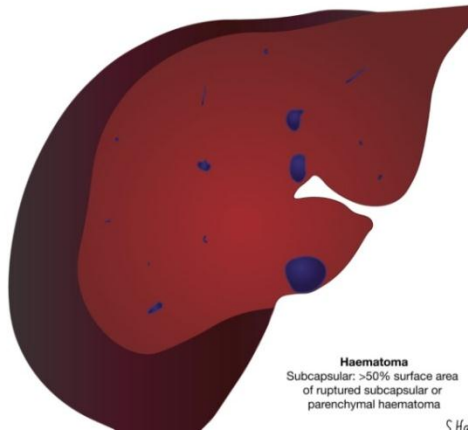
Grade II

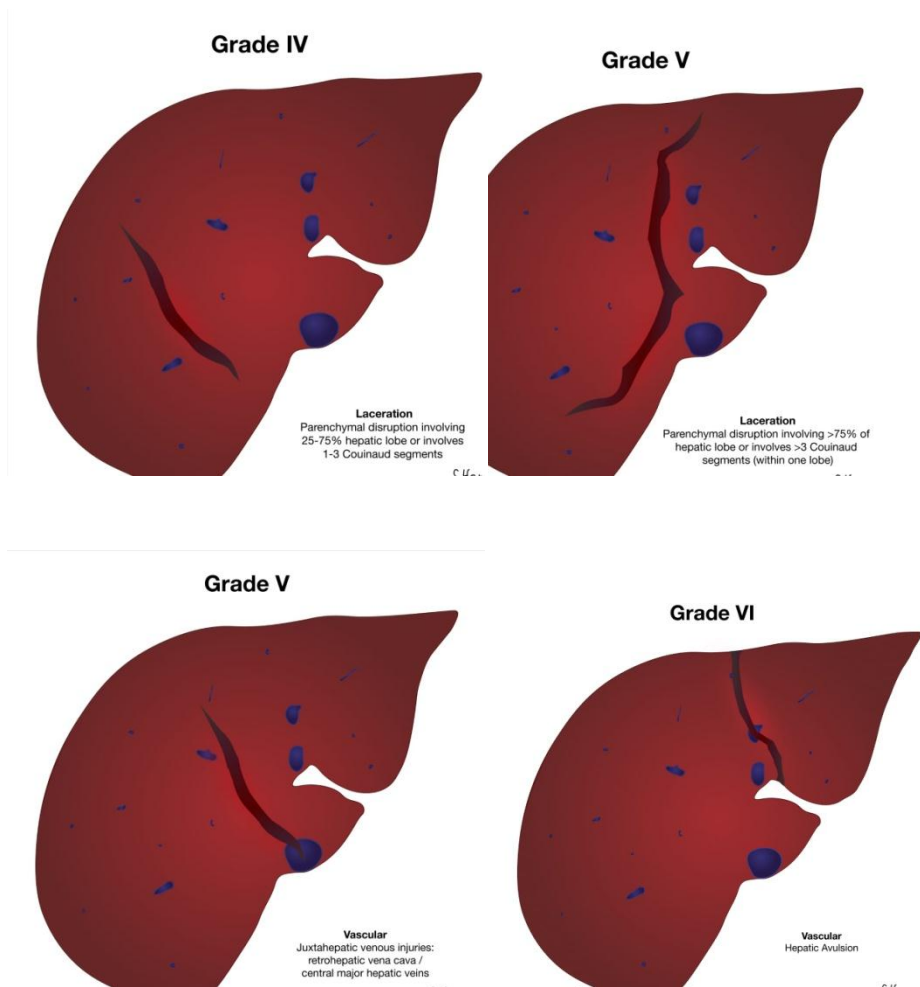


Grade III



Grade III





ILLUSTRATED IMAGES OF GRADES LIVER INJURY

Common findings in CT indicative of liver injury is disruption of hepatic parenchyma with perihepatic blood / hematoma and hemoperitoneum. Bleeding from liver will be seen on CT like extravasation of contrast material with liver parenchyma and peritoneal surface.

Hemodynamically unstable patients require immediate laparotomy and proceed and stable patient is benefitted from more conservative approach. Hemostatic injuries don't require operation but need close surveillance for indicators of rebleeding or associated complications.

Non-operative management of liver injuries has the excellent results with success achieved 85-97% of case application of non operative approach for selected stable patient and resulted in a decreasing mortality for liver injuries. Candidate for non-operative management must demonstrate evidence that all bleeding from liver has stopped. These patients have no tachycardia, fall in blood pressure, metabolic acidosis or physical examination of evidence of shock.

Physiological stability and monitoring is the major predictor of successful non-operative management of hepatic trauma. Even with high grade injuries, non-operative management can be attempted as long as the patient remains hemodynamically stable without evidence of bleeding.

The surgeon needs to diligently determine whether the patient has bleeding liver and that would benefit from surgery. Unlike spleen injuries, the operative intervention of liver trauma is less definitive & will be challenging one. For this reason, minimal decrease in Hb levels are at

times tolerated & occasionally treated with blood transfusion. Frequent abdominal examinations to detect evidence of intestinal injury are also an important part of NOM.

After successful non-operative management patient may require the treatment of complications like bile leak with bilioma formation, hemobilia, development of liver abscess. CT / USG imaging can be useful in evaluation for abscess/ bilioma, managed by percutaneous aspiration. ERCP with stent placement sometimes required to decompress the biliary tree & to promote healing of bile leak.

KIDNEY INJURIES

Kidney injuries are less common compared to spleen and liver in blunt injury abdomen

AAST-KIDNEY INJURY SCALING SYSTEM⁷

GRADE	INJURY	DESCRIPTION
I	Contusion	Microscopic (or) gross hematoma urological Studies normal.
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration.
II	Hematoma	Non expanding perirenal Hematoma Confined to renal Retroperitoneum
	Laceration	<1cm parenchymal depth of renal cortex without urinary extravasation.
III	Laceration	>1 cm parenchymal depth of renal cortex Withoutcollecting system rupture(or) urinary extravasation.
IV	Laceration	Parenchymal laceration extending through The renal cortex, medulla and collecting System.
	Vascular	Main renal artery (or) vein injury with Continued hemorrhage.
V	Laceration	Completely shuttered kidney
	Vascular	Avulsion of renal hilum which devascularizes the kidney

EVALUATION OF PATIENT^{11,17,5,1}

Detailed History and physical examination plays vital role in decision making process

History

1.Place,Time and mode of injury –RTA,assaults,falls,etc...

2.Type and size of the vehicle in automobile accidents

3.The location of patients in the vehicle when accidents happen

4.side of impact

In case of assault

Type of weapon by which victim was assaulted

In case of injury due to fall,

The height of the place and Things on which victim fell

H/O loss of consciousness,vomiting ,ENT bleed,headache,seizures

H/O Pain,urinary retention, constipation

History of intake of any drugs, alcohol,

Past medications, drug allergy

Past medical history etc are obtained in detail

Physical examination

General examination

Level of consciousness and alertness,

Hydration status

Whether the patient is anaemic or not

Bleeding points, fractures are noted

Vitals data – Pulse rate and volume , blood pressure and respiratory rate

If the victim is in shock with severely anaemic, massive blood loss should be suspected.

PRIMARY SURVEY AND RESUSCITATION

ABCD, resuscitation and primary assessment of acute critical condition

Airway –clear mouth and Establish patent and controlled airway, check the cervical spine injury status,

Breathing and ventilation-give 100% O₂ and look for chest injuries

Circulation and bleeding control-check pulse and BP, identify the bleeding site

Disability-neurological status assessment by using Glasscow coma scale

Exposure –after complete undressing of patient, examine other injuries

SECONDARY SURVEY

After life threatening injuries have been dealt, secondary survey begins and it is to identify other injuries through head to toe examination and review of patient's history.

Adjuvant to survey

Two wide bore intravenous line, urinary and gastric catheter

Blood-Complete hemogram, blood sugar, renal function test, electrolytes, blood grouping and matching, coagulation profile ECG, xray chest, cervical spine, abdomen erect

Specific investigations

Appropriate investigations to know the extent of injury

TERTIARY SURVEY [REEVALUATION & DISPOSITION]

After life threatening injuries has been cared, Comprehensive and systematic re-evaluation is done and are systematically reexamined for occult injuries not evident on initial presentation in emergency ward

EXAMINATION OF ABDOMEN

Abdominal examination is extremely important and it is done by experienced surgeon.

INSPECTION

Contour of abdomen

Distension whether localized (or) generalized

Movement with respiration: Absent or normal

Look for Hernial orifices for traumatic hernia

Skin

Abrasions, lacerations, contusions, bruises, tyre marks, object marks,

Others like Perineal hematoma, Blood staining in urethral meatus should be looked for.

PALPATION

Tenderness-whether localized or diffuse and it helps in localizing the site of injury.

Guarding –due to peritonitis or local spasm of muscles due to injury.

Rebound tenderness indicates significant intra abdominal injury.

Rigidity present or not

Guarding and tenderness may be totally absent in a profoundly shocked victims

Description of laceration or Localised hematoma.

PERCUSSION

Check Liverdullness ,check for distended loops of bowel, free fluid and shifting dullness, non shifting dullness (Ballance's sign)

Suprapubic dullness to know distended bladder.

AUSCULTATION

Absent in the presence of peritonitis and intraperitoneal hematoma.

RECTAL EXAMINATION

Look for Sphincter tone /presence of bleeding in rectal injuries ,fecal stain Sphincter tone is decreased in spinal cord injuries

GENITALIA EXAMINATION

Blood at external urethral meatus noted in Perineal or vaginal laceration

he per abdomen examination is not reliable in following situations

1. In unconscious patient and restless patient,as it is difficult to asses
2. Reflex guarding may be present in injury to ribs or spine
3. In few patients it takes time for development of physical signs
4. In the presence of head injury and neurological deficit.

OTHER SYSTEMS EXMINATION

RESPIRATORY SYSTEM

Look for decreased air entry due to haemothorax, pneumothorax, ribs fracture, Flailchest, lung contusion, collapse, aspiration .

CARDIOVASCULAR SYSTEM

Look for any cardiac injury ,cardiactamponade, etc.

CENTRAL NERVOUS SYSTEM

Pupillary reaction

Eye opening ,verbal response ,motor response Assesed by Glasgow coma scale

Extremities

Any abnormal mobility of limbs and fractures noted .

INVESTIGATIONS

Basic investigations

Hemoglobin level: Serial Hb% monitoring helps to identify the ongoing blood loss and need of blood transfusion.

Hematocrit: To know the recent or acute blood loss.

Blood coagulation profile:

Tests are BT,CT,PT,APTT,INR

To know the bleeding tendency of the patients

Continuous monitoring is needed in patients already on anticoagulation drugs or antiplatelet drugs

Basic renal function tests,serum electrolytes

To find patients with early sepsis and to prevent multiorgan dysfunction

Important in both patients going for operative /conservative management

Liver function test in cases of suspected liver, biliary system and pancreatic injuries

It includes serum protein levels,coagulation profile,

serum bilirubin both conjugated,unconjugated and enzymes like

Serum alkaline phosphatase

Serum glutamate oxalate transaminase(SGOT)

Serum glutamate pyruvate transaminase(SGPT)

Serum isocitrate dehydrogenase,etc

In blunt injury liver,there will be elevated transaminases level which is strongly associated with hepatic trauma

Arterial blood gas(ABG) analysis for patient with ventilatory support

XRAYs:

Xray-chest to know fracture ribs hemo,pneumothorax.

