BLUNT INJURY ABDOMEN – AND THEIR IMPACT ON ABDOMINAL VISCERAE

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CERTIFICATE

This is to certify that the dissertation titled **"BLUNT INJURY ABDOMEN AND THEIR IMPACT ON ABDOMINAL VISCERAE"** is the original work done by **Dr.J.KEVIN JOSEPH**, Post Graduate in Department of General Surgery , Tirunelveli, to be Submitted to The TamilNadu Dr.M.G.R. Medical University, Chennai – 32 towards the partial fulfillment of the requirement for the award of M.S. Degree in General Surgery April 2012.

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CONTENTS

INTRODUCTION

The care of the trauma patient is demanding and requires speed and efficiency. Evaluating patients who had sustained blunt abdominal trauma remains one of the most challenging and resource intensive aspects of acute trauma care.

Blunt abdominal trauma is a leading cause of mortality and morbidity among all age groups . Identification of serious intra abdominal pathology is often challenging .Many injuries do not manifest during the initial assessment and treatment period. Missed intra abdominal injuries and concealed hemorrhage are the cause of increased mortality and morbidity especially in patients who survive the initial phase after an injury.

Physical signs are also often unreliable due to

a) Associated injuries may divert the focus from abdomen and it may be diagnosed late
b) Frequent accompanying of alcohol intoxication confuses the diagnosis

Coordinating a trauma resuscitation demands a thorough pathophysiology of trauma and shock , excellent clinical and diagnostic acumen , skill with complex procedures, compassion and the ability to think rationally in a chaotic milieu.

The number survivors of polytrauma have increased by 50% in recent years and this is attributed to prompt medical treatment and rapid transfer of patient’s to major trauma centers.

AIM OF THE STUDY

1) To study the effect of blunt injury abdomen and their impact on abdominal viscerae
2) To Study regarding the pattern of distribution as age , sex and organ involvement
3) To evaluate various associated injuires in blunt injury abdomen
4) To focus on clinical signs & prioritize them as the prime tool in early diagnosis
5) To Correlate the findings of abdominal sonography in trauma with laparotomy findings
6) To analyze mortality with regarding to individual visceral injury

Inclusion Criteria's:

- ✓ Age limit >12 yrs
- ✓ All patients with head injury
- ✓ All patients with fractures

Exclusion Criteria:

Patients below 12 yrs of age

REVIEW OF LITERATURE

Classification of abdominal Blunt injuries

a) Crush injury

b) Blast injury

c) Seatbelt syndrome

Contents Of Abdomen

A.Intra-Thoracic Abdomen:

1.Diaphragm

2.Liver

3.Spleen

4.Stomach

B.Pelvic Abdomen:

1.Urinary Bladder

2.Urethra

3.Rectum

4.Small Intestine

5.Uterus , tubes , ovary

C.Retroperitoneal Abdomen:

1.Kidney

2.Ureters

3.Pancreas

4.Great Vessels

5.Duodenum

D.True Abdomen

1.Small Intestine

2.Large Intestine

3.Distended Bladder

4.Gravid uterus

Frequency Of injury in Blunt abdominal Trauma:

a. Spleen – 25%

b. Kidney- 12%

c. Intestine – 15%

d. Liver – 15%

e. Retroperitoneal haematoma – 13%

f. Mesentry – 5%

Management:

Pre Hospital Care:

a. Ensure adequately functioning airway \ I.V line

b. Apply sterile dressings

c. Don’t remove foreign body in trunk as major bleeding may follow after removal.

d. Evisceration is best left undisturbed , except application of sterile dressing.

Hospital Care and Diagnosis:

Important factors relevant to the care of a patient with blunt abdominal trauma, specifically those involving motor vehicles, include the following:

- The extent of vehicular damage
- Whether the passenger space was intruded
- Whether a passenger died
- Whether the person was ejected from the vehicle

- The role of safety devices such as seat belts and airbags
- The presence of alcohol or drug use
- The presence of a head or spinal cord injury
- If the patient has sustained rib fractures on the lower left chest there is associated 20% splenic injury and associated rib fractures on lower right chest there is 10% liver injury
- If patient has back pain pain associated with compression fracture of upper limb or spinal region , it carries an associated 20% significant renal injury…

Physical Examination:

Primary survey

Resuscitation is performed concomitantly and continues as the physical examination is completed. Priorities in resuscitation and diagnosis are established on the basis of hemodynamic stability and the degree of injury. The goal of the primary survey, as directed by the Advanced Trauma Life Support (ATLS) protocol, is to identify and expediently treat life-threatening injuries. The protocol includes the following:

- Airway, with cervical spine precautions
- Breathing
- Circulation
- Disability
- Exposure

Secondary survey

After an appropriate primary survey and initiation of resuscitation, attention should be focused on the secondary survey of the abdomen. The secondary survey is the identification of all injuries via a head-to-toe examination. For life-threatening injuries that necessitate emergency surgery, a comprehensive secondary survey should be delayed until the patient has been stabilized.

At the other end of the spectrum are victims of blunt trauma who have a benign abdomen upon initial presentation. Many injuries initially are occult and manifest over time. Frequent serial examinations, in conjunction with the appropriate diagnostic studies, such as abdominal computed tomography (CT) and bedside ultrasonography, are essential in any patient with a significant mechanism of injury.

The evaluation of a patient with blunt abdominal trauma must be accomplished with the entire patient in mind, with all injuries prioritized accordingly. This implies that injuries involving the head, the respiratory system, or the cardiovascular system may take precedence over an abdominal injury.

The abdomen should neither be ignored nor be the sole focus of the treating clinician and surgeon. In an unstable patient, the question of abdominal involvement must be expediently addressed. This is accomplished by identifying free intra-abdominal fluid with diagnostic peritoneal lavage (DPL)

or focused assessment with sonography for trauma (FAST). The objective is rapid identification of those patients who need a laparotomy.

The initial clinical assessment of patients with blunt abdominal trauma is often difficult and notably inaccurate. Associated injuries often cause tenderness and spasms in the abdominal wall and make diagnosis difficult. Lower rib fractures, pelvic fractures, and abdominal wall contusions may mimic the signs of peritonitis.

In general, accuracy increases if the patient is reevaluated repeatedly and at frequent intervals. However, repeated examinations may not be feasible in patients who need general anesthesia and surgery for other injuries. The greatest compromise of the physical examination occurs in the setting of neurologic dysfunction, which may be caused by head injury or substance abuse.

The most reliable signs and symptoms in alert patients are pain, tenderness, gastrointestinal hemorrhage, hypovolemia, and evidence of peritoneal irritation. However, large amounts of blood can accumulate in the peritoneal and pelvic cavities without any significant or early changes in the physical examination findings.

The respiratory pattern should be observed because abdominal breathing may indicate spinal cord injury. A sensory examination of the chest and abdomen should be performed to evaluate the potential for spinal cord injury. Spinal cord injury may interfere with the accurate assessment of the abdomen by causing decreased or absent pain perception.

The abdominal examination must be systematic. The abdomen is inspected for abrasions or ecchymosis. Particular attention should be paid to injury patterns that predict the potential for intra-abdominal trauma (eg, lap belt abrasions, steering wheel–shaped contusions). In most studies, lap belt marks have been correlated with rupture of the small intestine and an increased incidence of other intra-abdominal injuries.

Ecchymosis involving the flanks (Grey Turner sign) or the umbilicus (Cullen sign) indicates retroperitoneal hemorrhage, but this is usually delayed for several hours to days.

Visual inspection for abdominal distention, which may be due to pneumo peritoneum, gastric dilatation secondary to assisted ventilation or swallowing of air, or ileus produced by peritoneal irritation, is important.

Auscultation of bowel sounds in the thorax may indicate the presence of a diaphragmatic injury. Abdominal bruit may indicate underlying vascular disease or traumatic arteriovenous fistula.

Palpation may reveal local or generalized tenderness, guarding, rigidity, or rebound tenderness, which suggests peritoneal injury. Such signs appearing soon after an injury suggest leakage of intestinal content. Peritonitis due to intra-abdominal hemorrhage may take several hours to develop.

Fullness and doughy consistency on palpation may indicate intra-abdominal hemorrhage. Crepitation or instability of the lower thoracic cage

indicates the potential for splenic or hepatic injuries associated with lower rib injuries.

Tenderness on percussion constitutes a peritoneal sign. Tenderness mandates further evaluation and probably surgical consultation.

Rectal and bimanual vaginal pelvic examinations should be performed. A rectal examination should be done to search for evidence of bony penetration resulting from a pelvic fracture, and the stool should be evaluated for gross or occult blood. The evaluation of rectal tone is important for determining the patient's neurologic status, and palpation of a high-riding prostate suggests urethral injury.

The genitals and perineum should be examined for soft tissue injuries, bleeding, and hematoma. Pelvic instability indicates the potential for lower urinary tract injury, as well as pelvic and retroperitoneal hematoma. Open pelvic fractures are associated with a mortality rate exceeding 50%.

A nasogastric tube should be placed routinely (in the absence of contraindications, eg, basilar skull fracture) to decompress the stomach and to assess for the presence of blood. If the patient has evidence of a maxillofacial injury, an orogastric tube is preferred.

As the assessment continues, a Foley catheter is placed and a sample of urine is sent for analysis for microscopic hematuria. If injury to the urethra or bladder is suggested because of an associated pelvic fracture, then a retrograde urethrogram is performed before catheterization.

Tertiary survey

The concept of the tertiary trauma survey was first introduced by Enderson et al to assist in the diagnosis of any injuries that may have been missed during the primary and secondary surveys. The tertiary survey involves a repetition of the primary and secondary surveys and a revision of all laboratory and radiographic studies. In a study, a tertiary trauma survey detected 56% of injuries missed during the initial assessment within 24 hours of admission.

The most important initial concern in the evaluation of a patient with blunt abdominal trauma is an assessment of hemodynamic stability. In the hemodynamically unstable patient, a rapid evaluation must be made regarding the presence of hemoperitoneum. This can be accomplished by means of diagnostic peritoneal lavage (DPL) or the focused assessment with sonography for trauma (FAST). Radiographic studies of the abdomen are indicated in stable patients when the physical examination findings are inconclusive.

Blood Studies:

Complete blood count:

The presence of massive hemorrhage is usually obvious from hemodynamic parameters, and an abnormal hematocrit value merely confirms the diagnosis. Normal hemoglobin and hematocrit results do not rule out significant hemorrhage. Patients bleed whole blood. Until blood volume is replaced with crystalloid solution or hormonal effects (eg, adrenocorticotropic

hormone [ACTH], aldosterone, antidiuretic hormone [ADH]) and transcapillary refill occurs, anemia may not develop.

Bedside diagnostic testing with rapid hemoglobin or hematocrit machines may quickly identify patients who have physiologically significant volume deficits and hemodilution. Reported hemoglobin from ABG measurements also may be useful in identifying anemia. Some studies have correlated a low initial hematocrit (ie, < 30%) with significant injuries.

Do not withhold transfusion in patients who have relatively normal hematocrit results (ie, >30%) but have evidence of clinical shock, serious injuries (eg, open-book pelvic fracture), or significant ongoing blood loss. Hemodynamic instability in an adult despite the administration of 2 L of fluid indicates ongoing blood loss and is an indication for immediate blood transfusion. Use platelet transfusions to treat patients with thrombocytopenia (ie, platelet count < 50,000/µL) and ongoing hemorrhage.

An elevated white blood cell (WBC) count on admission is nonspecific and does not predict the presence of a hollow viscus injury (HVI). The diagnostic value of serial WBC counts for predicting HVI within the first 24 hours after trauma is very limited.

Liver function tests

Liver function tests (LFTs) may be useful in the patient with blunt abdominal trauma; however, test findings may be elevated for several reasons (eg, alcohol abuse). One study has shown that an aspartate aminotransferase

(AST) or alanine aminotransferase (ALT) level more than 130 U corresponds with significant hepatic injury.–Lactate dehydrogenase (LDH) and bilirubin levels are not specific indicators of hepatic trauma.

