“INCIDENCE OF HOLLOW VISCUS INJURY IN BLUNT INJURY ABDOMEN”

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BRANCH – I

GENERAL SURGERY

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THE TAMIL NADU DR. M.G.R.MEDICAL UNIVERSITY

CHENNAI

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CERTIFICATE

This is to certify that this dissertation on "**INCIDENCE OF HOLLOW VISCUS INJURY IN BLUNT INJURY ABDOMEN"** is a bonafide work done by **Dr.L.LALITH KUMAR** Post graduate student (2018 - 2020) in the **Department of General Surgery, Government Stanley Medical College & Hospital, Chennai** under my direct guidance and supervision, in partial fulfilment of the regulations of the The Tamilnadu Dr.M.G.R. Medical University, Chennai for the award of **M.S., Degree (**General Surgery) Branch-I, examination to be held in May 2020.

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DECLARATION

I, **Dr.L.LALITH KUMAR**, solemnly declare that this dissertation titled "**INCIDENCE OF HOLLOW VISCUS INJURY IN BLUNT INJURY ABDOMEN",** is a bonafide work done by me, in the Department of General Surgery , Government Stanley Medical College & Hospital-Chennai, under the guidance and supervision of my unit chief PROF. Dr.C.BALAMURUGAN M.S.,

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Dr. L. LALITH KUMAR

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LIST OF ABBREVIATIONS

ARDS - Acute respiratory distress syndrome

CBD - Common bile duct

CHD - Common hepatic duct

CPR - Cardiopulmonary resuscitation

CT - Computed tomography

CUSA - Cavitron ultrasonic surgical aspirator

CVP - Central venous pressure

DPL - Diagnostic peritoneal lavage

ERCP - Endoscopic retrograde cholangiopancreatography

GCS - Glasgow coma scale

ICS - Intercostal space

ICU - Intensive care unit

IVC - Inferior venacava

KUB - Kidney, ureter, bladder x ray film

MRI - Magnetic resonance imaging

PCN - Percutaneous nephrostomy

USG – Ultrasonography

ABSTRACT

BACKGROUND AND OBJECTIVES

To study the incidence of hollow viscus injury in blunt injury abdomen, various modes of presentation , need for early diagnosis, common site of injury and evaluate various modalities of treatment and common complications.

Blunt injury abdomen is caused mainly by road traffic accidents. They are usually not obvious. Hence u need strong suspicion to look for hollow viscus injury, late diagnosis may lead to fatal outcome. This dissertation choosen due to Rapid of increasing number of vehicles and consequently road traffic accidents,

METHODOLOGY

Patients coming with blunt injury abdomen due to RTA or TTA or Fall from height or Fall of heavy object to Department of General

surgery in STANLEY MEDICAL COLLEGE AND HOSPITAL between 2018 to 2019 are taken up for study.

RESULTS

Males are mostly affected. It is commonly seen in the age group of 21-40 years. Road traffic accident forms the most common mode of injury. Commonly injured viscera in this present study is small bowel and they were treated by primary closure. Mesenteric injury is the second most common injury and were managed by simple repair.

INTERPRETATION AND CONCLUSION

Repeated clinical examination and apporapite imaging with multidisciplinary teamwork plays an important role in diagnosing the hollow viscous injury in blunt injury abdomen. CECT abdomen is the sensitive investigation to diagnose the injury. Early diagnosis and management reduces morbidity and mortality. Surgery remains the main stay of treatment.

KEY WORDS: Hollow viscous injury , blunt injury abdomen

CONTENTS

INTRODUCTION

Blunt injury abdomen is most commonly causes due to road traffic accidents. The rapid increase in automobiles and lack of road safety has caused rapid increase in road traffic accident, blunt injury abdomen . Road traffic accidents account for 75 to 80 % of blunt injury abdomen. fall from height, assault with blunt objects, sport injuries, industrial mishaps, bomb blast also results in blunt injuy abdomen.

Hollow viscus injury in blunt injury abdomen is usually not obvious. Hence often missed, unless repeatedly looked for. Early diagnosis significantly reduces morbidity and mortality. The morbidity and mortality significantly increases due to late presentation and delay in diagnosis .

In view of large number of motor vehicles, consequent road traffic accidents, this dissertation has been chosen to study the incidence of hollow viscus injury in blunt injury abdomen its modes of presentation and modalities of management to the patients presenting at Stanley medical college and hospital ,Chennai-1

AIM AND OBJECTIVES OF THE STUDY

1. To study the incidence of hollow viscus injury in blunt injury abdomen.
2. To study the most common site of hollow viscus injury .
3. To compare morbidity and mortality between early and late presentation and management.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

HISTORICAL ASPECTS:

Hippocrates and Galen are said to have given correct description for blunt injury abdomen.