Rib fracture is common in splenic,liver injury,

Xrayabomen erect to know the hollow viscus perforation

Left Lateral decubitus view in special circumstances

IN SPLENIC INJURY

- Normal splenic outline altered
- Elevation of left hemi diaphragm
- Obliteration of left psoas shadow
- Medial displacement of gastric air bubble
- Greater curvature of stomach outline indented
- Fracture of left lower ribs noted
- Stippling of air noted in case of ruptured of retroperitoneal portion of duodenum and rectum
- Psoas shadow is obliterated in retroperitoneal and intraperitonealhemorrhageOral Contrast Studies contraindicated, as barium causes dangerous peritoneal reaction

LAPAROCENTESIS

The methods of laparocentesis are

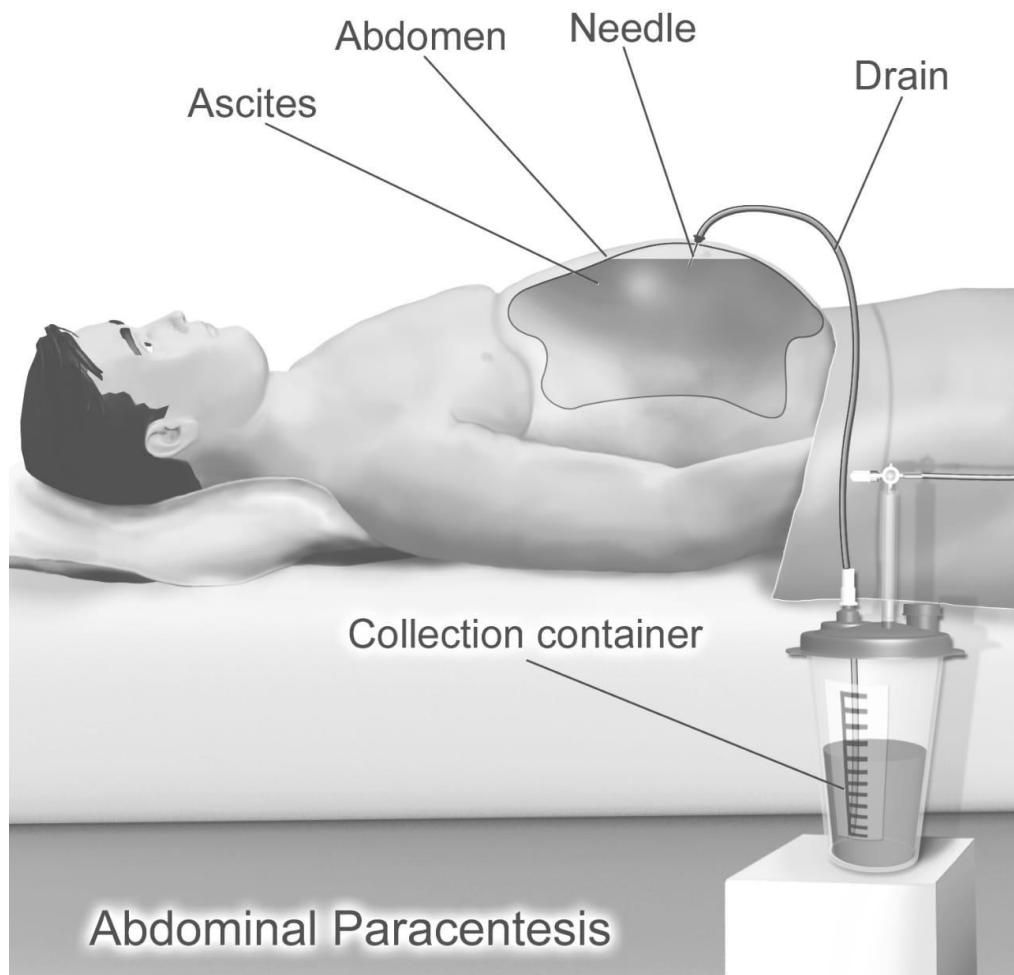
a) By needle A single tap or Quadrant tap

b) By a cannula 1.Peritoneal tap

2. Peritoneal lavage

Needle laparocentesis has advantages,since it is a quick, easy, bedside procedure requiring no elaborate facility or experience.Its accuracy rate ranges65-75%. It is particularly single or 4 quadrant tap negative results do not rule out visceral injuries. But this procedure is better than usual conventional procedures.

The peritoneal tap by cannula and lavage are still better methods – particularly the later one.



Abdominal paracentesis by needle:

Indicated in diagnostic aid only for those in which physical examination is equivocal, in head injury, spinal injury etc.

Technique: Abdomen is cleansed with antiseptic solution. After infiltration of local anaesthesia, A 16 or 18 gauge short level spinal needle is attached to a syringe and inserted through abdomen. Suction is applied to the syringe when the needle slowly advanced into the abdomen at

different sites; About 10 ml of non clotting blood constitutes a positive tap.If blood is obtained from punctured vessels mostly it will clot.

Considerations:

1. Abdomen scars area and other points of possible bowel fixation to abdominal should be avoided.
2. Direction of needle in the abdominal cavity should be changed only after withdrawing the needle just superficial to peritoneum and it can be reintroduced
3. In the presence of marked distension of bowel,needle puncture should be avoided, because if punctured abnormally altered intraluminal pressure may cause leakage.

DPL- Diagnostic Peritoneal Lavage :

Diagnostic peritoneal lavage (DPL) was introduced by Root et al 1964.It is a rapid, inexpensive, accurate and relatively safe adjunctive diagnostic modality in the treatment of patients with blunt abdominal injury with solid organ injury.DPL is helpful in determining the presence of blood or enteric fluid due to intra abdominal injury.

DPL is the most sensitive test available for determining the presence of intra abdominal injury.

There are three basic methods of introducing the DPL catheter into the peritoneal cavity.

They are:

1. Open technique (Perry)
2. Percutaneous or closed technique (Jashidi/Lazorus Nelson)
3. Semi open technique.

Open Technique(Perry et al 1970,Thal and

Shires 1973,Sachatello and Bivins 1976)

After decompression of stomach by ryles tube aspiration and bladder catheterisation and infiltrating skin with local anaesthesia, a 2 to 3 cm long incision is given 3 inches infraumbilically in the midline with No.11 knife and deepened down till peritoneum is entered.Peritoneum is grasped with artery hemostat and place 2-0 chromic purse string suture taken around . Peritoneal dialysis catheter (v4900) inserted on a trocar and is introduced into peritoneal cavity by rotary motion through the incision and patient is asked to tense his abdominal musculature while inserting.As soon as trocar enters into the peritoneal cavity, trochar is removed and the catheter is advanced towards pelvis.With 10ml syringe aspiration is done through catheter. If the aspiration yields feculent

fluid, frank blood, bile stained, it is termed as positive lavage and procedure is not carried. On the other hand if aspiration does not yield anything, 400-1000cc of ringer lactate solution (20 ml/kg of body wt with maximum of 1000cc) is infused with an intravenous infusion set for 10 to 15 minutes.

As soon as the bottle is empty, the bottle is kept down and by siphonaction the peritoneal fluid comes back into the bottle. The whole procedure is usually complete within 25-30 minutes.

2. Percutaneous / closed (Jamshidi /LazarousNeison) technique:

Using anintracath, a dialysis catheter inserted by using trochar. It takes less time but is not reliable, as sometimes tip may be blocked by omentum.

It is related to high chance of hallow viscous perforation and vesselInjury, as this blind approach by percutaneous fashion.

3. Semi Open Technique:

It is safe and rapid and extremely reliable procedure (Moore JB, Moore EE, Morkovchick1981). Procedure:afterRyles tube aspiration and catheterization,periumbilical area is cleaned and draped and infiltrated with local anaesthesia. Ainfraumbilicalcurved incision is made

to one side of umbilicus is made. The incision is extended down to the linea alba, after ensuring perfect hemostasis. A 5 mm incision is made in lineaalba and edges are grasped, a standard dialysis catheter with trocar is inserted into peritoneal cavity towards the pelvis. after peritoneal puncturing ,the trocar is drawn back and catheter is advanced to the pelvic floor.

The tap is considered positive if greater than 10 ml of blood is aspirated .If not , 1 liter of warmed 0.9% sodium chloride (Nacl) is infused and patient is rolled from side to side to enhance intra peritoneal sampling. The saline bottle is then lowered down to the floor for draining fluid by siphonage action.

A minimum recovery of 75% lavage fluid id required for the test to be considered valid. The fluid is then sent analysis of Red and White blood cells counts (RBC, WBC), lavage alkalaine phosphatase and lavage amylase levels and for the presence of bile.

The standard interpreting lavage data criteria in blunt abdominal trauma is by on the work by “S.S.Hanna, 1990 in Management of blunt trauma abdomen”.

POSITIVE:

1. Aspiration of >10ml of free flowing unclotted blood.
2. RBC>100,000/mm.
3. WBC>500/mm(confirmed by repeat DPL).
4. Evidence of food, foreign particles or bile (enteric content) in lavage fluid
5. Grossly bloody lavage return.
6. Lavage fluid exists via Foleys Catheter or chest tube.
7. Enzymes –Amylase >175 IU/dl,Alkaline phosphatase >3IU
8. Presence of bile in lavage fluid confirmed bio-chemically.

Equivocal-Intermediate:

1. Aspiration of <10 ml of free flowing unclotted blood.
2. RBC 50,000-100,000/mm.
3. Amylase >75 U/dl<175 U/dl

NEGATIVE:

1. RBC <50,000/mm
2. WBC 100-500/mm
3. Amylase<75 U/dl

INDICATIONS:

In patients with Unexplained shock or hypotension

Spinal cord injury

Altered sensorium

Equivocal pulmonary embolism

CONTRAINDICATIONS

Contra indicated when there is A clear indication of laparotomy.the gravid uterus,the prior abdominal surgery and massive obesity are relative contraindication⁶.

The reported sensitivity 80 to 96,5% and specificity is 87.3-99.5% respectively⁸.

ULTRASONOGRAM

To know the amount of free fluid in adomen, solid organ injuries, hemo and pneumoperitoneum

ADVANTAGES:

- First basic non invasive investigation before CT
- Readily available in emergency,cost effective
- No radition exposure

- No contrast material injected
- Continuous monitoring in selected patients can be done

DISADVANTAGES:

- Operator dependent
- Inconclusive in Obese patients
- Sensitivity is from 80-90% and specificity is from 90-95%

COMPUTER TOMOGRAPHY [CT] SCAN OF ABDOMEN AND PELVIS¹⁸

After stabilization of patients, CT is taken and it is indicated in blunt injury abdomen and inconclusive physical examination and usg report to know definitive pathology

CONTRAINDICATIONS

Hemodynamically instable patients

If there is Clear indications for exploratory laparotomy

ADVANTAGES

- More specific than USG
- Grade of injuries identified and Non Operative management of solid organs can be done

- Adequate assessment of the retroperitoneum also can be done
- Less operator dependent

DISADVANTAGES

- High cost and time consuming
- Experts like radiologist needed
- Ionizing radiation
- Requires contrast media
- Requires patients transport

SPECIFIC INJURIES AND ITS MANAGEMENT^{1,14,13}

Spleen is most common solid organ injured in blunt injury abdomen due to deceleration type of mechanisms and by direct blow .

- Physical abdominal examination
- External abrasions,laceration may be present
- Tenderness and localised guarding and rigidity in left hypochondrium.
- Kehr's sign-pain at tip of the shoulder seen in less than 50% of patient
- Balance sign-dull percussion in left upper quadrant, is also seen

LATENT PERIOD OF BAUDET

In some patients, due to delayed rupture of large subscapular hematoma,there will be symptoms and signs of Splenic rupture after period of stability

INVESTIGATIONS:

X-ray.

DPL- if necessary

USG - hemoperitoneum and to know the extent of injury.