Serum amylase or lipase measurements

The serum lipase or amylase level is neither sensitive nor specific as a marker for major pancreatic or enteric injury. Normal levels do not exclude a major pancreatic injury. Elevated levels may be caused by injuries to the head and face or by an assortment of nontraumatic causes (eg, alcohol, narcotics, various other drugs). Amylase or lipase levels may be elevated because of pancreatic ischemia caused by the systemic hypotension that accompanies trauma.

However, persistent hyperamylasemia or hyperlipasemia (eg, abnormal elevation 3-6 hours after trauma) should raise the suggestion of significant intra-abdominal injury and is an indication for aggressive radiographic and surgical investigation.

Blood typing, screening, and cross-matching

Blood from all trauma patients with suspected blunt abdominal injury should be screened and typed. If an injury is identified, this practice greatly reduces the time required for cross-matching. An initial cross-match should be performed on a minimum of 4-6 units for those patients with clear evidence of abdominal injury and hemodynamic instability. Until cross-matched blood is available, O-negative or type-specific blood should be used.

Drug and alcohol screening

Perform drug and alcohol screens on trauma patients who have alterations in their level of consciousness. Breath or blood testing may quantify alcohol level.

Urine Studies

Indications for diagnostic urinalysis include significant trauma to the abdomen and/or flank, gross hematuria, microscopic hematuria in the setting of hypotension, and a significant deceleration mechanism.

Obtain a contrast nephrogram by utilizing intravenous pyelography (IVP) or computed tomography (CT) scanning with intravenous (IV) contrast. Gross hematuria indicates a workup that includes cystography and IVP or CT scanning of the abdomen with contrast.

Perform a urine toxicologic screen as appropriate. Obtain a serum or urine pregnancy test on all females of childbearing age.

Plain Radiography

Although their overall value in the evaluation of patients with blunt abdominal trauma is limited, plain films can demonstrate numerous findings. The chest radiograph may aid in the diagnosis of abdominal injuries such as ruptured hemidiaphragm (eg, a nasogastric tube seen in the chest) or pneumoperitoneum.

The pelvic or chest radiograph can demonstrate fractures of the thoracolumbar spine. The presence of transverse fractures of the vertebral

bodies (ie, Chance fractures) suggests a higher likelihood of blunt injuries to the bowel. In addition, free intraperitoneal air, or trapped retroperitoneal air from duodenal perforation, may be seen.

Ultrasonography

The use of diagnostic ultrasonography to evaluate a patient with blunt trauma for abdominal injuries has been advocated since the 1970s. European and Asian investigators have extensive experience with this technology and are leaders in the use of ultrasound for the diagnosis of blunt abdominal trauma.
The first American report of physician-performed abdominal ultrasonography in the evaluation of blunt abdominal trauma was published in 1992 by Tso and colleagues.

Bedside ultrasonography is a rapid, portable, noninvasive, and accurate examination that can be performed by emergency clinicians and trauma surgeons to detect hemoperitoneum. In fact, in many medical centers, the FAST examination has virtually replaced DPL as the procedure of choice in the evaluation of hemodynamically unstable trauma patients.

The FAST examination is based on the assumption that all clinically significant abdominal injuries are associated with hemoperitoneum. However, the detection of free intraperitoneal fluid is based on factors such as the body habitus, injury location, presence of clotted blood, position of the patient, and amount of free fluid present.

In a patient with isolated blunt abdominal trauma and multisystem injuries, FAST performed by an experienced sonographer can rapidly identify free intraperitoneal fluid (generally appearing as a black stripe). The sensitivity for solid organ encapsulated injury is moderate in most studies. Hollow viscus injury (HVI) rarely is identified; however, free fluid may be visualized. For patients with persistent pain or tenderness or those developing peritoneal signs, FAST may be considered as a complementary measure to CT scanning, DPL, or exploration.

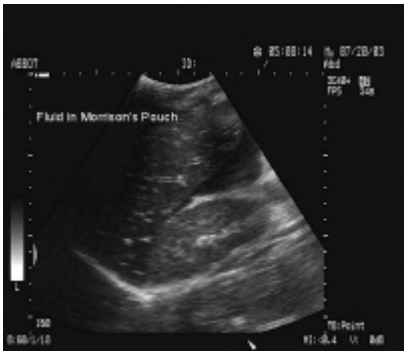
The minimum threshold for detecting hemoperitoneum is unknown and remains a subject of interest. Kawaguchi and colleagues found that 70 mL of blood could be detected,whereas Tiling et al found that 30 mL is the minimum requirement for detection with ultrasonography.–They also concluded that a small anechoic stripe in the Morison pouch represents approximately 250 mL of fluid, whereas 0.5-cm and 1-cm stripes represent approximately 500 mL and 1 L of free fluid, respectively.

The current FAST examination protocol consists of 4 acoustic windows with the patient supine. These windows are pericardiac, perihepatic, perisplenic, and pelvic (known as the 4 *P* s). An examination is interpreted as positive if free fluid is found in any of the 4 acoustic windows and as negative if no fluid is seen. An examination is deemed indeterminate if any of the windows cannot be adequately assessed.

The pericardial window is obtained via a subcostal or transthoracic approach. It provides a 4-chamber view of the heart and can detect the presence of hemopericardium, which is demonstrated by the separation of the visceral and parietal pericardial layers.

The perihepatic window yields views of portions of the liver, diaphragm, and right kidney. It reveals fluid in the Morison pouch (see the images below), the subphrenic space, and the right pleural space.

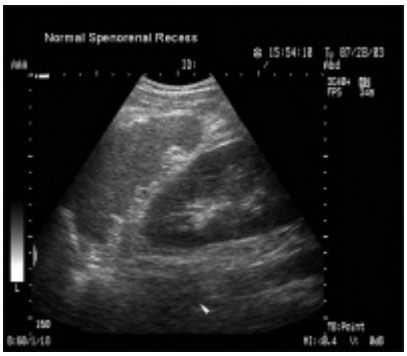
Blunt abdominal trauma. Normal Morison pouch (ie, no free fluid).



Blunt abdominal trauma. Free fluid in Morison pouch

The perisplenic window provides views of the spleen and the left kidney and reveals fluid in the splenorenal recess (see the images below), the left pleural space, and the subphrenic space. The pelvic window makes use of the bladder as a sonographic window and thus is best accomplished while the

patient has a full bladder. In males, free fluid is seen as an anechoic area (sonographically black) in the rectovesicular pouch or cephalad to the bladder. In females, fluid accumulates in the Douglas pouch, posterior to the uterus.



Blunt abdominal trauma. Normal splenorenal recess.

Blunt abdominal trauma. Free fluid in splenorenal recess.

FAST's diagnostic accuracy generally is equal to that of DPL. Studies demonstrate a degree of operator dependence; however, some studies have shown that with a structured learning session, even novice operators can identify free intra-abdominal fluid, especially if more than 500 mL of fluid is present. Sensitivity and specificity of these studies range from 85% to 95%

As noted, FAST relies on hemoperitoneum to identify patients with injury. Chiu and colleagues, in their study of 772 patients with blunt trauma undergoing

FAST scans, reported 52 patients had an abdominal injury. Of the 52 patients, 15 (29%) had no hemoperitoneum on FAST or CT scan results. These findings suggest that the reliance on hemoperitoneum as the sole indicator of abdominal visceral injury limits the utility of FAST as a diagnostic screening tool in stable patients with blunt abdominal trauma.

Rozycki et al studied 1540 patients and reported that ultrasonography was the most sensitive and specific modality for the evaluation of hypotensive patients with blunt abdominal trauma (sensitivity and specificity, 100%)

Hemodynamically stable patients with positive FAST results may require a CT scan to better define the nature and extent of their injuries. Taking every patient with a positive FAST result to the operating room may result in an unacceptably high laparotomy rate.

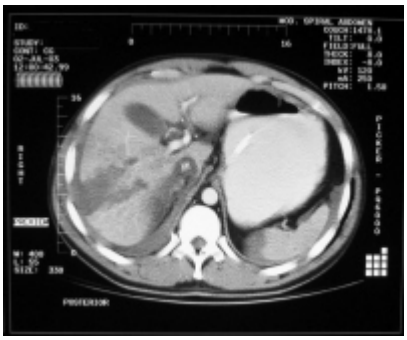
Hemodynamically stable patients with negative FAST results require close observation, serial abdominal examinations, and a follow-up FAST examination. However, strongly consider performing a CT scan, especially if the patient is intoxicated or has other associated injuries.

Hemodynamically unstable patients with negative FAST results are a diagnostic challenge. Options include DPL, exploratory laparotomy, and, possibly, a CT scan after aggressive resuscitation.

Computed Tomography

Although expensive and potentially time-consuming, CT scanning often provides the most detailed images of traumatic pathology and may assist in

determination of operative intervention. CT remains the criterion standard for the detection of solid organ injuries (see the image below). In addition, a CT scan of the abdomen can reveal other associated injuries, notably vertebral and pelvic fractures and injuries in the thoracic cavity.



Blunt abdominal trauma with liver laceration.

CT scanning, unlike DPL or FAST, has the capability to determine the source of hemorrhage (see the image below). In addition, many retroperitoneal injuries go unnoticed with DPL and FAST examinations.

Blunt abdominal trauma with splenic injury and hemoperitoneum.

Transport only hemodynamically stable patients to the CT scanner. When performing CT scans, closely and carefully monitor vital signs for clinical evidence of decompensation. Preliminary evidence suggests that a flat vena

cava on CT scan is a marker for underresuscitation and may be correlated with higher mortality and hemodynamic decompensation.

CT scans provide excellent imaging of the pancreas, duodenum, and genitourinary system. The images can help quantitate the amount of blood in the abdomen and can reveal individual organs with precision. The primary advantage of CT scanning is its high specificity and use for guiding nonoperative management of solid organ injuries.

Drawbacks of CT scanning relate to the need to transport the patient from the trauma resuscitation area and the additional time required to perform CT scanning compared to FAST or DPL.

In addition, CT scanning may miss injuries to the diaphragm and perforations of the gastrointestinal (GI) tract, especially when performed soon after the injury. Although some pancreatic injuries may be missed with a CT scan performed soon after trauma, virtually all are identified if the scan is repeated in 36-48 hours. For selected patients, endoscopic retrograde cholangiopancreatography (ERCP) may complement CT scanning to rule out a ductal injury.

Finally, CT scanning is relatively expensive and time consuming and requires oral or intravenous (IV) contrast, which may cause adverse reactions. The best CT imagery requires both oral and IV contrast. Some controversy has arisen over the use of oral contrast and whether the additional information it provides negates the drawbacks of increased time to administration and risk of

aspiration. The value of oral contrast in diagnosing bowel injury has been debated, but no definitive answer exists at this time.

Diagnostic Laparoscopy

The introduction of minimally invasive surgery has revolutionized many surgical diagnostic protocols. In the late 1980s and early 1990s, there was considerable interest in the use of laparoscopy for evaluation and management of blunt and penetrating abdominal trauma. Subsequent studies, however, revealed major limitations to this approach and cautioned against its widespread use. The most important limitation is inability to reliably identify hollow viscus and retroperitoneal injuries, even in the hands of experienced laparoscopists. Diagnostic laparoscopy involves placing a subumbilical or subcostal trocar for the introduction of the laparoscope and creating other ports for retractors, clamps, and other tools necessary for visualization of the repair.

Diagnostic laparoscopy has been most useful in the evaluation of possible diaphragmatic injuries, especially in penetrating thoracoabdominal injuries on the left side. In blunt trauma, it has no clear advantages over less invasive modalities such as DPL and CT scanning; furthermore, complications can result from trocar misplacement.

Diagnostic Peritoneal Lavage

The idea of evaluating the abdomen by analyzing its contents was first used in the diagnosis of acute abdominal conditions. In 1906, Salomon described the passage of a urethral catheter by means of a trocar inserted

through the abdominal wall to obtain samples of peritoneal fluid with the aim of establishing the diagnosis of peritonitis from infectious agents (eg, pneumococcal or tuberculous organisms). This technique has since been refined and is now known as abdominal paracentesis.

In 1926, Neuhof and Cohen described the sampling of peritoneal fluid in cases of acute pancreatitis and blunt abdominal trauma by passing a spinal needle through the abdominal wall.–In 1965, Root et al reported the use of percutaneous DPL in patients who had sustained blunt abdominal trauma.