USG image showing free fluid in morrison's pouch and perisplenic space

CT-SCAN OF ABDOMEN AND PELVIS

Done in stable patients



CT image showing splenic injury with hemoperitoneum

TYPES OF SPLENIC INJURY

1. capsular tear-small,superficial lacerations
2. subcapsular hematoma-hematomas contained by capsule of spleen
3. Parenchymal hematoma
4. Lacerations
5. Severe vascular injuries

MANAGEMENT

Non-operative management-in hemodynamically stable patients after resuscitation,and in absence of associated injuries and peritonitis Approximately 50 to 60% of adults receive NOM,success rate upto 90%

NOM- TREATMENT GUIDELINES

Monitor vitals,checkhematocrit

Bedrest for 48hours

After discharge,Bedrest with bathroom previlages for 2weeks from date of injury

No sports activities for 8- 10weeks

Immediate splenectomy for failed NOM

2. Operative management-immediate or delayed splenectomy

Indications

Hemodynamically unstable patients

Hypotension on admission

High CT grades of injury

Active contrast extravasation on CT

Need of more blood transfusion

After initial resuscitation, splenic injuries are treated conservatively by splenorrhaphy or by partial

Trend towards non operative management of solid organ injuries are increasing to prevent fatal complications of overwhelming post splenectomy infection (OPSI)

GRADE I AND II:

Bleeding is controlled by Electrocautery and Argon beam coagulation

Hemostatic agent like gelatin sponge, oxidized cellulose, topical thrombin are used

GRADE III,IV INJURY

Suturing with the help of pledget.

Vicryl or absorbable mesh wrapping

GRADE III AND IV MAJOR UPPER OR LOWER INJURIES:

Resection of avulsed segment and debridement.

IN SPLENIC HILAR INJURY:

Splenectomy when spleen cannot be salvageable

OPERATIVE PROCEDURE – OPEN SPLENECTOMY¹⁰

- Left sub costal or midline incision is made
- Spleen is lifted forward and medially after passing the hand over lateral surface of spleen
- Posterior layer of lieno-renal ligament is divided

- Adhesions to the stomach or colon if present they are divided
- Short gastric vessels and left gastro epiploic vessels which is present in gastro splenic ligament is divided between clamps
- Tail of pancreas is identified and preserved
- Splenic artery and vein is isolated; divided in between the clamps and ligated
- Artery is ligated before vein to prevent engorgement
- Splenectomy completed ; hemostasis secured ; drain kept
- Wound closed in layers
- There will be slight modifications for Giant spleen and ruptured spleen
- In case of ruptured spleen, finger compression of hilar vessels is done until the dissection has reached a stage where it is possible to clamp vessels without injury to pancreas

POST SPLENIC INJURY COMPLICATIONS¹

1.Delayed splenic rupture-DSR

Incidence upto 5% after advent of imaging modalities

Mortality ranges upto 5 to 15%

Occurs after latent period of boudetusually after 4-8days

Occurs due to i)clot disruption

ii)Expanding subcapsular hematoma

iii)Rupture of pseudocyst/aneurysm

Treatment-splenectomy

2.Splenic abscess formation

Treated with drainage of abscess and splenectomy

3.Splenic artery pseudoaneurysm

Often asymptomatic,mostly will resolve spontaneously

Angiographic embolization required in some case

4.Pseudocysts

5.Splenectomy related complications

SPLENECTOMY –POSTOPERATIVECOMPLICATIONS14,15

- Bleeding
- Acute gastric dilatation
- Pancreatitis
- Subphrenic abscess
- Thrombocytosis
- Deep vein thrombosis
- Respiratory complications-lung atelectasis,pneumonia

OPSI-overwhelming post splenectomy infection:

- Most common in 1-6week after splenectomy
- Incidence upto 2%
- Fulminant sepsis, meningitis and pneumonia caused by streptococcal pneumonia, H. influenza, N. meningitidis
- Death is more common in 1st year after splenectomy
- Vaccines are given within 2 weeks
- Antibiotic prophylaxis is given upto 2 years

HEPATIC INJURY AND MANAGEMENT^{1,14}

Injured in both blunt and penetrating injuries. Right lobe is more commonly injured than left lobe due to compression and deceleration mechanisms

TYPES OF HEPATIC INJURY

- Laceration
- Subcapsular hematoma
- Parenchymal hematoma
- Vascular injury
- Hepatic avulsion
- Bilioma

DIAGNOSIS

PER ABDOMEN shows right hypochondrial tenderness and rigidity

X-ray abdomen –

Haziness in the region of liver

Elevation of right dome of diaphragm

Fracture of right lower ribs .

USG:identifieshemoperitoneum and liver injury

USG image showing hyperechoic region with hypoechoic rim indicates hepatic laceration with surrounding hematoma



CT:more specific and used to grade liver injuries.

MANAGEMENT:

Aim:

To control hemorrhage and removal of devitalized tissue

4Ps:

P-Push:traumatized area of liver is manually closed

P-Pringle:hemostatic clamp applied to hepatoduodenal ligament

P-Plug:large laceration can be plugged

P-Pack

For Grade I and II

Suturing the lacerated site

Application of hemostatic agents like gelfoam, etc.

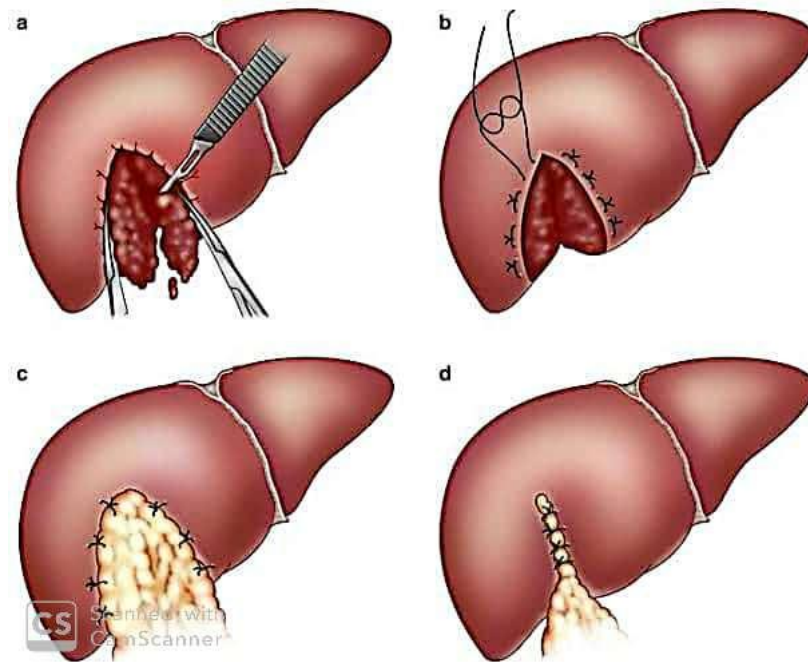


Image showing different management of liver injuries

For Grade III , IV, V:

Initially Bleeding controlled by Pringles manoeuvre

Topical hemostatic agents

Bleeding vessels are ligated

Hepatectomy along non anatomic planes.

Injured parenchyma is closed with mattress sutures

Ligation of right and left hepatic arteries

If bleeding cannot be controlled by Pringles manoeuvre

Rebuttress the sutures.

If bleeding is still persists pack the liver with multiple pad around the liver

If bleeding stops, abdomen is closed without drain and planned to remove the pack later

If bleeding is still uncontrolled hepatic vein and I.V.C repair planned

SEQUALES OF LIVER INJURIES²

Post operative bleeding

Abscess formation

Hemobilia, biliary fistula

Pulmonary complications like lung atelectasis, sepsis

Coagulopathy, Disseminated intravascular coagulation

Sepsis

MORBIDITY AND MORTALITY:

Morbidity rate ranges from 22 to 30%

Overall mortality rate-10-15%

PREREQUESTS FOR NON OPERATIVE MANAGEMENT

Usually done in tertiary care centres where immediate laparotomy facilities available when pt become unstable

Hemodynamically stable .

Absence of other injuries like hollow viscus perforation

Absence of a other clear indication for laparotomy

Requirements of 2 or less units of blood transfusion

SUCCESS RATE:

Grade 1-3 injuries is upto 95%

For Grade 4-5 injuries, it is upto 75 to 80%.

KIDNEY INJURIES AND MANAGEMENT ¹

Kidney injuries are less common compared to spleen and liver in blunt injury abdomen

DIAGNOSIS

Physical examination-loin tenderness,hematuria

Ultrasound-detectskidney injuries,amount of hemoperitoneum,associated injuries

CT-is more specific and is to grade the kidney injuries

TREATMENT

In general,Grade I to III,hemodynamically stable patient managed non-operatively. High grade injuries IV,Vwith concomitant intra peritoneal injury and unstable patients managed operatively

1. When patient is stable with systolic BP>90 mm Hg ,microscopic hematuria without any other associated injury is observed and reviewed after 3weeks
2. When patient is stable with systolic BP<90 mm ,gross hematuria,renal injuries suspected and contrast CT tis taken and treated accordingly

3. In unstable patient on table IVP performed if it is normal, patient is observed if it is abnormal with expanding/pulsatile hematoma, proceeded with renal exploration
4. In Grade I, II and III and IV with no other indications for laparotomy
 - Observation and Bed rest.
 - Watch for delayed bleeding
 - Remove Foleys once the urine is normal.
 - Planned for selective embolization.
5. Grade III and IV with indications for laparotomy with other injuries Exploration is done. Reconstruction attempted if renal pedicle injury and nonviable kidney identified with worsening GC, proceeded with nephrectomy

MATERIALS AND METHODS

The study was conducted in Coimbatore Medical College and Hospital, Coimbatore for a period of 1 years and 7 months.

INCLUSION CRITERIA^{1,11}

All patients more than 12 years admitted with blunt injury abdomen with solid organ injuries in Coimbatore medical college hospital were included

Hemodynamically stable patients (patients with no tachycardia, no hypotension, no shock)

EXCLUSION CRITERIA:

Hemodynamically unstable patients were taken to OT

Patients with hollow viscus perforation

Children upto age of 12 years

Patients with penetrating trauma

Patients with major head injury and major polytrauma

All patients admitted with history of blunt abdominal injury were included in this study managed in our hospital according to hospital protocol. All patients were received in casualty op and MLC entry made .patients were transferred to trauma ward and thorough examination was done by duty surgeon and planned accordingly

Initially primary survey of these patients was done according to ATLS guideliness. History and complete physical examination was done from head to toe. All necessary basic investigations were done.

Xray and ultra sonogram was done for all patients and CT scan was done for selected cases. Hemodynamically unstable patients ,hollow viscus perforation, other peritonitis patients are evaluated thoroughly by physical examination and by radiological investigations. Diagnostic Peritoneal tapping was done for all patients and Diagnostic peritoneal Lavage was done whenever clinically equivocal abdomen was there.

Based on the physical examination and investigations patients with solid organ injuries were classified and treated appropriately

Clinically unstable patient and patient who became unstable after some period of time were taken for immediate laparotomy. Initially

nasogastric tube, catheterization of bladder was done before laparotomy. After opening abdomen, thorough examination of all intra abdominal organs, hollow viscus organs, individual solid organ injuries were treated based on its grade of injuries. Unstable patients underwent operative management. Postoperatively patients were treated with appropriate antibiotics, appropriate vaccines for splenectomy, adequate postoperative care, and any complications were treated.