DPL is used as a method of rapidly determining the presence of intraperitoneal blood. It is particularly useful if the history and abdominal examination of an unstable patient with multisystem injuries are either unreliable (eg, because of head injury, alcohol, or drug intoxication) or equivocal (eg, because of lower rib fractures, pelvic fractures, or confounding clinical examination).

DPL is also useful for patients in whom serial abdominal examinations cannot be performed (eg, those in an angiographic suite or operating room during emergency orthopedic or neurosurgical procedures).

INDICATIONS:

- Hemodynamically unstable patients with negative FAST \CT
- Patients with a spinal cord injury
- Those with multiple injuries and unexplained shock
- Obtunded patients with a possible abdominal injury
- Intoxicated patients in whom abdominal injury is suggested

- Patients with potential intra-abdominal injury who will undergo prolonged anesthesia for another procedure.

Contraindications:

Absolute contraindication :

The obvious need for laparotomy.

Relative contraindication:

- ✓ Morbid obesity
- ✓ History of multiple abdominal surgeries
- ✓ Pregnancy.

Various methods of introducing the catheter into the peritoneal space have been described.

These include the open, semiopen, and closed methods.

The open method requires an infraumbilical skin incision that is extended to and through the linea alba. (In pregnant patients or in patients with particular risk for potential pelvic hematoma, the incision should be placed superior to the umbilicus.) The peritoneum is opened, and the catheter is inserted under direct visualization.

The semiopen method is identical, except that the peritoneum is not opened and the catheter is delivered percutaneously through the peritoneum into the peritoneal cavity.

The closed technique requires the catheter to be inserted blindly through the skin, subcutaneous tissue, linea alba, and peritoneum.

The closed and semiopen techniques at the infraumbilical site are preferred at most centers. The fully open method is the most technically demanding and is restricted to those situations in which the closed or semiopen technique is unsuccessful or is deemed unsafe (eg, patients with pelvic fractures, pregnancy, obesity, or prior abdominal operations).

PROCEDURE:

After insertion of the catheter into the peritoneum, attempt to aspirate free intraperitoneal blood (at least 15-20 mL).

Results are considered positive in a blunt trauma patient if ,

- ✓ 10 mL of grossly bloody aspirate is obtained before infusion of the lavage fluid
- ✓ If the siphoned lavage fluid contains more than 100,000 red blood cells (RBCs)/µL, more than 500 white blood cells (WBCs)/µL,
- ✓ Elevated amylase content,
- ✓ Bile, bacteria, vegetable matter, or urine.

Only approximately 30 mL of blood is needed in the peritoneum to produce a microscopically positive DPL result.

If findings are negative, infuse 1 L of crystalloid solution (eg, lactated Ringer solution) into the peritoneum. Then, allow this fluid to drain by gravity, and ensure that laboratory analysis is performed.

Complications :

- ✓ Bleeding from the incision and catheter insertion,

- ✓ Infection (ie, wound, peritoneal),
- ✓ Injury to intra-abdominal structures (eg, urinary bladder, small bowel, uterus).
- ✓ These complications may increase the possibility of false-positive studies
- ✓ Bleeding from the incision, dissection, or catheter insertion can cause false-positive results that may lead to unnecessary laparotomy. Achieve appropriate hemostasis prior to entering the peritoneum and placing the catheter.

False-positive DPL results can occur if an infraumbilical approach is used in a patient with a pelvic fracture. A pelvic x-ray film should be obtained prior to performing DPL if a pelvic fracture is suggested. Before DPL is attempted, the urinary bladder and stomach should be decompressed.

DPL has been shown in some studies to have a diagnostic accuracy of 98-100%, a sensitivity of 98-100%, and a specificity of 90-96%. It has some advantages, including high sensitivity, rapidity, and immediate interpretation. The main limitations of DPL include its potential for iatrogenic abdominal injury and its high sensitivity, which can lead to nontherapeutic laparotomies.

With the availability of fast, noninvasive, and better imaging modalities (eg, FAST, CT scanning), the role of DPL is now limited to the evaluation of unstable trauma patients in whom FAST results are negative or inconclusive. In some contexts, DPL may be complemented with a CT scan if the patient has positive lavage results but stabilizes.

MANAGEMENT OF SPECIFIC INJURIES AT LAPAROTOMY

PATHOPHYSIOLOGY OF BLUNT INJURIES

Management of patient with blunt abdominal trauma requires and understanding of the injury mechanism. In general injuries can be classified as high energy or low energy. Several pathophysiogical processes involved are

1) Sudden pronounced rise in intra abdominal pressure causing burst injury of solid organs or rupture of hollow viscus.
2) Compression of abdominal viscera the applied force to the anterior wall to the posterior thoracic cage or vertebral column.
3) Abrupt, shearing forces can cause tear of organs or vascular pedicles

SPLENIC INJURIES

Organ most frequently injured in blunt abdominal trauma

a. Compression may occur between the anterior wall and posterior rib cage
b. Clinical picture includes Left upper quadrant pain , Signs of hypovolumia , Pain in the left shoulder (Kehr's Sign)
c. Xray features include-

- ✓ Enlargement of splenic shadow ,
- ✓ Medial displacement of gastric shadow ,
- ✓ associated rib fractures..

SPLENIC INJURY SCALE

GRADE		INJURY DESCRIPTION
I	**Haematoma**	- Subcapsular, non expanding < 10 % surface area
	Laceration	- Capsular tear, non bleeding < 1cm Parenchymal depth
II	**Haematoma**	- Subcapsular, non expanding 10-50% surface area intra parenchymal non expanding < 2cm in diameter
	Laceration	- Capsular tear, active bleeding
III	**Haematoma**	- Subcapsular > 50 % surface area or expanding ruptured subcapsular haematoma, active bleeding - Intra parenchymal haematoma > 2 cm or expanding
	Laceration	> 3 cm parenchymal depth or involving trabecular Vessels.
IV	**Haematoma**	- Intraparenchymal haematoma with active bleeding
	Laceration	- Laceration involving segmental or hilar vessels producing major devascularisation (>25 % of spleen)

Splenic Salvage:

- ✓ Adequate mobilization enhances success of salvage
- ✓ Capsular tear-Topical hemostatic agents
- ✓ Small lacerations- Interlocking sutures
- ✓ Major laceration <50% - Segmental splenic resection

Splenic Salvage Should not be pursued:

- ✓ If the patient has protracted hypotension
- ✓ Undue delay is anticipated in repair of laceration
- ✓ Patient has other severe injuries

Splenectomy Complications:

- ✓ Left pleural effusion
- ✓ Left lower lobe collapse
- ✓ Post splenectomy sepsis

Liver Injuries:

Liver is the largest organ in the abdominal cavity .Due to its size injuries sufficient to lacerate the liver are associated with injuries to other organs in about 80% cases.Spontaneous hemostatic mechanism that characterize liver tissue may contribute pervasive observation that 85% of liver injuries do not bleed at time of laparotomy.

A patient who has history of being in shock at the scene following blunt trauma should be suspected of having major liver trauma.

X-Ray features:

- ✓ Evidence of hemoperitoneum (Elevation of diaphragm)
- ✓ Fracture lower ribs corresponding to right side

GRADE		INJURIES DESCRIPTION
I	**Haematoma**	- Subcapsular, non expanding ,< 10 % Surface area
	Laceration	- Capsular tear, non bleeding < 1 cm deep
II	**Haematoma**	- Subcapsular non expanding, 10-50 % intraparenchymal, non expanding
	Laceration	- < 3m parenchymal depth < 10 cm in length
III	**Haematoma**	- Subcapsular > 50 % surface area, expanding ruptured intra parenchymal, haematoma with active bleeding.
	Laceration	- > 3 cm parenchymal depth.
IV	**Haematoma**	- Ruptured central haematoma
	Laceration	- Parenchymal disruption involving 25 to75% Of hepatic lobe
V	**Laceration**	- Parenchymal destrucion > 75 % of hepatic lobe

Most Liver injuries infact requires documentation and no drainage.

Indications for laparotomy during the period of observation are

1. Deteriorating vital signs.

2. Infection

3. Progressive expansion of the haematoma.

General measures in Management:

Class I parenchymal Lacerations:

- ✓ treated by compression for 5 to 10 minutes.

Topical agents. microfibrillar collagen and gel foam. can be used to stop bleeding

Class II parenchymal lacerations:

- ✓ Classically horizontal mattress sutures with 0 chromic catgut often place with blunt needle is used

Class III & IV Lacerations:

- ✓ Lacerations which continue to bleed despite initial management requires tractotomy .The depth of wound are explored and specific blood vessels and biliary radicals are individually suture ligated.
- ✓ If bleeding continues still compression on porta hepatis (Pringle manoeuvre)
- ✓ When selective ligation fails ligation of hepatic artery is done . It produces dramatic hemostasis without subsequent liver failure
- ✓ Alternative is resectional debridement accompalisehed by finger fracture , removing the devitalized liver or portion of the segment

Bleeding from Hepatic Veins:

- ✓ Unilobular – Resection and debridement is sufficient
- ✓ Bilobular – placement of intracaval shunt
- ✓ Still uncontrollable packing of injury and resuscitation is appropriate followed by subsequent removal of pack in 24-72 hours

Complications following liver injury:

- ✓ Pulmonary complications
- ✓ Coagulopathy
- ✓ Jaundice
- ✓ Biliary fistula
- ✓ Hemobilia
- ✓ DIC

DUODENAL INJURIES

These injuries are suspected if history of trunk injury or localized blow to epigastrium with handle bars , steering wheel or fist. Failure to recognize this injury is associated with high mortality and morbidity caused by abscess formation and sepsis since it's a retroperitoneal organ.

X-Ray features:

- ✓ Obliteration of psoas shadow
- ✓ Absence of air in duodenal bulb
- ✓ Air in retroperitoneum

CT with oral contrast is definite showing extravasation of dye..

Management:

Full inspection by taking down hepatic flexure of colon and performing a kocher maneuver is mandatory….

- ✓ Limited perforation or simple laceration within 6 hrs are treated by primary closure , if more than 6 hrs has elapsed suture closure with tube duodenostomy is indicated
- ✓ If laceration is extensive Roux-en-Y jejuno duodenostomy is indicated
- ✓ Distal duodenum (III &IV) parts injuries can be primarily closed if it occurs within 6 hrs of injury , but if duration extends above 6 hrs resection of III & IV parts and duodenal jejunostomy should be performed.
- ✓ Pancreatico duodenectomy is occasionally indicated for massive injury in right upper quadrant cant be repaired usually due to devascularisation…

SMALL INTESTINE INJURIES

- ✓ Crushing injury of the bowel between the spine and the blunt object such as the steering wheel or handlebars
- ✓ Deceleration shearing of the small bowel at fixed points such as ileocaecal valve and around superior mesenteric artery
- ✓ Closed loop rupture caused by increased intra-abdominal pressure.

Antibiotics should be started preoperatively

At Laparotomy:

- ✓ Significant bleeding must be first priority
- ✓ Apply non-crushing clamps to prevent further leakage of small bowel contents
- ✓ Examine small bowel carefully from ligament of trietz to ileocaecal valve
- ✓ Single holes can be closed without debridment
- ✓ Transection of small bowel is debrided and closed in routine fashion and mesenteric defect is to be closed

Complications:

- ✓ Intra-abdominal abscess
- ✓ Anastamotic leakage
- ✓ Enterocutaneous fistula
- ✓ Intestinal obstruction

PANCRETIC INJURIES

Blunt trauma to the abdomen from a direct kick , blow or seat belt injury may crush the pancreas over the vertebral column . The shared blood supply between the pancreas and duodenum makes the likelihood of these two injuries in combination very high

- ✓ Persistant Amylasemia
- ✓ Contrast duodenography revealing widening of C loop
- ✓ Loss of psoas shadow , anterior displacement of stomach
- ✓ Left pleural effusion

CLASSIFICATION OF PANCREATIC INJURIES

TYPE	**DEFINITIONS**
I	Contusion and laceration
II	Distal transection or parenchymal Injury with duct injury
III	Proximal transection or parenchymal Injury with probable duct injury

Management:

The entire pancreas should be visualized clearly .

- ➢ Simple debridement
- ➢ Injury to body and tail should be treated with partial resection

In patients with ductal transactions in the head, the treatment options are

1. Roux-en-y distal pancreatico jejunostomy

2. Anterior Roux-en-y distal pancreatico jejunostomy.

3. Resection.

Complications:

- Pancreatic Fistula
- Abscess in lesser sac
- Pseudo pancreatic Cyst

RETRO-PERITONEAL HEMATOMAS

Retroperitoneum can be divided into three zones,

Zone 1 –Central

Zone 2 – Flank \ Peri nephric

Zone 3 – Pelvic

Management:

Zone 3 injuries will usually have associated pelvic injuires and so exploration of these injuries are hazardous . Incision to peritoneum destroys the tamponade effect so non operative management is the rule in zone 3 injuries . Also discrete bleeding points can rarely be identified as there is catastrophic bleeding.

- ✓ Zone 2 injuries can be left alone if not expanding
- ✓ Zone 1 injuries are always explored due to associated injury to major vascular structures and viscera (Pancreatico duodenal injuries)

RENAL INJURIES

The kidney is the most common injured part of the Urinary Tract.

Classification:

- MAJOR – 15% (Deep cortical \ Medullary lacerations , Large perinephric hematomas,Vascular Injuries Of Vascular pedicle)
- MINOR – Other Injuries

X-Ray:

a. Absent psoas muscle shadow

b. Altered kidney outline

c. Ground glass appearance suggestive of either extravasation

of urine or haemoperiotoneum.

d. Associated bony injuries like rib fractures

IVU:

a. Delay in visualization of the contract.

b. Extravasation of the contract

c. Lack of continuous renal outline

d. Enlarged renal shadow.

A normal IVU in a patient with haematuria indicates minor renal contusion

MANAGEMENT:

- ✓ Renal Injuries associated with blunt injury abdomen are usually not explored unless they are pulsatile or expanding.
- ✓ Shattered kidney is treated with nephrectomy to prevent haemorrhage.
- ✓ Renal vein injury is repaied by venorrhaphy.

  Renal artery injury is repaired by lateral arteriorrhaphy, arterial resection.

BLADDER INJURY

Majority of bladder injuries occur due to blunt abdominal trauma . Bladder injury should be suspected strongly in persons with hematuria and pelvic fractures.

Bladder rupture may be **Extraperitoneal or Intraperitoneal**

Diagnosis by IVU \ Cystography

Extra-Peritoneal Rupture:

- Non Operative management is the rule
- By prolonged Foleys catheter use
  - If patient has no Intra-abdominal injuries
  - No significant local hemorrhage
  - No UTI
  - Severe pelvic fractures \ massive Retro peritoneal bleeding

Delayed repair can be contemplated once the retroperitoneal bleeding is controlled and their condition is stabilized

Intra-Pertitoneal Rupture:

- ✓ Transabdominal approach – Closure with SPC and drainage..

MATERIALS AND METHODS

Thirty Four cases of blunt abdominal trauma admitted in all surgical units at Tirunelveli Medical College Hospital, Tirunelveli during the period of December 2010 to November 2011 were taken for this study.

The cases were selected in such a way that only those patients with definitive history and clinical findings suggestive of injury to Viscerae which were later confirmed by investigations, laparotomy and autopsy. Detailed history regarding the mode and nature of injury were taken, The clinical features were studies in details with special note to any associated injuries like head injury, chest injury and fracture limbs. Basic investigations viz. blood Hb, blood urea, blood sugar, serum creatinine and blood grouping were done in all cases.

Plain X-ray of the abdomen in erect posture was taken in most of the cases expect in those who were admitted in a critically ill condition. Radiographs of other parts were also taken to find out associated injuries.

Under aseptic precaution using sterile 18 G needle peritoneal tapping done in all the four quadrants, in all patients with the history of blunt abdominal trauma.

At laparotomy a systematic approach with examination of all intra abdominal organs were made. After surgery the patients were continued on nasogastric, aspiration, antibiotics.Postoperative complications were specifically looked for, if present were treated appropriately.

OBSERVATION

In our study conducted at Tirunelveli Medical college hospital for 34 cases of blunt injury abdomen , the following findings were noted,

Splenic Injuries	11	-32.35%
Liver injuries	08	- 23.52%
Bladder injury	04	-11.76%
Renal injury	04	-11.76%
Mesentery	03	-8.82%
Bowel perforation	04	-11.76%

At laparotomy the commonest organ injured in most of the series is spleen **(Denver Hospital study, Herman Hospital)**

Age wise the age group of 31-40 is most commonly affected 35% . S.C **Dwivedi et al and B.C. Jain et al** reported similar results. This shows that persons in the active period of life are more susceptible for accidents and injuries.

Sex wise male affection rate is 94% **. B.C. Jain et al and Connecticut society of surgeon**s study on abdominal trauma reported similar results. This increased incidence in males is probably due to outdoor nature of occupation and aggressive behaviour in males.

Diagnostic Four quadrant aspiration was done in all cases , and it was positive for presence of blood \ fluid in 29 cases 85.29%. Abdominal paracentesis when positive is highly predictive of significant intraabdominal

injuries but the accuracy varies from 50 % to 90 % in various studies, **Authony et al** Showed 90 % accuracy.

All the cases were resuscitatied and subjected to FAST before exploratory laparotomy . Of these there were 3 cases where the FAST findings did not correlate with laparotomy findings .FAST missed a case of splenic laceration , a case of Liver laceration , and there was a wrong interpretation of a case of Renal injury having associated liver injury.

The incidence of False positive was 2.94% and the incidence of False negative 5.88%.In cased of bladder injuries FAST revealed presence of clots and mesenteric and bowel injuries it revealed presence of free fluid. **Stritmatter B. et al** howed a sensitivity of 95.5 % and specificity of 97.5 % hence ultrasonogram can be used as a initial imaging procedure.

Associated injuries include Rib fractures in 5 cases of liver lacertion 62.5% , 3 rib fractures in spleen 27.27% , 1 rib fracture in mesenteric contusion 33.33%. There is a 20 % chance of splenic injury and10 % chance of liver injury with fracture ribs on the left or right lower six ribs **(Graffin W.o et al , Moore E.E.)**

Zone 2 RPH was present in all four cases of renal injury , the right kidney was injured in 3 cases and the left in one case , Zone 3 RPH was present in a case of mesenteric contusion.

# of both superior and inferior pubic rami was present in all four cases of bladder injury

forearm was present in a case of mesenteric contusion , # tibia was present in a case of ileal perforation.

In our study there was no incidence of simultaneous two solid organ injury.

So the associated injuries include,

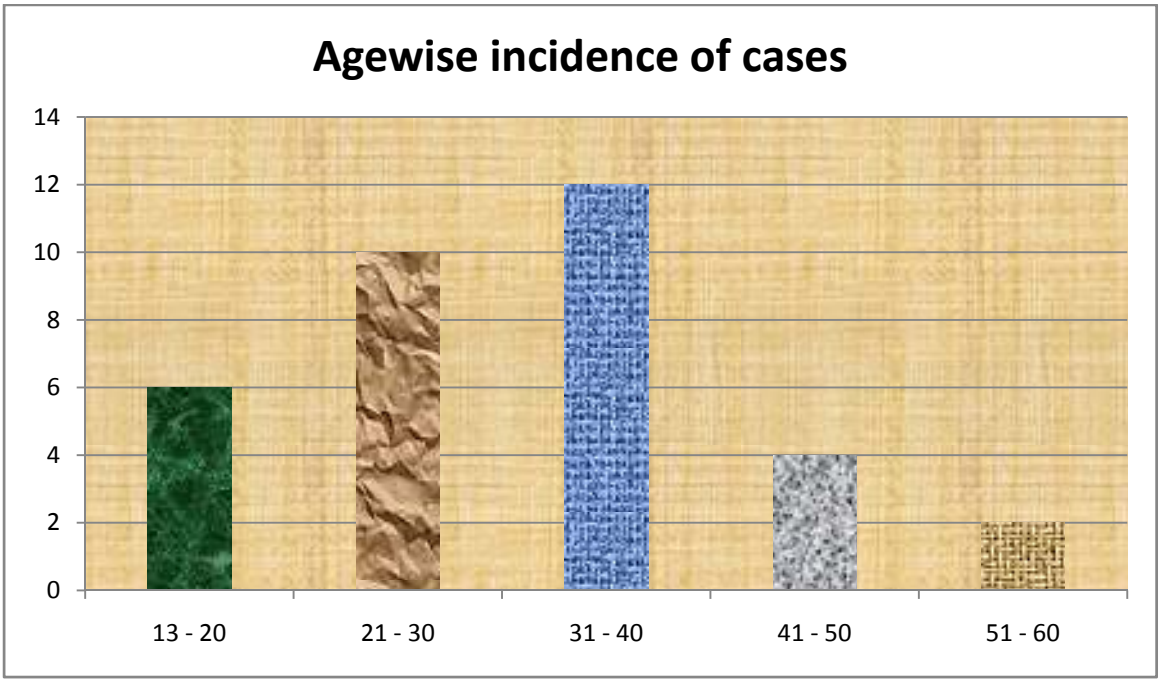
1.Rib #	- 9	26.47%
2.RPH	- 5	14.70%
3. superior and inferior pubic rami	- 4	11.76%
4.# Tibia	- 1	2.94%
5. # Forearm	- 1	2.94%

Total no of death in our study was two cases , A case of Grade IV liver laceration with massive hemoperitoneum and a case of Grade III laceration spleen.The mortality rate is 6% . Herman Hospital study showed a mortality of 24%.

RESULTS

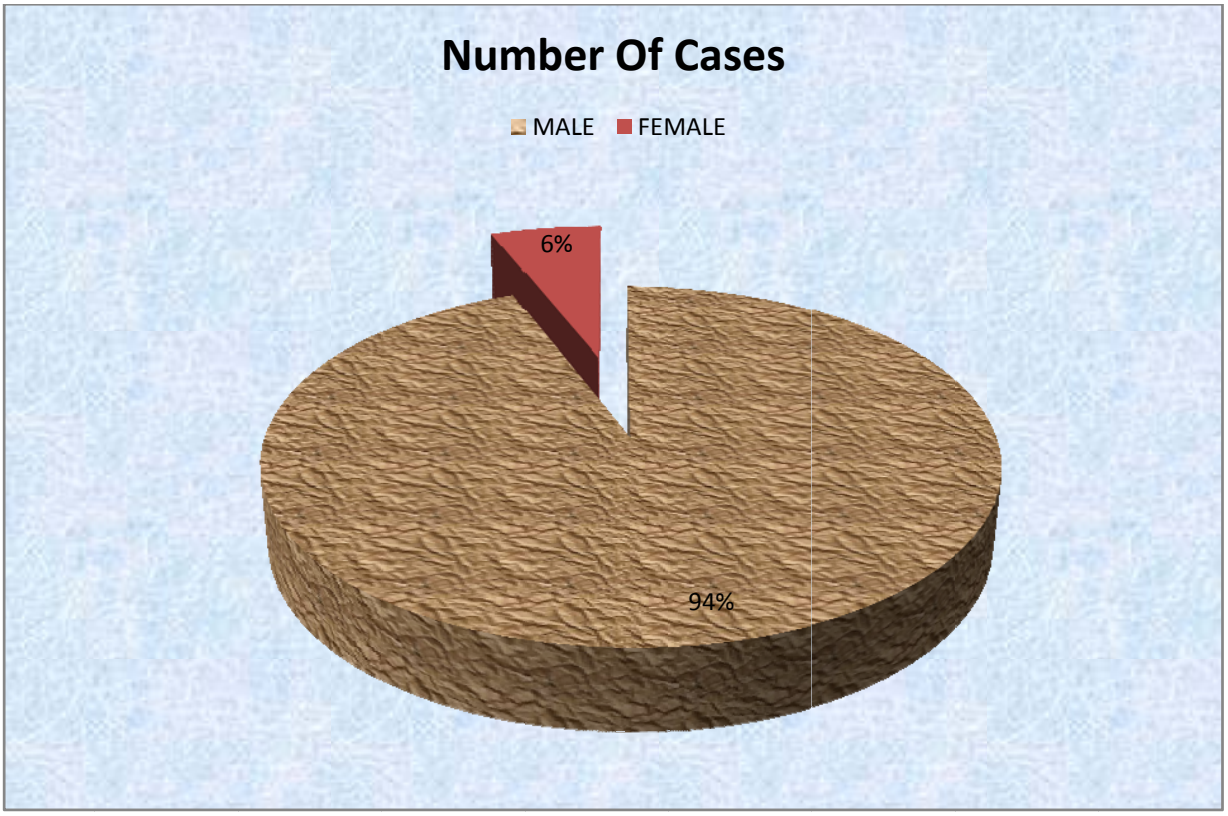
AGE WISE INCIDENCE OF CASES

Sl No	Age of the patient	Number of cases
1	13 – 20	6
2	21 – 30	10
3	31 – 40	12
4	41 – 50	4
5	51 – 60	2