Hemodynamically stable patients are observed by both clinically and radiologically by monitoring vitals like pulse, blood pressure, Hb, amount of free fluid in the abdomen. The impact of non-operative management and causes for converting operative management and postoperative outcomes are analysed

CT SHOWING SPLEEN INJURY¹⁸



INTRAOPERATIVE IMAGE SHOWING SPLEEN INJURY



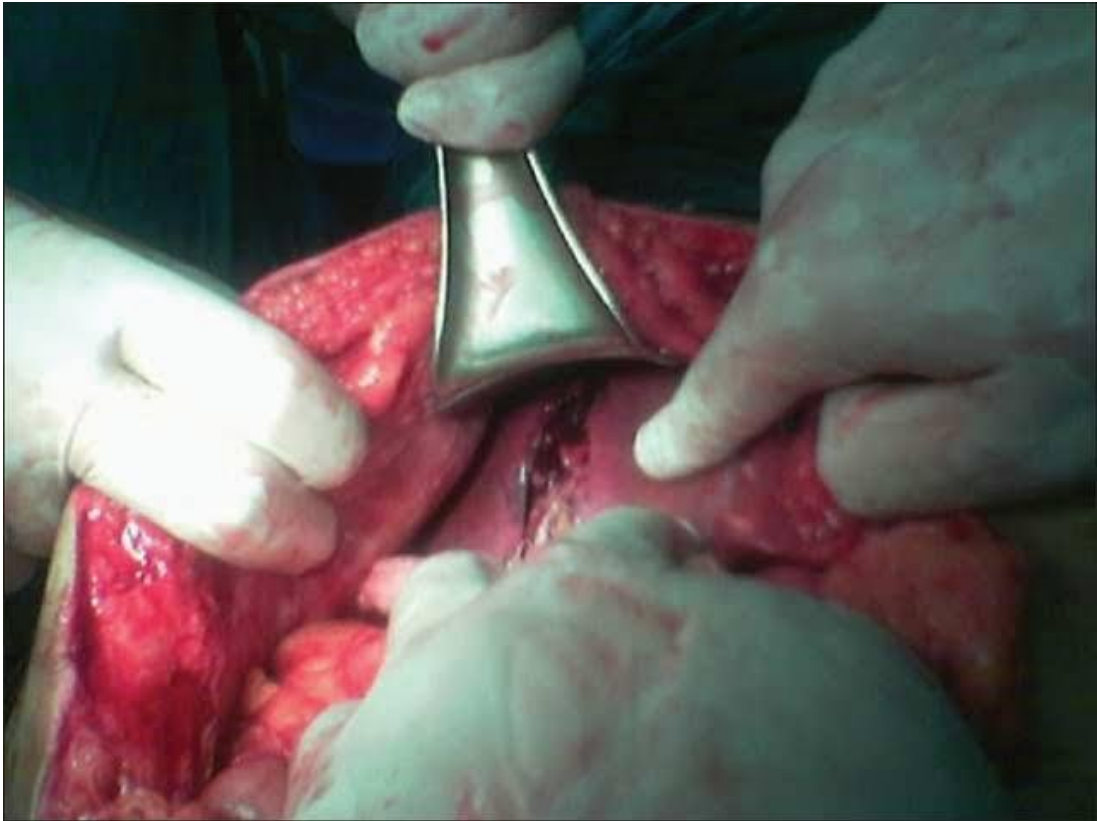
POSTSPLENECTOMY SPECIMEN



CT IMAGE SHOWING LIVER INJURY



INTRAOPERATIVE IMAGE SHOWING LIVER INJURY



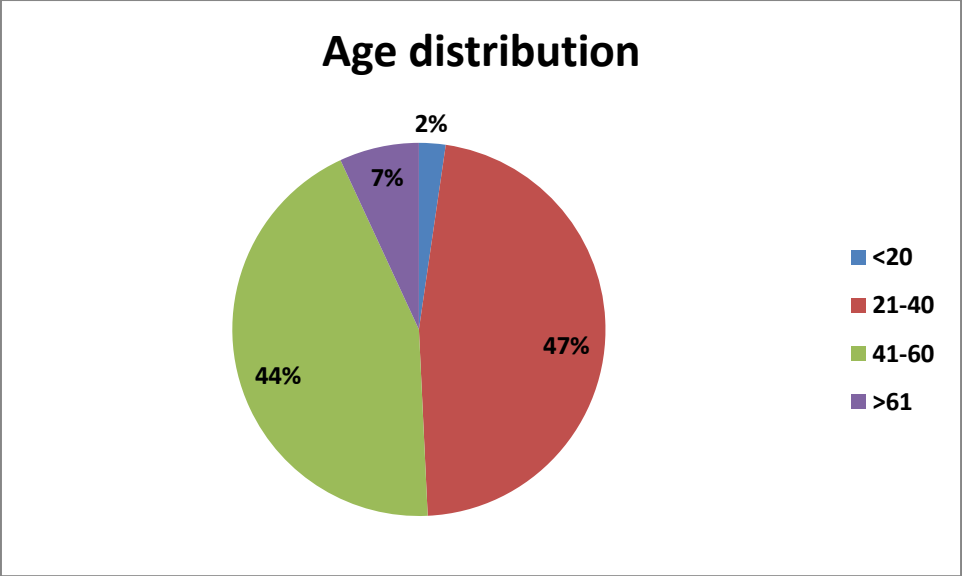
RESULTS AND DISCUSSION

Table 1: Mean Age

	N	Minimum	Maximum	Mean	SD
Age	130	19	86	41.72	12.881

Table 2:Age distribution

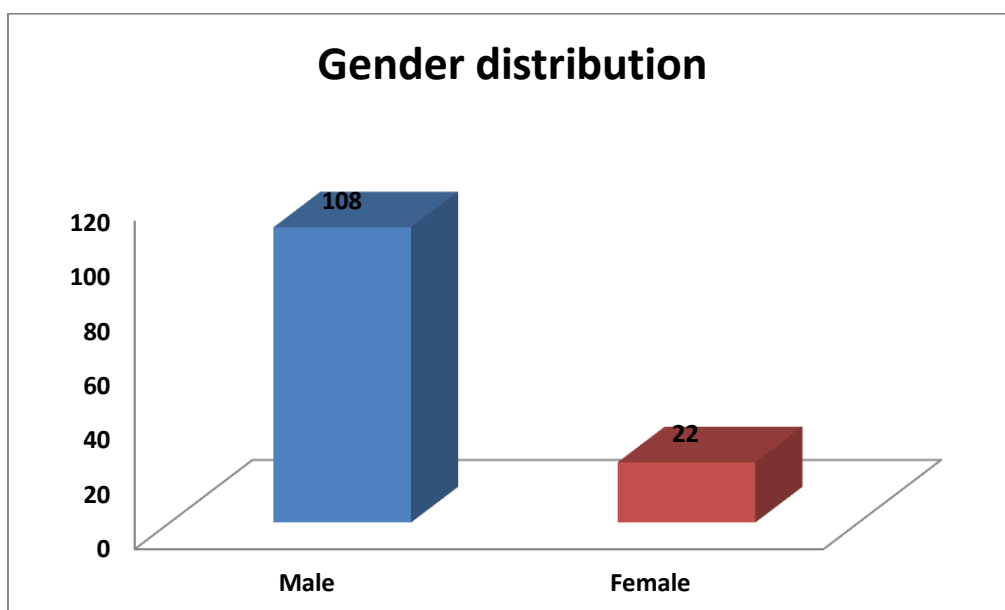
Age Groups	Frequency	Percent (%)
<20	3	2.3
21-40	61	46.9
41-60	57	43.8
>61	9	6.9
Total	130	100.0



Most of blunt injury is due to road traffic accidents. Henceforth Blunt injury occurs more commonly among most active age group 40 to 60 years of age group.

Table 3: Gender distribution

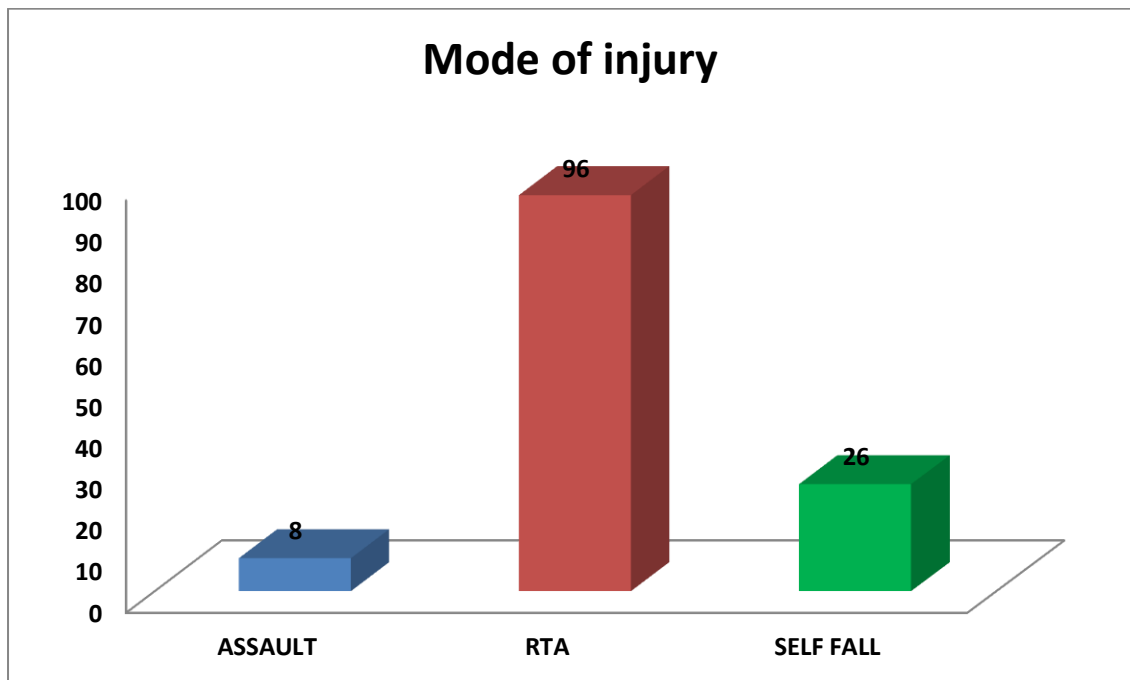
Gender	Frequency	Percent (%)
MALE	108	83.1
FEMALE	22	16.9
Total	130	100



Most of road traffic accidents and blunt injuries occurred among male patients compared female

Table 4:Mode of injury

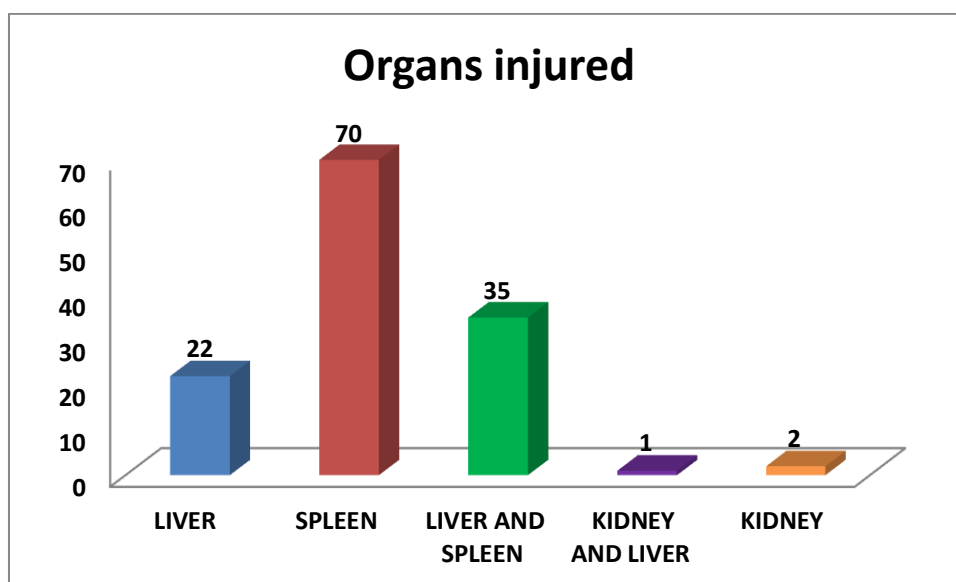
Mode of injury	Frequency	Percent (%)
ASSAULT	8	6.2
RTA	96	73.8
SELF FALL	26	20.0
Total	130	100



When comparing type and mode of injury ,Road traffic accidents predominates; self fall comes next to RTA