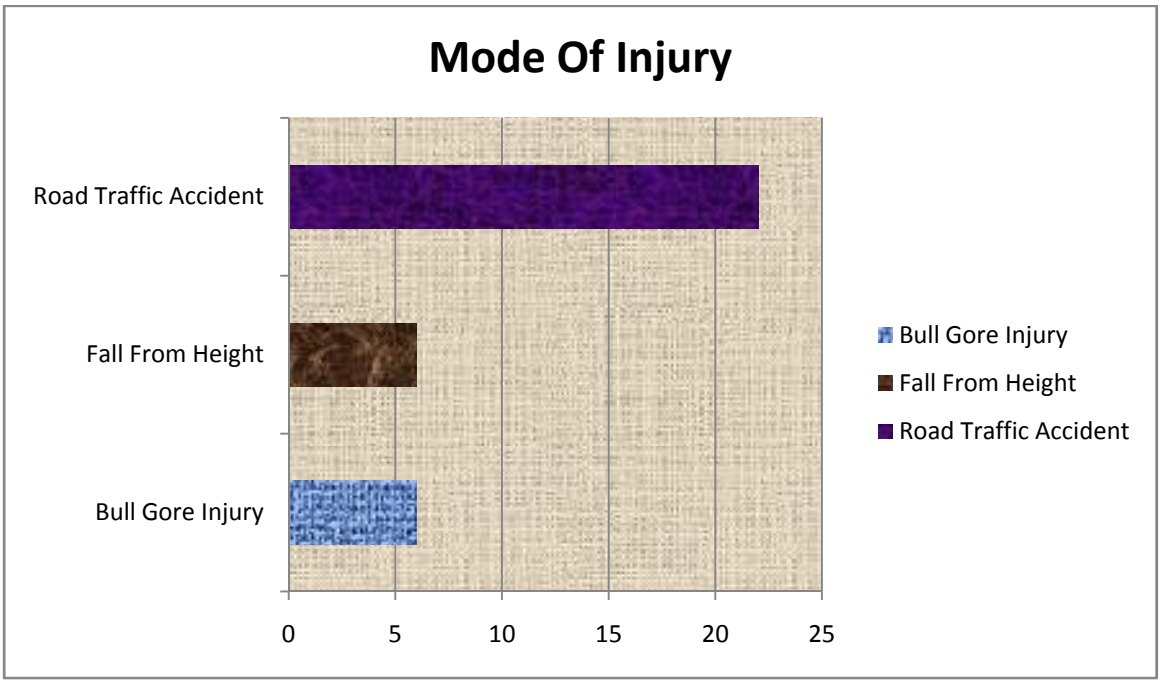
SEX WISE INCIDENCE OF CASES

SEX	NO OF CASES
Male	32
Female	2
Total	34



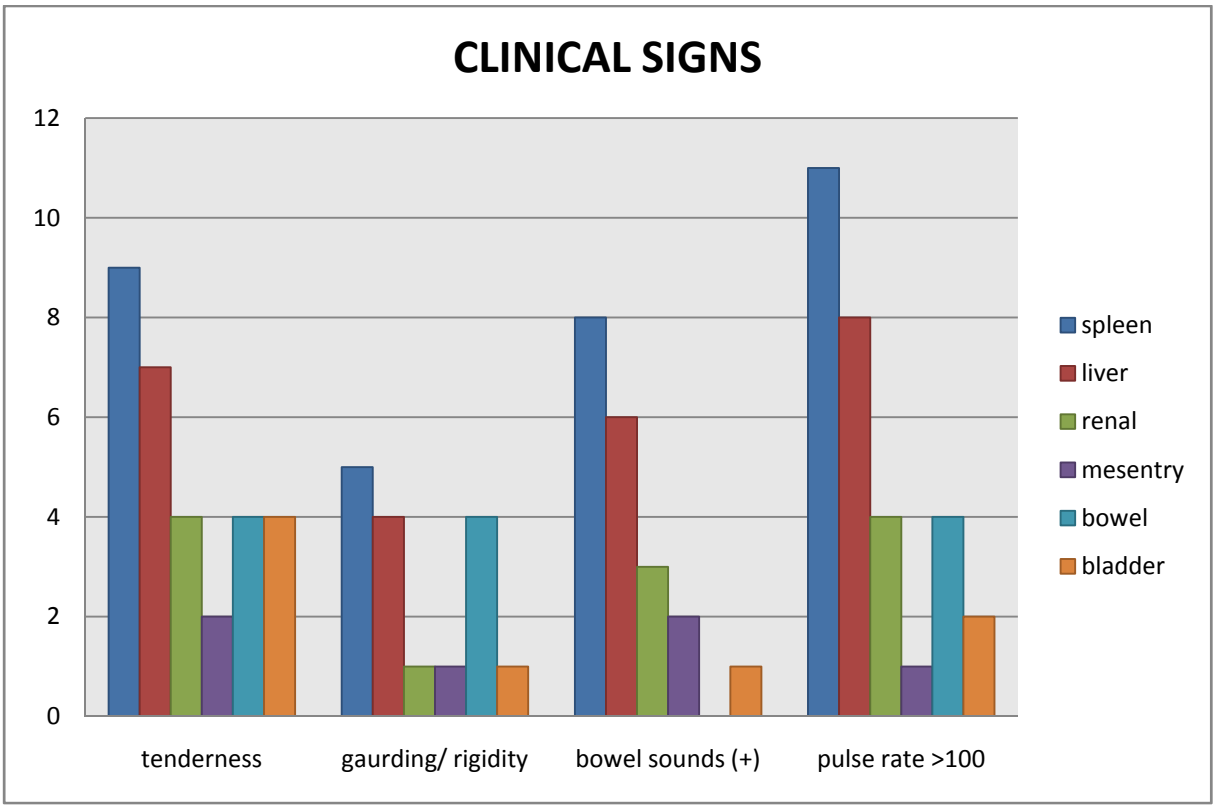
MODE OF INJURY

S. No	Mode of injury	No of cases
1	Road traffic accident	22
2	Fall from height	6
3	Bull Gore Injury	6



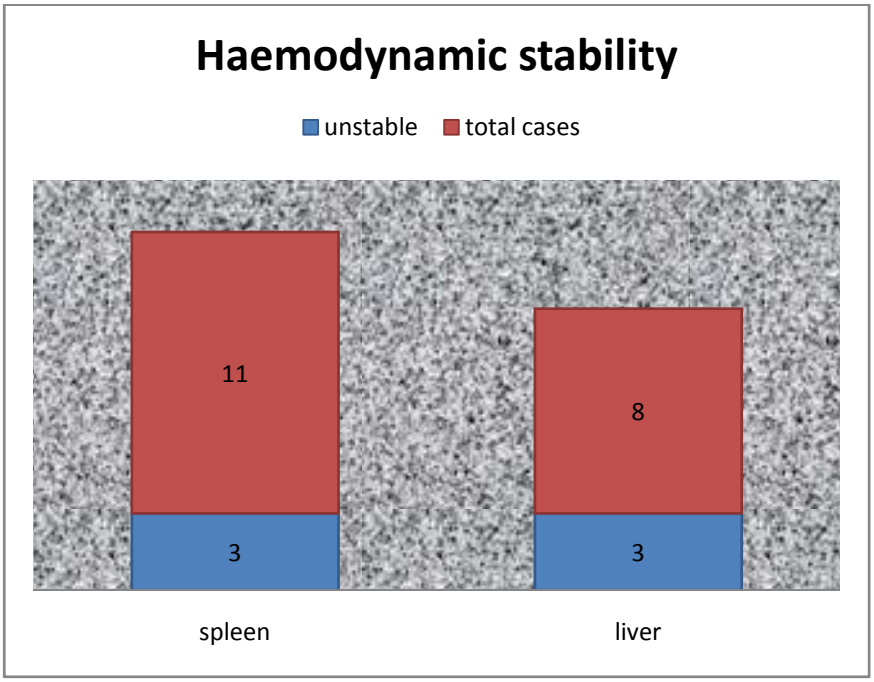
CLINICAL SIGNS

Clinical Signs	Spleen	Liver	Renal	Mesentry	Bowel	Bladder
Tenderness	9	7	4	2	4	4
Guarding / Rigidity	5	4	1	1	4	1
Bowel Sounds (+)	8	6	3	2	0	1
Pulse Rate >100/Min	11	8	4	1	4	2



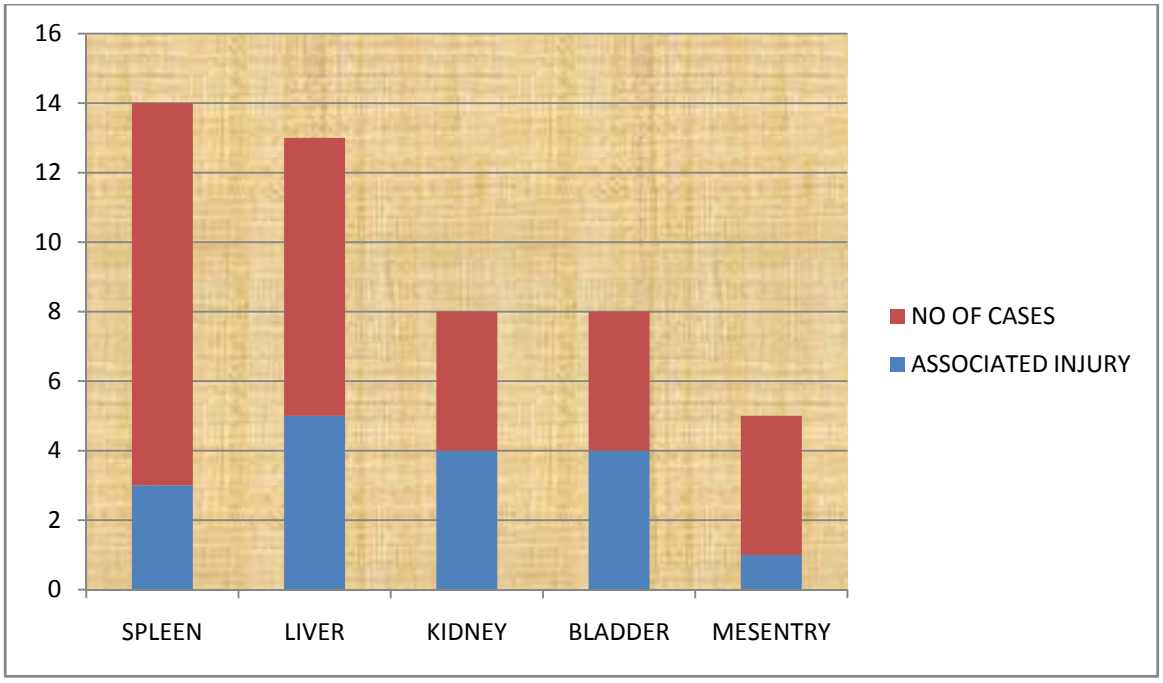
HAEMODYNAMIC STABILITY

Organ Injured	Unstable Cases	Total No Of Cases
Spleen	3	11
Liver	3	8



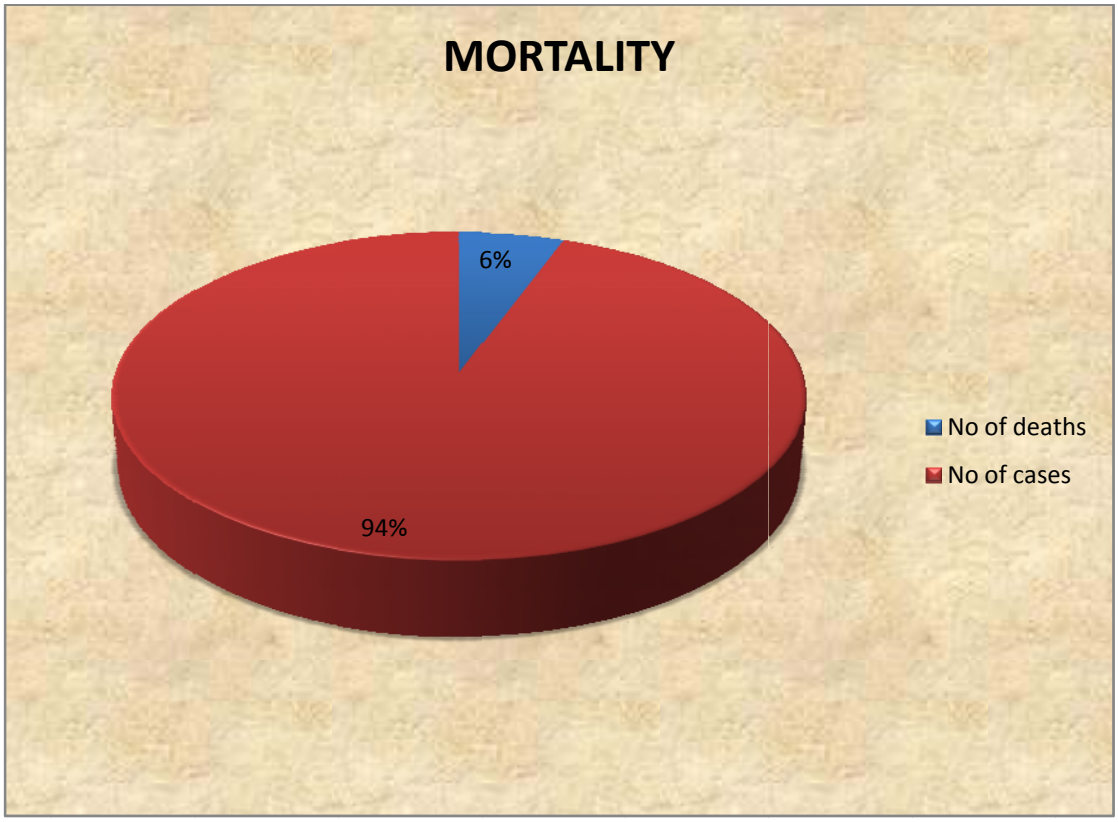
ASSOCIATIED INJURIES

ORGAN INJURED	TYPE OF ASSOCIATED INJURY	NO OF CASES
Spleen	Fracture Of Ribs	3/11
Liver	Fracture Of Ribs	5/8
Kidney	Retro Peritoneal Haematoma	4/4
Bladder	Fracture Suprapubic Rami	4/4
	Retro Peritoneal Haematoma	1/4
Mesentry	Retro Peritoneal Haematoma	1/4



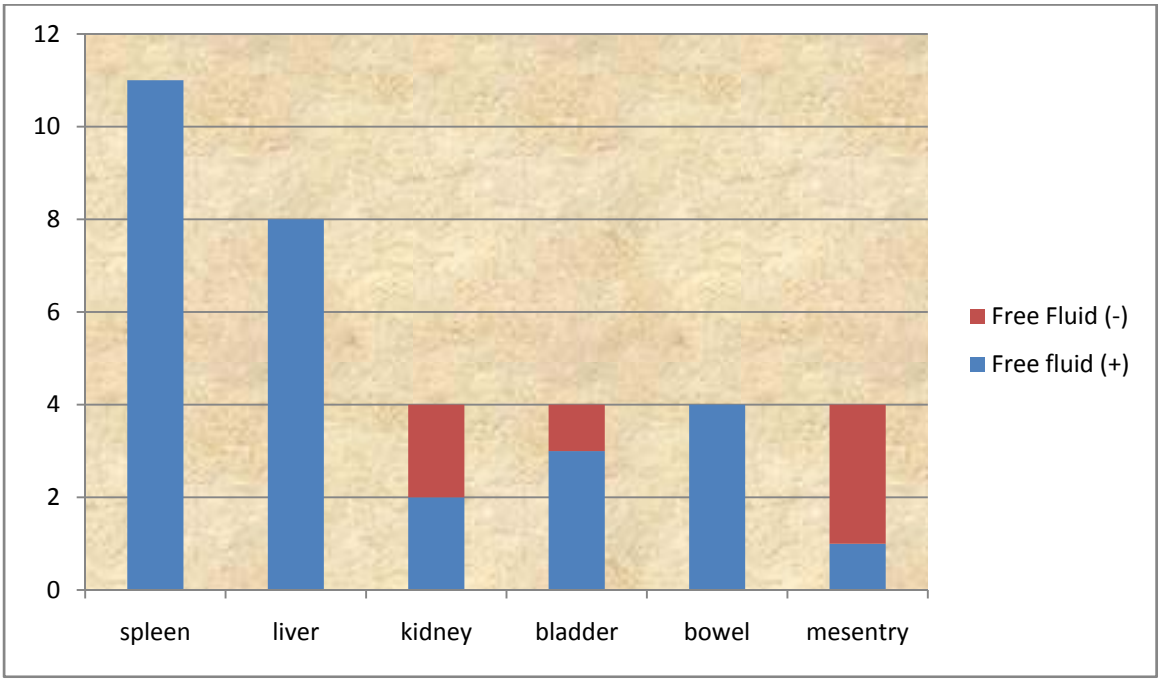
MORTALITY

No Of Death	2
Total No Of Cases	34



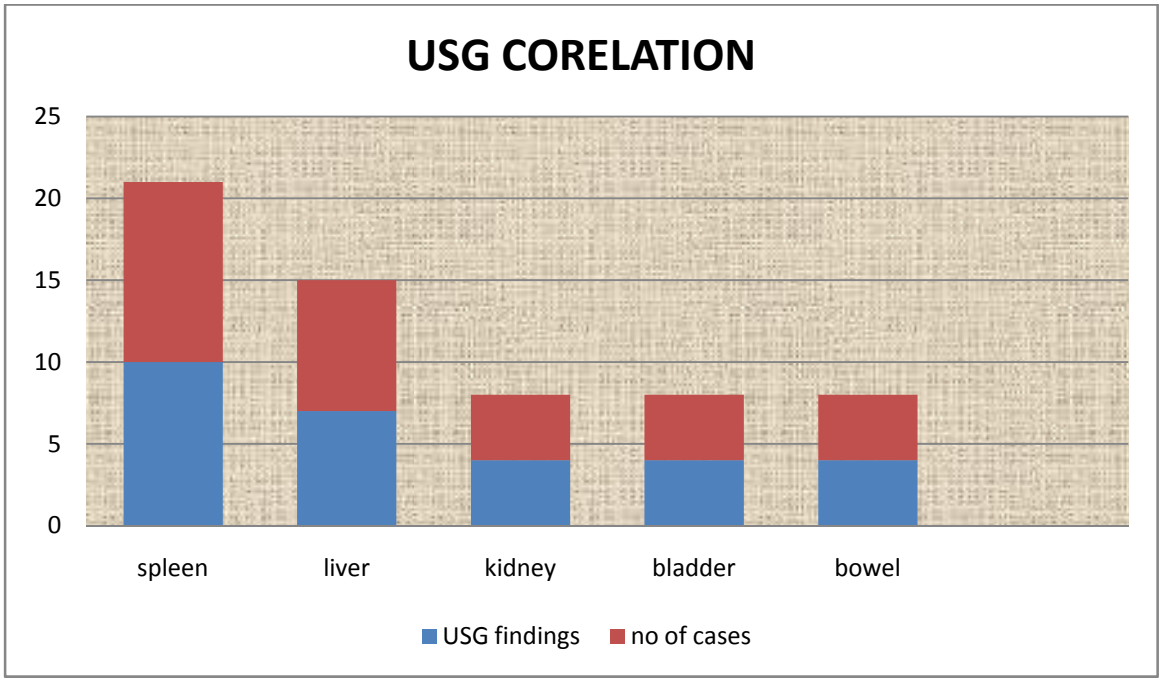
DIAGNOSTIC PARACENTESIS

ORGAN	FREE FLUID (+)	FREE FLUID (-)
Spleen	11	0
Liver	8	0
Kidney	2	2
Bladder	3	1
Bowel	4	0
Mesentry	1	3



USG CORELATION

ORGAN	**USG FINDING**	**NO OF CASES**
Spleen	Laceration	10/11
Liver	Laceration	7/8
Kidney	contusion	4/4
Bladder	Free fluid abdomen	4/4
Bowel	Free fuid abdomen	4/4



DISCUSSION

SPLENIC INJURY:

Spleen is the commonest organ injured following blunt abdominal trauma. In our study 11 cases (32.35%) of cases presented with injury to spleen.The associated injuries included fracture of Left lower ribs in 3 cases .27.27% .

Of the patients presented 3 patients were hemodynamically unstable with B.P systolic below 90 mm of Hg and pulse rate greater than 120\mt .They were resuscitated appropriately and taken up for laparotomy.

The commonest finding in all the patients were tenderness in the left Hypochondrium which was present in nine patients . Most of the patients had contusions or abrasions over the left hypochondrium.

Kehrs sign was present in 4 patients , ballance sign was present in none.Bowel sounds were present in 8 cases .

Abdominal paracentesis was done in all cases and was positive in all cases. X-ray chest and abdomen was taken in all hemodynamically stable patients . It showed fracture ribs 6-9 in two patients and # 9^{th} rib in one patient..

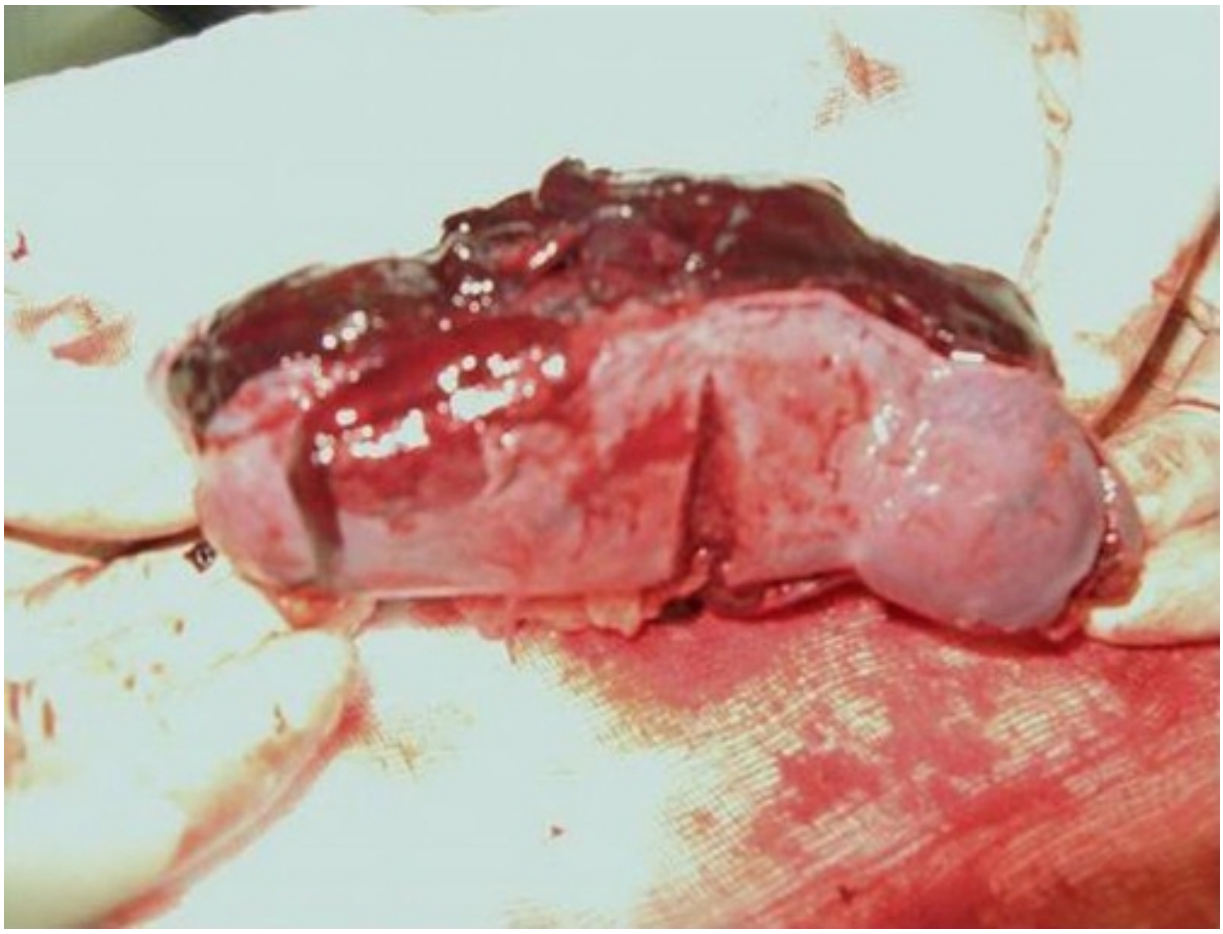
The diagnosis of splenic injury was confirmed by clinical examination, the presence of haemoperitoneum which was confirmed by abdominal paracentesis and ultrasonogram.