Table 5:Organs injured

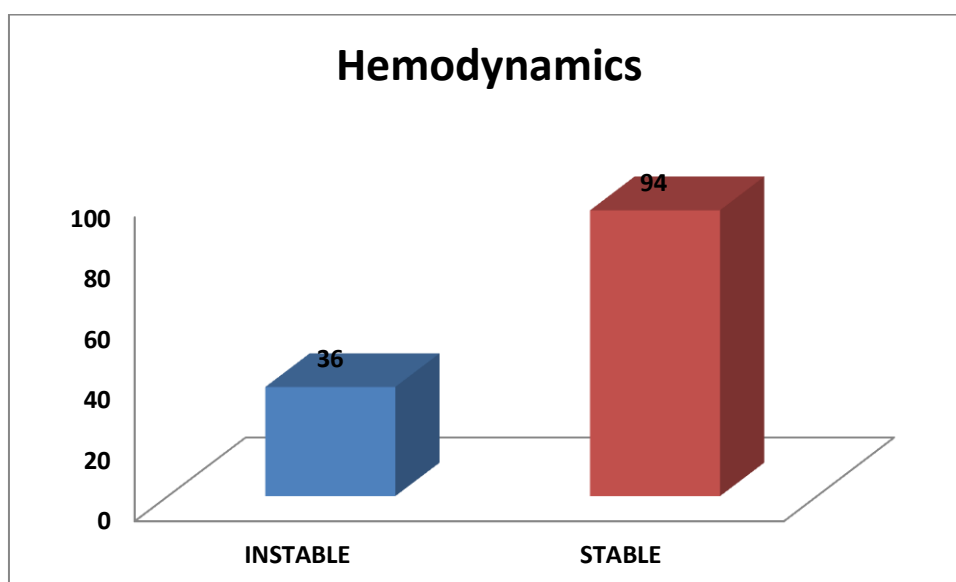
Organs injured	Frequency	Percent (%)
LIVER	22	16.9
SPLEEN	70	53.8
LIVER AND SPLEEN	35	26.9
KIDNEY AND LIVER	1	.8
KIDNEY	2	1.5
Total	130	100



In blunt abdominal injury ,splenic trauma was more common,which was about 53.8%; multiorganinjury(more than one) was 27.7%; liver injuries alone accounted for 16.9%

Table 5:Hemodynamics

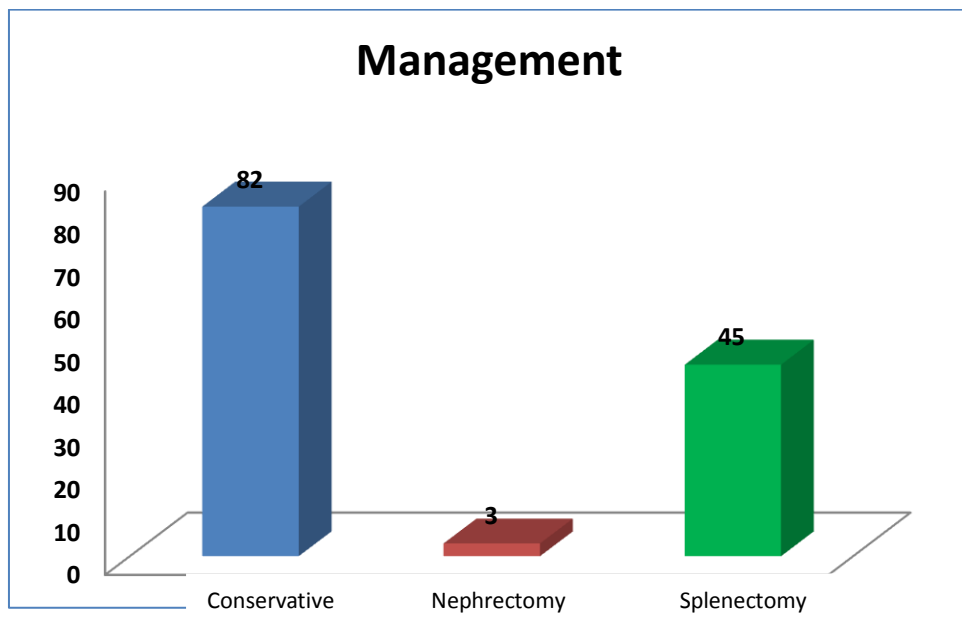
Hemodynamics	Frequency	Percent (%)
INSTABLE	36	27.7
STABLE	94	72.3
Total	130	100



Hundred and thirty blunt injury abdomen patients were received in trauma ward. Thirty six were hemodynamically unstable. Henceforth those patients were taken to operation theatre directly after initial resuscitation and ruling out other injuries. Ninety four patients were observed for non-operative management which accounted for 72.3%. Patients were monitored according to NOM guidelines

Table 6: Management of Patients

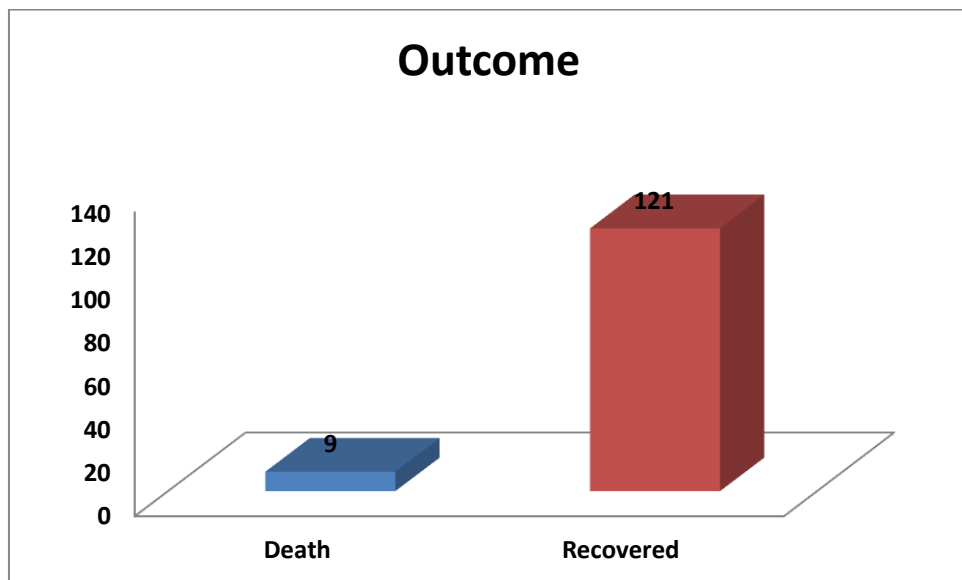
Management	Frequency	Percent (%)
Conservative	82	63.1
Nephrectomy and others	3	2.3
Splenectomy	45	34.6
Total	130	100



Out of one hundred and thirty patients received in trauma ward in the period of nineteen months, thirty six patients were hemodynamically unstable, were taken to operation theatre directly and underwent operative management. Ninety four patients were kept under conservative management, since patients were clinically stable, out of which twelve patients became unstable in course of treatment and underwent operative management. Unstable patients had grade four or more AAST solid organ injuries or more than one organ involvement in which most of the patients underwent splenectomy. Hemodynamically stable patients were observed and managed according to NOM guidelines

Table 7: Outcome

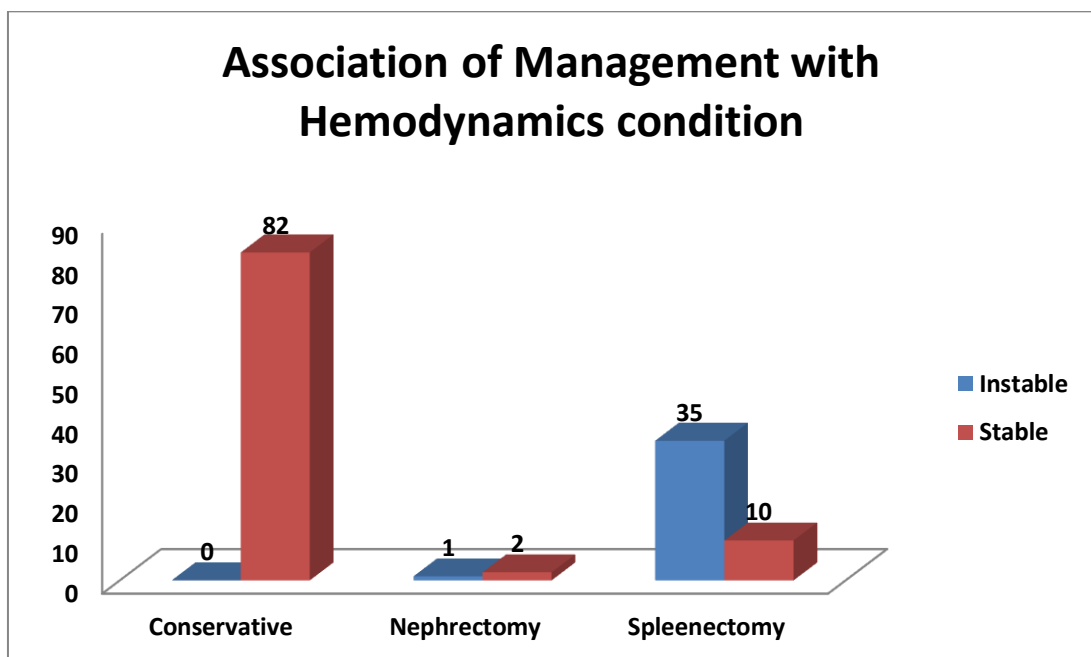
Outcome	Frequency	Percent (%)
Death	9	6.9
Recovered	121	93.1
Total	130	100



Seven death occurred in initial instability patients who underwent operative management; Two death occurred in failed NOM patients; Totally9 (6.9%) patients died among those who were admitted in trauma ward with history of blunt injury abdomen , solid organ injury

Table 8: Association of Management with Hemodynamics condition among the study participants

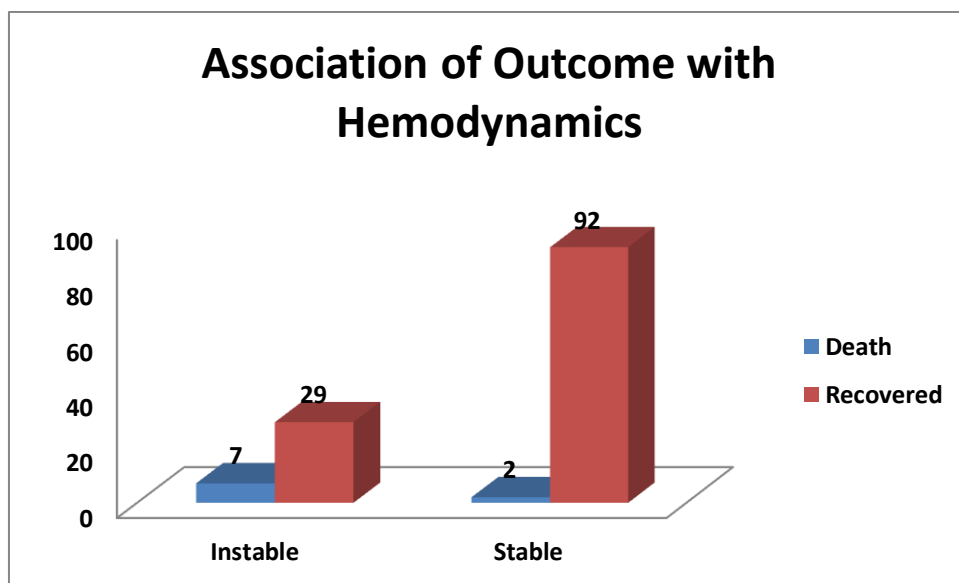
Hemodynamics condition	Management			P value
	Conservative	Nephrectomy	Splenectomy	
INSTABLE	0(0.0%)	1(2.8%)	35(97.2%)	.158
STABLE	82(87.2%)	2(2.1%)	10(10.6%)	



Most of the hemodynamically unstable patients had high grade splenic and liver injury who were treated by operative management. Hemodynamically stable patients who had upto grade 3 and grade 4 solid organ injury, were observed and treated by NOM guidelines

Table 9: Association of Outcome with Hemodynamics condition among the study participants