At laparotomy all the cases which were operated upon had Grade III injuries in 7 cases Grade IV in 2 cases and Grade V in 1 case .Splenectomy was

done in all cases, appropriate surgical procedures (ICD insertion) was done for cases with hemothorax.

One patient expired pre operatively .He was hemodynamically unstable at the time of admission and his condition was very poor and did not respond to resuscitation.

AN OPERATED CASE OF GRADE IV LACERATION SPLEEN



Liver Injury:

Next to spleen liver is the commonest organ to be injured following blunt abdominal trauma. In our study the incidence of liver injury was 8 cases 23.52% . The association of rib # with liver injury was 5 cases 62.5% .Three patients were hemodynamically unstable .All patients were appropriately resuscitated and were taken for laparotomy.

Tenderness and guarding in Right hypochondrium was present in 7& 4 cases respectively .Bowel sounds were heard in 6 patients . Contusion or abrasions were present over right hypochondrium in all patients.

Abdominal paracentesis was positive in all cases. FAST missed a case of Grade I liver laceration and wrongly attributed a case of renal injury having associated liver laceration.

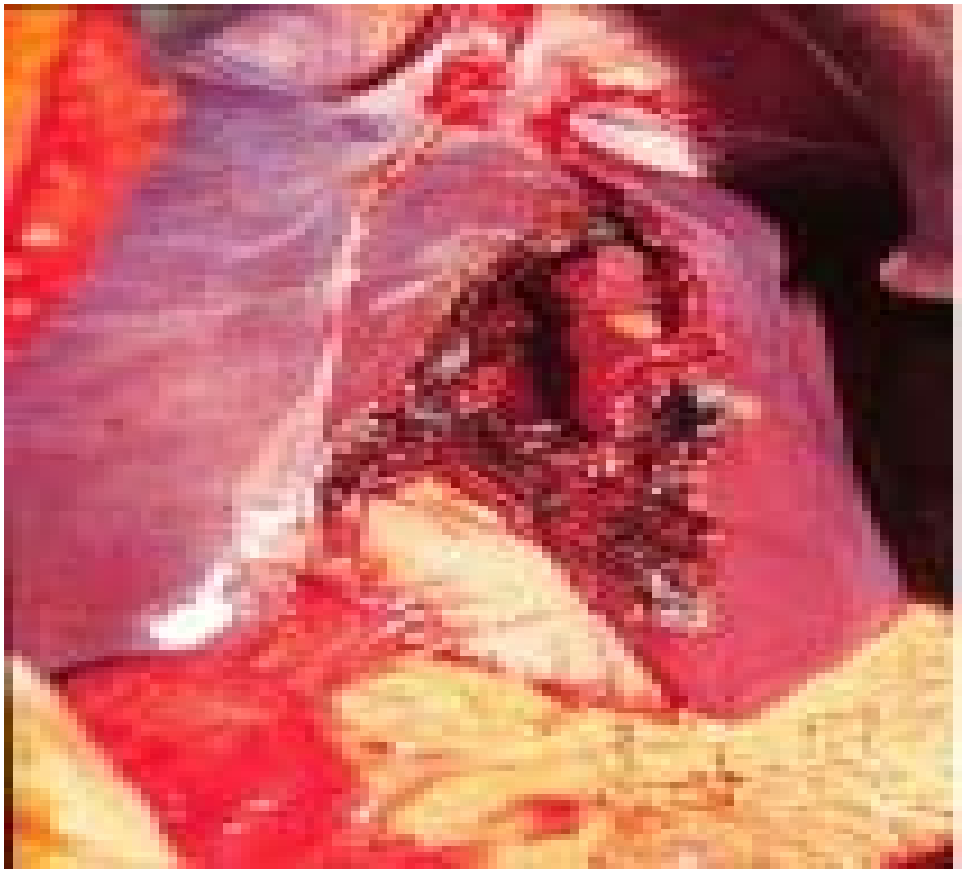
All patients were taken for laparotomy . 3 patients had Grade I injury , 4 patients had Grade II injury , 1 patient had Grade IV injury . Suture packing with gel foam was done in all these 7 patients .

Postoperatively all patients with grade I ,II injuries recovered well , except one case which had prolonged ooze for one week the ooze stopped gradually and he was doing well . Post operative fever was present in 6 patients which settled with antibiotic treatment and drainage.

Another patient with Grade IV injury was treated by Pringle manoevre , resectional debridement of the devitalized portion of the liver by finger fracture

technique. Omental pack was placed over the defect in the liver and the peritoneal cavity was drained. Patient expired Postoperatively due to severity of injuries.

GRADE IV LIVER LACERATION



RENAL INJURIES:

The total no of renal injuries was 4 , right kidney was injured in three cases and the left kidney in one case , All four cases were associated with RPH .

All patients presented with tenderness in flanks.Guarding \ Rigidity was present in one case . Hematuria was present in all cases. Paracentesis was positive in 2 cases. FAST revelaed Contusion of kidney in all cases & presence of free fluid in morrisons pouch in three cases. Hence to rule out any expanding hematoma and associated injuries patients were taken up for laparotomy

At laparotomy all renal injuries were of minor nature being contusion involving the renal cortex . There was non expanding RPH in zone 2 right side for 3 cases and non expanding RPH zone 2 left for one case . Since it was not expanding Retroperitoneum was not opened . There was minor breach of peritoneum with minimal free fluid in the pelvis in all cases.

There was no mortality in our study of four cases and in all cases hematuria settled after 2 weeks and renal parameters were normal.

Bladder Injuries:

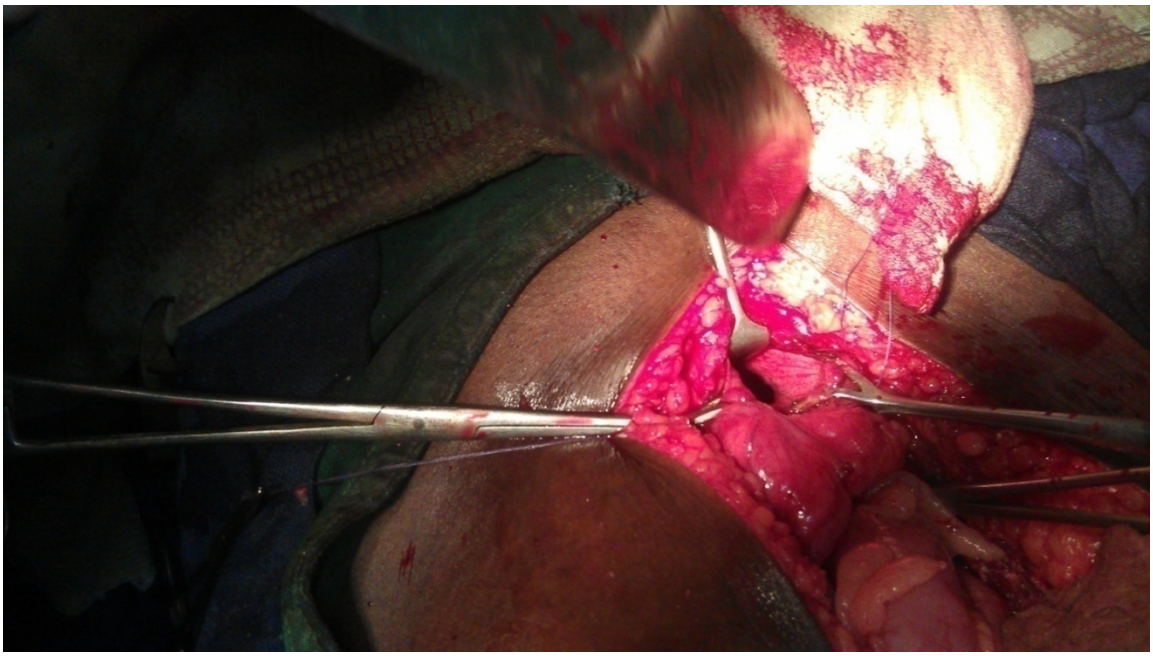
The total no of bladder injury in our study was 4 . All cases were intraperitoneal rupture .These injuries were associated with fracture of superior and inferior pubic rami. Once case was associated to have a Zone 3 Retroperitoneal hematoma .

Clinically patient presented with diffuse abdominal guarding and tenderness in supra pubic region .Hematuria was present in three cases .

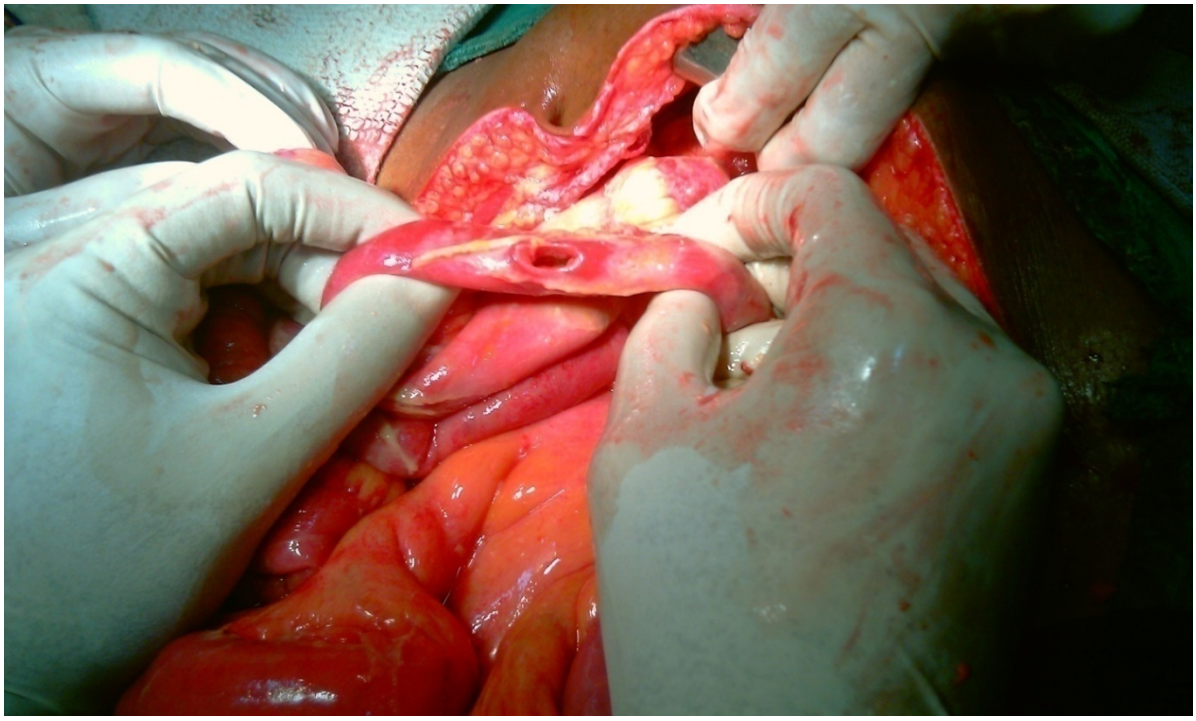
Diagnostic paracentesis was positive for turbid fluid in three cases. USG abdomen revealed presence of free fluid in all cases and presence of clots in the urinary bladder.

At laparotomy the findings included rupture of bladder fundus in a case and posterior aspect of bladder in two cases. In another case there was a small pin hole size laceration in posterior aspect of bladder about 1 cm size with non expanding zone 3 RPH .All cases were repaired using double layered closure and placing SPC via a separate opening ..

BLADDER INJURY - REPAIR



TRAUMATIC ILEAL PERFORATION



Bowel Injuries:

The total no of bowel injuries were 4 11.76% . Of these one case had perforation of jejunum , two cases had perforation of ileum and one was a perforation of duodenum . A case of ileal perforation had an associated # of tibia.

All cases presented with guarding and rigidity at time of admission , tenderness was present diffusely in all patients , bowel sounds were absent in all patients. All patients were hemodynamically stable .Xray showed air under diaphragm in two cases (50%) . USG revealed presence of Free fluid in all cases without any solid organ injury . Paracentesis was done and was positive for free fluid in all cases.

At laparotomy the perforation of duodenum was closed with a live omental patch , the jejunal perforation was closed in two layers with inner vicryl and outer silk . The ileal perforation margins were friable so resection anastamosis was done .

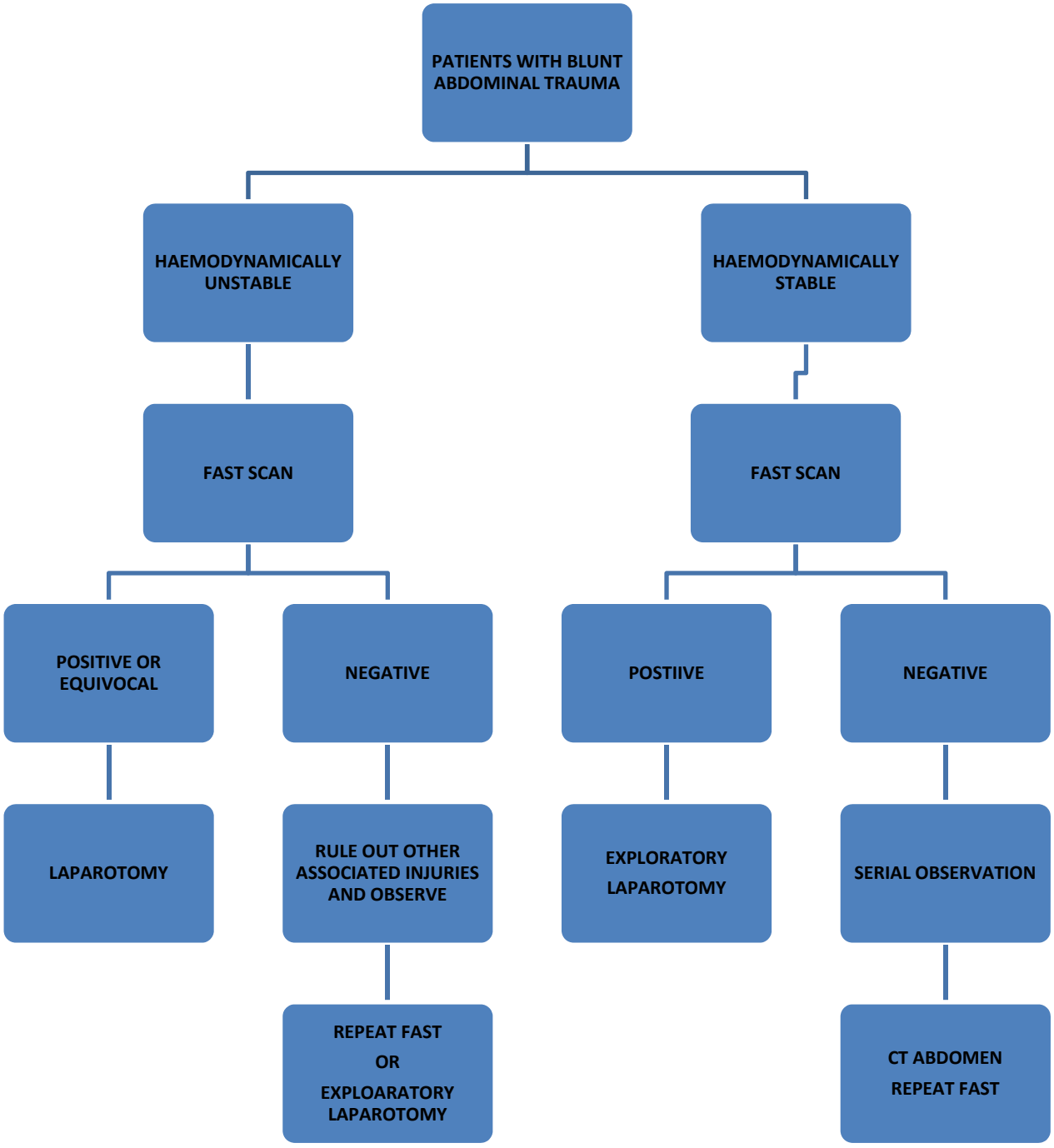
Mesenteric Injury:

The mesenteric injuries were 4 cases in total . Mesenteric contusion in jejunum was present in three cases and ileum was present in one case . The mesenteric contusion in ileum was associated with Retroperitoneal hematoma in zone 3 which was non expanding.

Clinically two patients presented with tenderness over umbilical and iliac regions.Guarding was present in one case . Bowel sounds were present in two cases . Diagnostic paracentesis was positive in one case for presence of blood . USG revealed presence of minimal free fluid in pelvis in all cases .

At laparotomy the contusion of mesentery in jejunum was not associated with any bowel pathology and the the bleeding stopped spontaneously . Hence after securing perfect hemostasis closure with a tube drain was done . The contusion in ileum was associated with segment of gangrene of ileum hence resection anastamosis of ileum was done . The associated Retroperitoneal hematoma in zone 3 was non expanding and hence was left as such .All patients recovered well without complications .

PROTOCOL FOR MANAGEMENT OF BLUNT INJURY ABDOMEN



CONCLUSION

1) The most commonly injured organ is spleen in blunt abdominal trauma which is similar to other studies
2) RTA accounted for majority of cases of blunt injury abdomen which is around 64.70%
3) Similar to many large series males are more often affected in blunt abdominal injuries than females and middle aged persons are more often affected than extremes of age
4) Commonest associated injuries occurred in our study was chest injury in eight cases
5) FAST is rapid cheap noninvasive procedure used for screening in the emergency ward itself while the patient is resuscitated.
6) Biochemical investigations are not of much help. The investigations only complimentary to clinical diagnosis.
7) In the unstable trauma patient, a positive FAST eliminates the need for further tests and indicates the necessity for abdominal exploration the emergency ward itself while the patient is resuscitated.
8) Diagnostic paracentesis is a rapid , bedside tool for diagnosis immediately at the bedside arrival of the patient.
9) Thorough initial clinical evaluation, repeated clinical examinations monitoring vital signs are essential in minimizing the chance of missing life threatening intra abdominal injuries.
10) The mortality in this study is related to severity of injuries . Severe the grading of injury more is the mortality.

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PROFORMA

Name

Age

Sex

Occupation

Address

IP No.

Date of Discharge

First Aid Given: Yes/ no

Level of consciousness on admission

Intoxicated

Mode of Injury

Primary management in peripheral hospital

Whether passed urine /faeces after injury

Vital parameters on admission changes if any

Pulse

B.P

Respiration Rate

Temperature

Bowel Sound

Abdominal Girth

General Look: Normal / Pale /Cyanosed

Pain

Site

Type

On Coughing

Increasing / Decreasing

- Shoulder Tip Pain: +/ -
- Vomiting: +/-
- Gaurding: +/-
- Rigidity: +/-

Tenderness:

- Site
- Rebound

Type of abdominal injury

- Abrasion / Laceration / ecchymosis / Bruises
- Others

Other system injury

Associated bony injury

- Lower ribs
- Pelvis
- Spine
- Long bones

Perineal heamatomas

PR

NG Aspirations

Bladder catheterization

Details of blood transfusion

DPA: +/-

Blood

- TC
- Hb
- Grouping & Typing

Plain X ray Abdomen

Chest

FAST

CT abdomen

Expected line of management

Purely conservative

Needs observation & delayed surgery if needed

Laprotomy details

Diaphragm	Rectum
Liver	Bladder
Spleen	Urethra
Stomach	Uterus
Small bowel	Mesentry
Colon Pancreas	
Omentum	Retro peritoneum

Condition on discharge

MASTER CHART

Sl. No	NAME	AGE\SEX	MODE	FAST	LAPAROTOMY	PROCEDURE DONE
1	Muttiah	45\M	RTA	Free Fluid	Mesentry contusion	Drainage
2	Arivudai Dass	22\M	Bull Gore	Free Fluid	Jejunal perforation	Closure
3	Vel	33\m	RTA	Spleen injury	laceration spleen	Splenectomy
4	Namachivayam	17\M	RTA	Liver injury	Laceration liver	Gel foam packing
5	Seenivasan	47\M	RTA	Free Fluid	ileal perforation	Resect anastamose
6	Chinnathai	45\F	Bull Gore	Free Fluid	ileal perforation	Closure
7	Arulappan	36\M	RTA	Spleen injury	laceration spleen	Splenectomy
8	Pitchaipandy	20\M	RTA	Free Fluid	Duo perforation	Closure
9	Selva Sekaran	32\M	ACC Fall	Liver injury	Laceration liver	Gel foam packing
10	karthick	22\M	RTA	Spleen injury	laceration spleen	Splenectomy
11	Imayavaramban	32\M	RTA	Spleen injury	laceration spleen	Splenectomy
12	Babu	25\M	RTA	Free Fluid	Bladder injury	Closure with SPC
13	Gopalakrishnan	28\M	ACC Fall	Free Fluid	Mesentry contusion	Drainage
14	Arumugam	39\M	ACC Fall	Free Fluid	Liver laceration	Gel foam packing
15	Sukumaran	34\M	RTA	Spleen injury	laceration spleen	Splenectomy
16	Thangamuneeswaran	28\M	Bull Gore	Free Fluid	Bladder injury	Closure with SPC
17	kumar	14\M	RTA	Free Fluid	Spleen laceration	Splenectomy
18	Soosairaj	15\M	RTA	Free Fluid	Bladder injury	Closure with SPC
19	Jesuraj	28\M	RTA	Liver injury	Laceration liver	Gel foam packing
20	Rathina Velayutham	27\M	RTA	Spleen injury	laceration spleen	Splenectomy
21	Vinayakam	35\M	RTA	Liver injury	Laceration liver	Gel foam packing
22	Vettum perumal	37\M	ACC Fall	Free Fluid	Spleen laceration	Splenectomy
23	Balamurugan	23\M	ACC Fall	Liver injury	Laceration liver	Gel foam packing
24	Hariram	20\M	Bull Gore	Liver injury	laceration liver	Gel foam packing
25	Selvaraj	40\M	RTA	Free Fluid	Bladder injury	Closure with SPC
26	Subbaiyah	60\M	RTA	Free Fluid	Kidney	Drainage
27	Kanthappan	40\M	RTA	Free Fluid	Mesentry contusion	Drainage
28	Kulalamani	55\F	Bull Gore	Free Fluid	Kidney	Drainage
29	Irulappan	39\M	ACC Fall	Spleen injury	Spleen laceration	Splenectomy
30	Manikandan	41\M	Bull Gore	Free Fluid	Kidney	Drainage
31	Senthil	35\M	RTA	Spleen injury	Spleen laceration	Splenectomy
32	Sakthi	26\M	RTA	Spleen injury	spleen laceration	Splenectomy
33	Muthuraj	14\M	RTA	Free Fluid	Kidney	Drainage
34	Shakthi	28\M	RTA	Liver injury	Laceration liver	Hepatorraphy