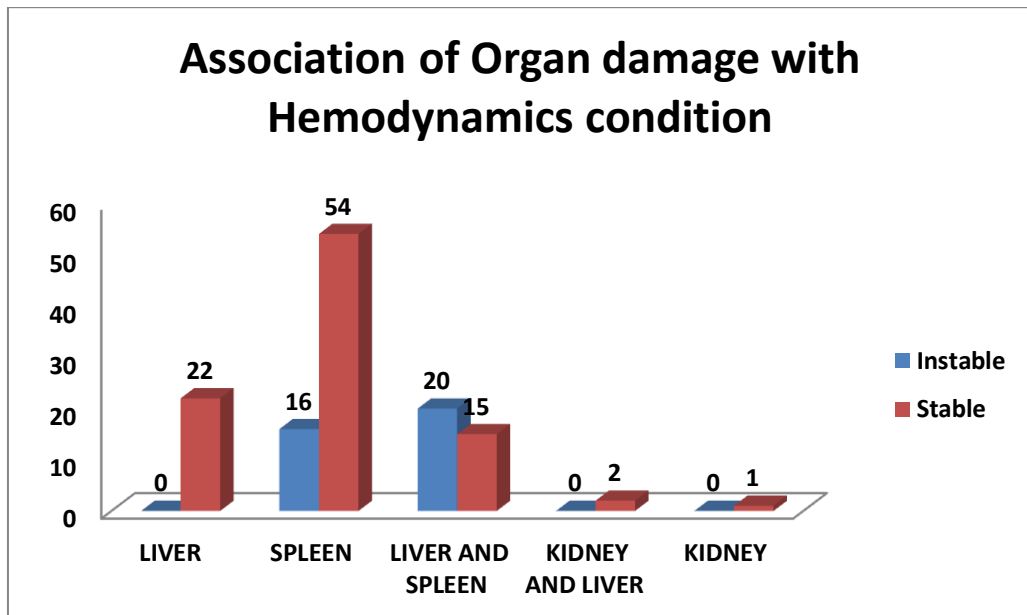
Hemodynamics condition	Outcome		P value
	Death	Recovered	
INSTABLE	7(19.4%)	29(80.6%)	.359
STABLE	2(2.1%)	92(97.9%)	



Out of 130, hemodynamically unstable patients underwent immediate operative management. Mortality was 19.4% among them, and most of which was due to high grade injuries and late presentation to hospital, multiple organ injuries. 80.6% patients recovered well with few postoperative complications.

Table 10: Association of Organ damage with Hemodynamics condition among the study participants

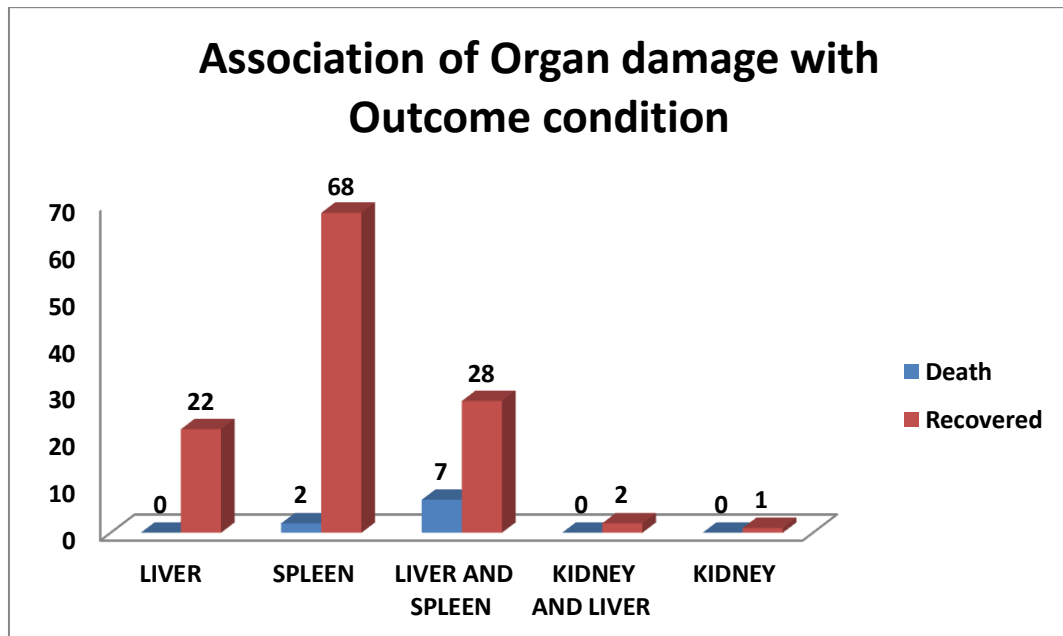
Organ damage	Hemodynamics condition		P value
	INSTABLE	STABLE	
LIVER	0(0.0%)	22(100.0%)	.752
SPLEEN	16(22.9%)	54(77.1%)	
LIVER AND SPLEEN	20(57.1%)	15(42.9%)	
KIDNEY AND LIVER	0(0.0%)	2(100.0%)	
KIDNEY	0(0.0%)	1(100.0%)	



Most of hemodynamicallyunstability were due to combined liver and splenic injuries and high grade injuries of spleen.In initial stability patients ,isolated liver injuries were stable,upto AAST grade three and few grade four patients were hemodynamically stable and observed

Table 11: Association of Organ damage with Outcome condition among the study participants

Organ damage	Outcome condition		P value
	Death	Recovered	
LIVER	0(0.0%)	22(100.0%)	.901
SPLEEN	2(2.9%)	68(97.1%)	
LIVER AND SPLEEN	7(20.0%)	28(80.0%)	
KIDNEY AND LIVER	0(0.0%)	2(100.0%)	
KIDNEY	0(0.0%)	1(100.0%)	



Death observed when there was involvement of more than one solid organ

Table 11: Association of Organ damage with gender among the study participants

Gender	Organ damage					P value
	Liver	Spleen	Liver and Spleen	Kidney	Kidney and Liver	
Male	18(16.7%)	58(53.7%)	30(27.8%)	0(0.0%)	2(1.9%)	.621
Female	4(18.2%)	12(54.5%)	5(22.7%)	1(4.5%)	0(0.0%)	

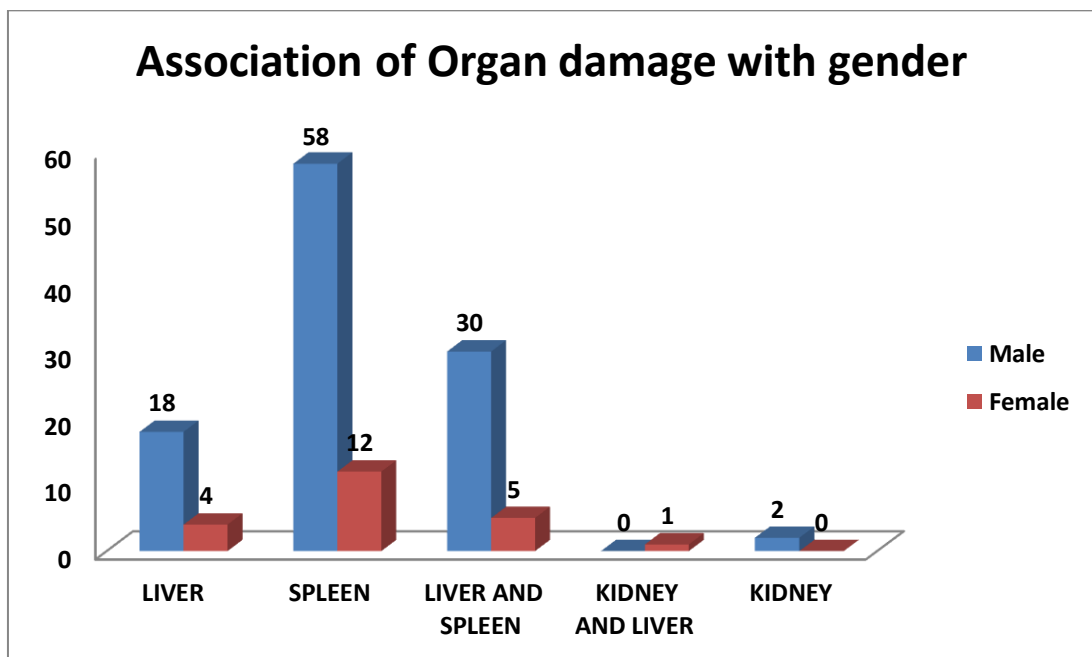
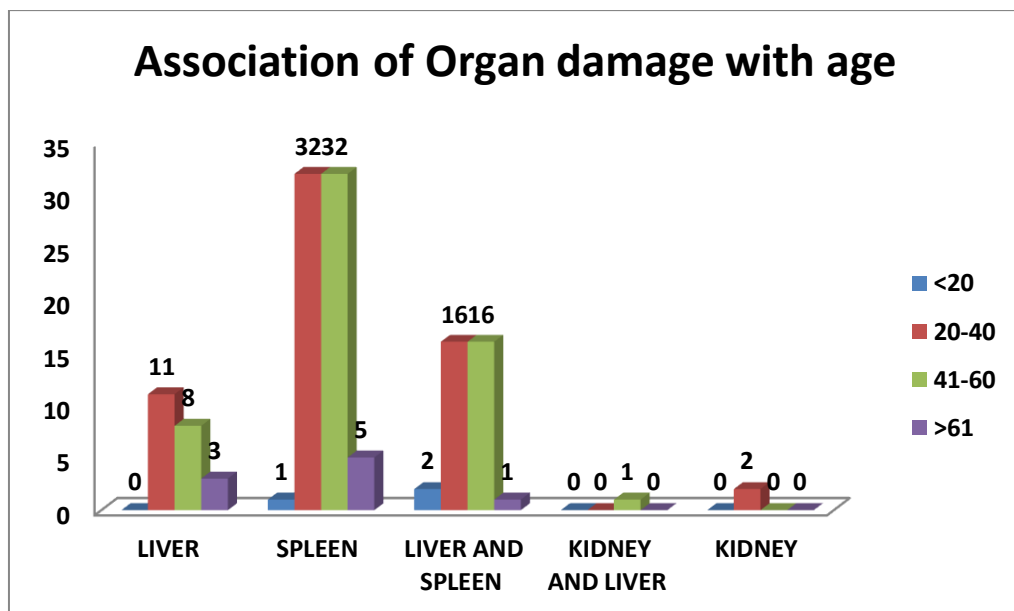


Table 12: Association of Organ damage with age among the study participants

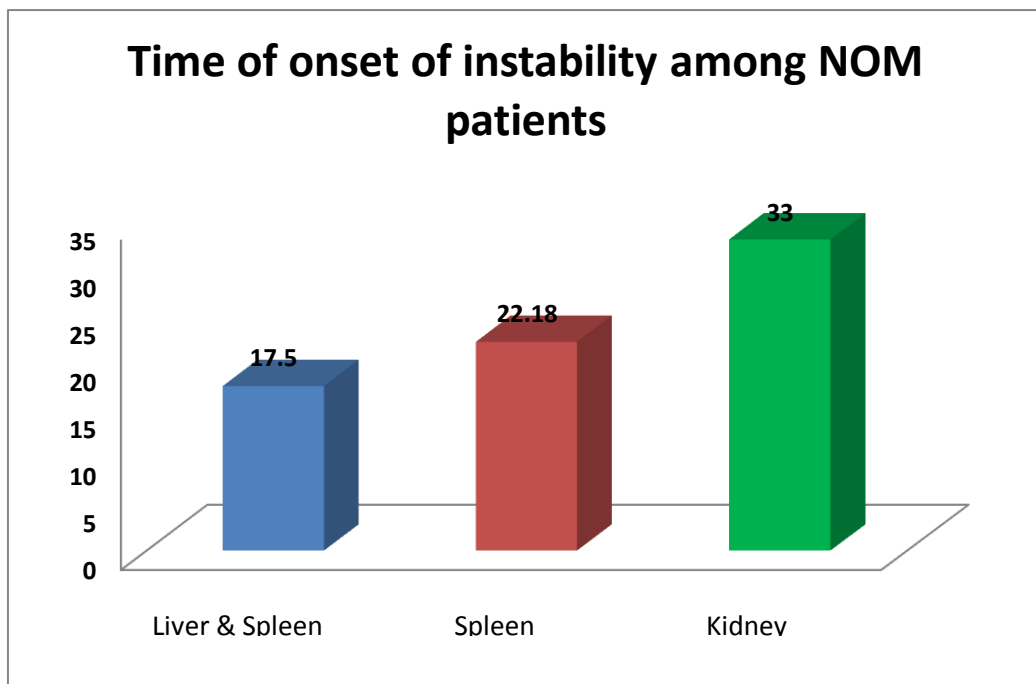
Groups	Organ damage					P value
	Liver	Spleen	Liver and Spleen	Kidney	Kidney and Liver	
<20	0(0.0%)	1(33.3%)	2(66.7%)	0(0.0%)	0(0.0%)	.461
21-40	11(18.0%)	32(52.5%)	16(26.2%)	0(0.0%)	2(3.3%)	
41-60	8(14.0%)	32(56.1%)	16(28.1%)	1(1.8%)	0(0.0%)	
>61	3(33.3%)	5(55.6%)	1(11.1%)	0(0.0%)	0(0.0%)	



As observed in many studies, spleen is the most commonly injured organ in blunt injury abdomen. In our study also it predominates in all age group.

Table 13: Time of onset of instability among NOM patients

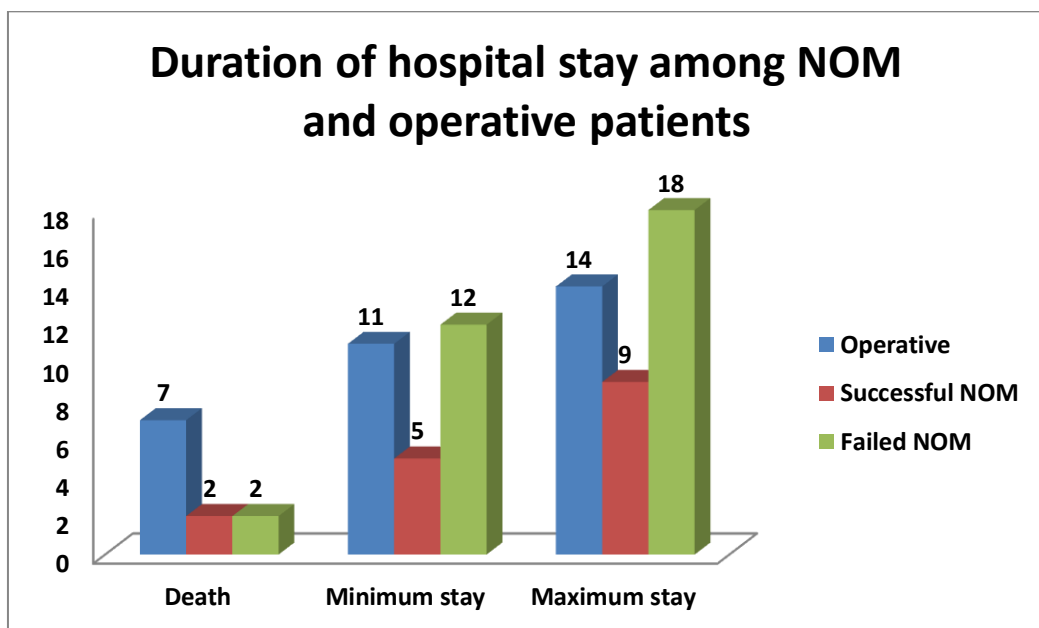
Organ involved	N	Minimum (hours)	Maximum (hours)	Mean	SD
Liver & spleen	2	15	20	17.50	3.536
Spleen	11	8	36	22.18	9.857
Kidney	2	18	48	33.00	21.213



Out of 94 hemodynamically stable patients, 12 developed hemodynamic instability between 17 to 33 hours and underwent immediate operative management. This was probably due to re bleeding from organ. This haemodynamic instability was observed within two days in our study

Table 14: Duration of hospital stay among NOM and operative patients

Management	N	Death	Minimum stay	Maximum stay	Mean	P value
Operative	36	7	11	14	12.6	.467
Successful NOM	82	2	5	9	5.8	
Failed NOM	12	2	12	18	14.4	



NOM was better in terms of less hospital stay and less trauma to the patients. mean hospital stay was 5.8 days compared to 12.6 days for operated patients. Since most of patients developed instability in first 2-3 days, it is advisable to discharge the patients after 5 days. Bed rest of atleast 2 weeks and avoidance of sports activities and strenuous activity for a period of 3 month is recommended

CONCLUSION

One hundred and thirty patients got admitted in trauma ward with solid organ injuries following blunt abdominal trauma. Hemodynamically unstable thirty six patients underwent immediate operative management and hemodynamically stable ninety four patients were observed and treated according to NOM guidelines. Out of ninety four patients developed instability within two days. Henceforth patients with solid organ injury with haemodynamic stability can be managed Non operatively under close monitoring of vitals.

NOM is successful upto 70% of blunt abdominal trauma with solid organ injuries NOM is successful upto 85 to 87% in hemodynamically stable patients even with high grade injuries

NOM were more successful in isolated liver injuries than other solid organs

NOM were successful upto AAST grade 4 and few grade 5 solid organ injury.

NOM is cost effective and required lesser duration of hospital stay compared to operative management.

By NOM we can prevent complications due to laparotomy, fatal complications due to splenectomy and other solid organ operative procedures. NOM is advisable in hospitals where there is facility to monitor closely and to operate when NOM fails, since NOM is successful in managing even in high grade AAST solid organ injuries.

BIBLIOGRAPHY

1. SABISTON. *Text book of surgery*, First South Asia Edition ed. :Vol I ELSEVIER; 2016. pg 409-482
2. SABISTON. *Text book of surgery*, First South Asia Edition ed. :Vol II ELSEVIER; 2016. pg 1418-1481
3. FISCHER'S *.Mastery of surgery*, 7th ed. : WOLTERS KLUWER; 2019. pg 1259-1270
4. Hamilton Bailey. *Emergency Surgery*, 13Ed ed. : CRC Press; Nov 2000. pg 446-471
5. VelmahosGC(1), Toutouzas KG, Radin R, Chan L, Demetriades. *Non-operative treatment of blunt injury to solid abdominal organs: a prospective study..*; 2003 Aug.
6. Haan JM, Bochicchio GV, Kramer N, et al.:*Non-operative management of blunt splenic injury.*
7. *AAST injury scaling and scoring system (www.aast.com)*
8. *Diagnosis and management of blunt abdominal solid organ injury.*
Department of Surgery, University of Tennessee Health Science

Center, Memphis, Tennessee, USA: CurrOpinCrit Care.; 2007
Aug.

9. Paul E. Schwartz, MD; Sylvester Sterioff, MD; Peter Mucha, MD; et al. *Postsplenectomy Sepsis and Mortality in Adults*. From the Departments of Surgery, Mayo Clinic and Mayo Foundation, Rocheste, San Diego.: JAMA; November 12, 1982
10. Brendan Moran .*Farquharson's Textbook Of Operative General Surgery*, 10 edition ed. : CRC Press/Exclusively distd . By Jaypee; 2015. pg 339-376
11. *Bailey & Love's Short Practice of Surgery*, 27th Edition: International Student's Edition ed. : CRC Press; Jan 2018.pg 289-364
12. M. SriramBhat .*Srb's Manual Of Surgery*, Sixth edition ed. : Jaypee Brothers Medical Publishers; 2019.pg 584-620
13. Sir Alfred Cuschieri .*Essential surgical practice* – 4th Edition- - pg 1-42.
14. *Principles of Surgery* – 8th Edition-Schwartz's pg 129-187
15. *Maingot's abdominal operations*, 10th Edition pg 763-786.

16. *BD Chaurasia's human anatomy vol-ii*
17. John L Kendall, MD, Andrew M Kestler, MD, Jason S Haukoos, MD, Blunt Abdominal Trauma Patients Are at Very Low Risk for IntraAbdominal Injury after Emergency Department Observation, West J Emerg Med. Nov 2011; 12(4): 496–504
18. Sclatani SJ, Shaftan GW, Scelea TM et al, Non operative salvage of computer tomography-diagnosed splenic injuries. J Trauma 39:818, 1995

APPENDIX-1-CASE PROFORMA

Name: Age: Sex : IP no.

Religion: Occupation:

Address:

Injury on: Admission on: Operated on:

Discharged on: Expired on:

Presenting Complaints:

Injury: Time: Place:

Mode-Road Traffic Accident

- Assault

- Industrial accident

- Fall

- Bull hit

- Others

Events that followed:

History of Present illness:

i) Pain Abdomen:

i) Mode of Onset Time

ii) Duration

iii) Sight

- iv) Migration of pain
- v) Nature
- vi) Referred pain
- vii) Relation to physiological act
 - Respiration
 - Micturition
- viii) Aggravating and Relieving Factors
- ii) Vomiting
- i) Duration
- ii) Relation to pain
- iii) Frequency and quality
- iv) Character of act.
- v) Vomitus.
- iii) Distension of Abdomen:
 - i) Duration
 - ii) Uniform/Localized
 - iii) If localized site:
 - iv) Rapid/Moderate/Slow
 - iv) Bowel Disturbances:
 - Constipation
 - Bleeding per rectum
 - Malena
 - v) Micturition Disturbances:

- Retention

- Hematuria

vi) Any other complaints and associated injuries if any

Previous History :

Personal History :

EXAMINATION :

General Physical Examination:

1) Consciousness.

2) Shock signs

3) Hydration

4) Pulse rate

5) Blood pressure

6) Respiratory rate

7) Anemia

8) Jaundice

9) Surgical Emphysema

10) Temperature

11) ENT bleeding

ABDOMEN:

Inspection: Shape

Skin over abdomen

Visible injuries

Prominent swelling

Hernial orifices

Movement with respiration peristaltic.

Palpation: Temperature

Tenderness.

Mass per Abdomen.

Girth of Abdomen.

Guarding.

Rigidity.

Percussion: Liver dullness

Splenic dullness

Fluid thrill

Shifting dullness

Auscultation: Bowel sounds

Bruit

External Genitalia:

Per Rectal Findings:

Associated Injuries:

- Head & Neck

- Thorax Ribs

- Spine

- Pelvis

- Extremities

Systemic Examination:

- Respiratory System

- Cardiovascular system

- Central nervous System.

PROVISIONAL DIAGNOSIS:

INVESTIGATIONS

i) Blood SerialHb% TC DC

PCV Grouping Sugar

ii)Urine Color Clarity Albumin

sugar Microscopic

iii)Stool Color Occult Blood

iv)Serum Amylase Bilirubin Electrolytes.

v)Radiology plain x ray abdomen(Erect/Supine)

Contrast

Other x rays.

vi) AbdominalParacentesis.

- Quantity

- character

- culture/sensitivity

- cytology

- amylase level

vii) Peritoneal Lavage:

viii) Ultrasonography

ix) CT abdomen

x) Ryle's tube aspiration

xi) Wound exploration

INDICATION FOR SURGERY:

TIME INTERVAL BETWEEN INJURY AND LAPAROTOMY:

Operative notes:

Date: Started: Closed:

Anaesthesia:

Findings:

Procedure Done:

Post operative complications:

Blood Transfusion - Pre operative

- Per operative

- Post operative

Follow Up :

FINAL DIAGNOSIS

APPENDIX – 2
ABBREVIATIONS

IAI	-	Intra-abdominal injury
USG	-	Ultrasound
CT	-	Computed Tomography
MRI	-	Magnetic Resonance Imaging
ED	-	Emergency Department
ICU	-	Intensive Care Unit
OPD	-	Out Patient Department
OT	-	Operation Theatre
RTA	-	Road Traffic Accident
ALT	-	Alanine Transaminase
AST	-	Aspartate Transaminase
GCS	-	Glasgow Coma Scale

PATIENT CONSENT FORM

STUDY TITLE:

**A STUDY OF OUTCOME OF NON OPERATIVE MANAGEMENT
IN BLUNT INJURY ABDOMEN WITH SOLID ORGAN INJURIES**

STUDY CENTRE:

Coimbatore Medical College Hospital, Coimbatore.

PARTICIPANT NAME:

AGE/SEX:

I.P. NO :

I confirm that I have understood the purpose of treatment and 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 the interventional 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 the 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 of , **A STUDY OF OUTCOME OF NON OPERATIVE MANAGEMENT IN BLUNT INJURY ABDOMEN WITH SOLID ORGAN INJURIES**

Date:

Signature of the patient & Name

Place:

Signature of the investigator & Name

ஒப்புதல் படிவம்

பெயர் :

வயது/ பாலினம் :

முகவரி :

அரசுகோவைமருத்துவக் கல்லூரிமருத்துவமனையில் பொதுஅறுவைசிகிச்சைபிரிவில் பட்டமேற்படிப்பு பயிலும் மாணவன் மரு. பெ. செந்தில் அவர்கள் மேற்கொள்ளும் "A STUDY OF OUTCOME OF NON OPERATIVE MANAGEMENT IN BLUNT INJURY ABDOMEN WITH SOLID ORGAN INJURIES" குறித்த ஆய்வில் செய்முறைமற்றும் அனைத்துவிபரங்களையும் கேட்டுக் கொண்டுள்ள துசந்தேகங்களை தெளிவுப்படுத்திக் கொண்டேன் என்பதைத் தெரிவித்துக் கொள்கிறேன்.

எனதுமகன்/மகள் இந்த ஆய்வில் கலந்துகொள்ள முழு சம்மமத்துடனும், சுய சிந்தனையுடனும் சம்மதிக்கிறேன்.

இந்த ஆய்வில் என்னுடையமகன்/மகளின் விபரங்கள் பாதுகாக்கப்படுவதுடன் இதன் முடிவுகள் ஆய்விதழில் வெளியிடப்படுவதில் ஆட்சேபனை இல்லை என்பதைத் தெரிவித்துக் கொள்கிறேன். எந்தநேரத்திலும் இந்த ஆய்விலிருந்து நான் விலகிக் கொள்ள எனக்கு உரிமை உண்டு என்பதையும் அறிவேன்.

இடம் :

பெற்றோரின் கையொப்பம்

நாள் :

APPENDIX3

KEY TO MASTER CHART

SL.NO	-	Serial number
A/S	-	Age/Sex
M	-	Male
F	-	Female
MOI	-	Mode of Injury
TOP	-	Time of Presentation
HD	-	Hemodynamic Instability
MN	-	Management
O	-	Outcome
D	-	Death
R	-	Recovered
AI	-	Associated Injuries
C	-	Conservative Management
S3L3R3	-	Spleen,Liver,Renal Injury
DOH	-	Duration Of Hospital Stay
RTA	-	Road Traffic Accidents

MASTER CHART

S.NO	A/S	IP	MOI	TOP	AI	CT GRADE	H.D	T	M	O	D
1	39/M	212	RTA	1		S3L3	S		C	R	5
2	45/M	2187	RTA	2		S4	S		C	R	6
3	40/F	4287	SELF FALL	1		S5	IS		S	R	12
4	25/M	7187	RTA	1		S4	S		C	R	6
5	21/M	4255	RTA	2		S4	S		C	R	6
6	35/M	10287	SELF FALL	2		S5L2	IS		S	R	13
7	44/M	10520	RTA	3	H	S3	S	26	S	R	12
8	22/F	11706	RTA	1		L3	S		C	R	7
9	36/M	15236	RTA	2	H	S4	IS		S	R	14
10	38/F	9284	RTA	1		L4	S		C	R	5
11	46/M	9481	RTA	2	H	S3	IS		S	R	12
12	33/M	9829	RTA	1		S3	S		C	R	5
13	48/M	10022	SELF FALL	1.5	H	S5	IS		S	R	13
14	56/M	10145	RTA	1	H	S5L4	IS	36	S	D	
15	64/M	10255	RTA	2		S5	IS		S	R	12

16	78/M	10366	RTA	2		S4	S		C	R	6
17	46/M	10444	RTA	3		L4	S		C	R	6
18	38/M	10589	RTA	1.5		S5L2	IS		S	R	13
19	27/M	10636	RTA	2.5		L4	S		C	R	5
20	33/M	10717	RTA	1		S4L3	IS		S	R	14
21	43/M	10752	RTA	1		S5	S	16	S	R	14
22	54/M	10802	RTA	2		L3	S		C	R	5
23	36/F	10826	RTA	1		S5	IS		S	R	13
24	40/M	10926	RTA	2	H	S4R4	IS		S	D	12
25	46/M	11126	RTA	1		S3	S		C	R	5
26	30/M	190168	RTA	2		L4	S		C	R	6
27	45/M	190263	RTA	3		S4L3	IS		S	R	13
28	36/M	190269	ASSAULT	3		S4L2	S		C	R	7
29	19/M	190642	RTA	4	H	S5	IS		S	R	14
30	25/5	195334	RTA	1.5		S4	S		C	R	5
31	27/M	191479	RTA	1.5		S4	S		C	R	6
32	24/M	195431	RTA	1	H	S4L3	IS		S	R	12
33	47/M	196575	SELF FALL	4	H	S5	S	18	S	R	14

34	40/M	197690	RTA	2		S4	S		C	R	6
35	34/M	198003	RTA	3		S4	IS		S	R	13
36	31/M	199257	RTA	4		S3R3L2	S		C	R	6
37	44/M	201691	RTA	2.5	H	S5L3	IS		S	R	12
38	28/M	204673	RTA	2	H	S5	IS		S	D	14
39	31/M	205785	SELF FALL	1	H	S4	S	24	S	R	14
40	49/M	207015	RTA	2		S4R3	S		C	R	6
41	24/F	208247	RTA	1.5		S4	IS		S	R	12
42	49/M	209611	SELF FALL	2	H	L3	S		C	R	5
43	45/M	216993	RTA	1		S5	S		C	R	7
44	38/M	212703	SELF FALL	1	H	S4L2	IS		S	R	13
45	45/M	213633	RTA	1.5		S3	S	32	S	R	12
46	38/M	214542	RTA	2	H	S4L3	IS		S	R	14
47	45/M	215866	SELF FALL	1		L4	S		C	R	5
48	50/F	216838	RTA	1.5	H	S2	IS		S	D	12
49	42/M	217627	SELF FALL	2	R	S4R2	S		C	R	6
50	48/M	220294	RTA	1	H	S4	S		C	R	6
51	45/F	221266	SELF FALL	2	R2	L3R2	S		C	R	5

52	30/M	222543	RTA	4		S4	IS		S	R	14
53	49/M	223143	RTA	3	B/L HPT	S4	S		C	R	7
54	55/F	224974	RTA	1	L PNU	S3	S		C	R	5
55	35/M	226230	ASSAULT	2	H	S5	IS		S	R	13
56	53/M	226889	SELF FALL	3	H	S4	S		C	R	6
57	62/M	228588	RTA	1		L3	S		C	R	6
58	55/F	229484	SELF FALL	2	GIIL	S5L3	S	10	S	D	
59	33/M	230421	SELF FALL	1		S4	S		C	R	6
60	29/M	231954	RTA	2	GIIR	S5L2R2	IS		S	R	12
61	54/M	233051	SELF FALL	4		S2R4	IS		N	R	13
62	35/M	233645	RTA	2		S2	S		C	R	5
63	23/F	236431	RTA	1		S4L2	IS		S	R	13
64	52/M	244689	SELF FALL	2		S4	S		C	R	7
65	46/M	246180	RTA	6	H	S3	S		C	R	5
66	45/M	246501	RTA	1	H	S4L4	IS		S	R	12
67	47/M	247570	RTA	2		S3	S		C	R	6
68	25/M	249400	RTA	3		S4	S		C	R	5
69	40/M	250714	SELF FALL	2	GIIR	S4	S		C	R	6

70	43/M	251738	RTA	2		S5	S	36	S	R	14
71	50/M	253378	RTA	2		S4	S		C	R	7
72	48/M	254128	RTA	3	GIIS	L3	S		C	R	6
73	55/M	254746	RTA	1		S4	S	14	S	R	13
74	29/M	3990	RTA	2	H	S5L3	IS		S	D	
75	20/M	1462	RTA	3	B/L H	S5L2	IS		S	R	14
76	52/M	1515	RTA	2		S3	IS		S	R	12
77	64/M	1555	RTA	1.5		S3R4	S	18	N	R	13
78	72/M	1641	ASSAULT	3		S5	S		C	R	5
79	44/F	1782	RTA	3.5		S4L2	S		C	R	5
80	38/F	1818	SELF FALL	1		L3	S		C	R	6
81	70/M	1904	RTA	0.5		S4	S		C	R	7
82	56/M	1908	RTA	2		S4R3	S		C	R	5
83	42/M	1956	RTA	2		S3	S		C	R	6
84	20/M	1978	RTA	2		S4R2	IS		S	D	
85	49/M	2444	RTA	1.5		S4R2	S		C	R	6
86	28/F	2673	RTA	2		S4	IS		S	R	12
87	37/M	3829	RTA	1	H	S4	S	8	S	R	13

88	47/M	5547	SELF FALL	4		S4L1	IS		S	R	13
89	60/M	6467	SELF FALL	2		L4	S		C	R	7
90	56/M	8027	RTA	2	H	S5	IS		S	R	14
91	55/M	9285	RTA	3		S4	S	24	S	R	14
92	40/M	9310	RTA	2	H	S4L3	IS		S	R	11
93	52/M	9110	SELF FALL	4		S3	S		C	R	5
94	38/F	10128	RTA	1		L3	S		C	R	6
95	22/M	10226	RTA	1		R3	S		C	R	6
96	55/M	16078	ASSAULT	2	H	S3	S		C	R	7
97	23/M	16922	RTA	4	R BB#	S3	S		C	R	6
98	40/M	18507	RTA	3		L3	S		C	R	6
99	38/M	19868	ASSAULT	1	L PNU	R3	S		C	R	5
100	42/M	21555	RTA	1		S4	S		C	R	6
101	32/M	23869	RTA	1	GIIL	S3L2	S		C	R	7
102	45/M	24722	SELF FALL	2		L4	S		C	R	6
103	52/M	26097	RTA	1	GIIR	S4L2	S		C	R	5
104	36/M	29012	ASSAULT	0.5	H	S4	S		C	R	6
105	40/M	30304	RTA	2	H	S5	S		C	R	5

106	23/M	31167	RTA	2		L4	S		C	R	5
107	48/F	32273	SELF FALL	1	H	S4	S		C	R	6
108	28/M	32212	RTA	2		L3	S		C	R	6
109	32/M	34312	SELF FALL	2		S5	S	20	C	R	5
110	23/M	36313	RTA	1		L3	S		C	R	7
111	26/M	38212	RTA	2		S5	S		C	R	5
112	36/M	39142	RTA	1		S4	S		C	R	6
113	45/F	40112	SELF FALL	2	H	S2L4	S		C	R	6
114	46/M	40882	RTA	1		S4	S		C	R	6
115	46/M	41222	RTA	1		S3	S		C	R	6
116	24/M	41862	RTA	2	H	S3L2	S	15	C	R	6
117	40/M	41922	ASSAULT	1		L4	S		C	R	7
118	38/F	41998	RTA	4	H	S3	S		C	R	5
119	42/F	42101	RTA	2	H	S4L4	IS		S	D	
120	38/F	42156	RTA	0.5		S4	S		C	R	5
121	22/M	42248	RTA	1		S5	S		C	R	7
122	58/M	42303	RTA	2	H	S3R3	S	48	N	D	
123	66/M	42456	SELF FALL	3.5		L4	S		C	R	6

124	72/M	42564	RTA	1		S3	S		C	R	5
125	86/M	42639	SELF FALL	2		L3	S		C	R	6
126	29/F	42777	ASSAULT	3	H	S3	S		C	R	6
127	36/F	42799	RTA	1		S4	S		C	R	7
128	48/M	42806	RTA	2		L3	S		C	R	5
129	57/M	42818	RTA	1	H	S4	S		C	R	5
130	44/M	42949	RTA	1.5	H	S3	S		C	R	5