By 1500 BC in Babylonia under the rule of Hammurabi distinct triage and surgical protocol was developed.

In 1580 reference of traumatic herniation of stomach through diaphragm made by ambriospare.

Nollesan did first repair of gastric injury in the 18^{th} century

For assassination the ancient Chinese used a sharp blow on the region of the spleen .

Fracture of body of pancreas in blunt trauma was Presented by trausee in 1827

Artery thrombosis occurring as a result of blunt trauma was described by von reckiling hausen.

Before 1900, 100% mortality reported from colonic injuries and bladder injury.

Peritoneal lavage was first performed by Solomon in 1906

Plancashlillin first described Tran section of stomach resulting from blunt trauma . Barily reported 32 cases of rupture of spleen during the period 1894-1924 was reported by barily .

In 1934 Aenhium used puncture of abdominal wall was used as diagnostic procedure in abdominal injuries by Aenhium. In 1938 Branch did resection of left lobe for 2 cases of liver laceration .

Voorhees first used synthetic grafts in 1952 and widely used by Hughes (1954) and Spencer (1955).

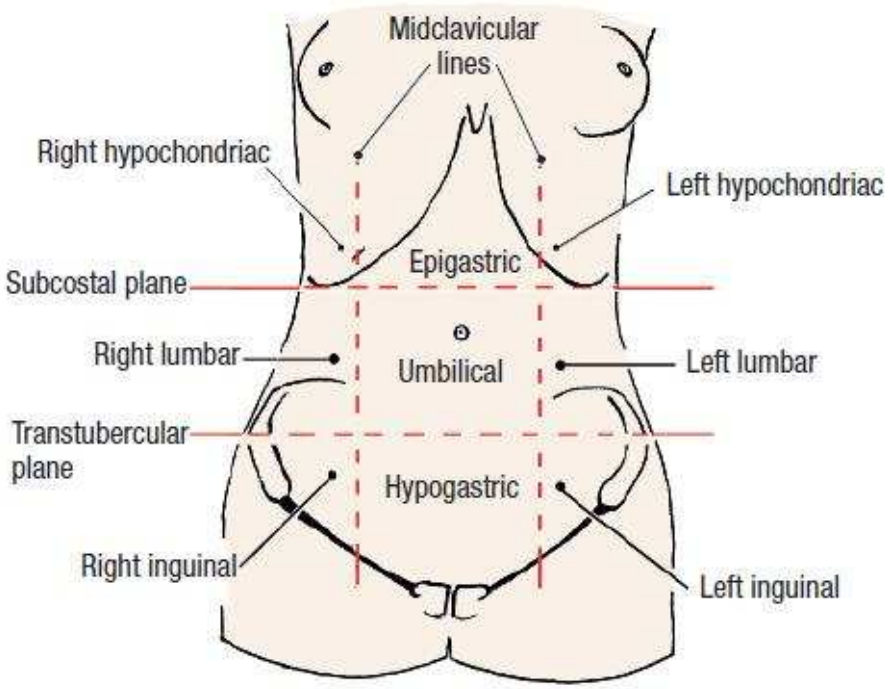
The development of emergency medical service is an landmark achievement in the history of trauma. Physicians were required by greeks to be present during the battle and hospitals established close to the battlefield by Romans. Ambulance system was first Instituted by Cincinnati general hospital in 1865.

Early detection of abdominal injuries made possible through advanced imaging studies like spiral CT scan and MRI .

ANATOMY OF ABDOMINAL CAVITY

ANATOMY OF ABDOMINAL CAVITY:

Abdominal cavity is a large body cavity in humans. It is located below the thoracic cavity and above the pelvic cavity. Roof is the thoracic diaphragm, floor is the pelvic inlet, opening into pelvis. It has some solid organs and hollow viscus. The abdominal cavity is anteriorly bounded by the rectus abdominis, vertebral columns posteriorly. External oblique, internal oblique and transverse abdominis laterally and the iliac muscles inferiorly.



NINE REGIONS

It is divided into nine regions by two horizontal and two vertical orbitrary lines. Transpyloric or addisons plane, is an imaginary horizontal plane located between upper border of symphysis pubis at the level of first lumbar vertebrae and suprasternal notch of the manubrium. Transtubercular lines is horizontal plane that passes through the iliac tubercles. The two vertical lines are downwards from midclavicle. The resulting quadrants are middle epigastrium , right and left hypochondrium, middle umbilical, right and left lumbar, middle hypo gastric, right and left iliac region.

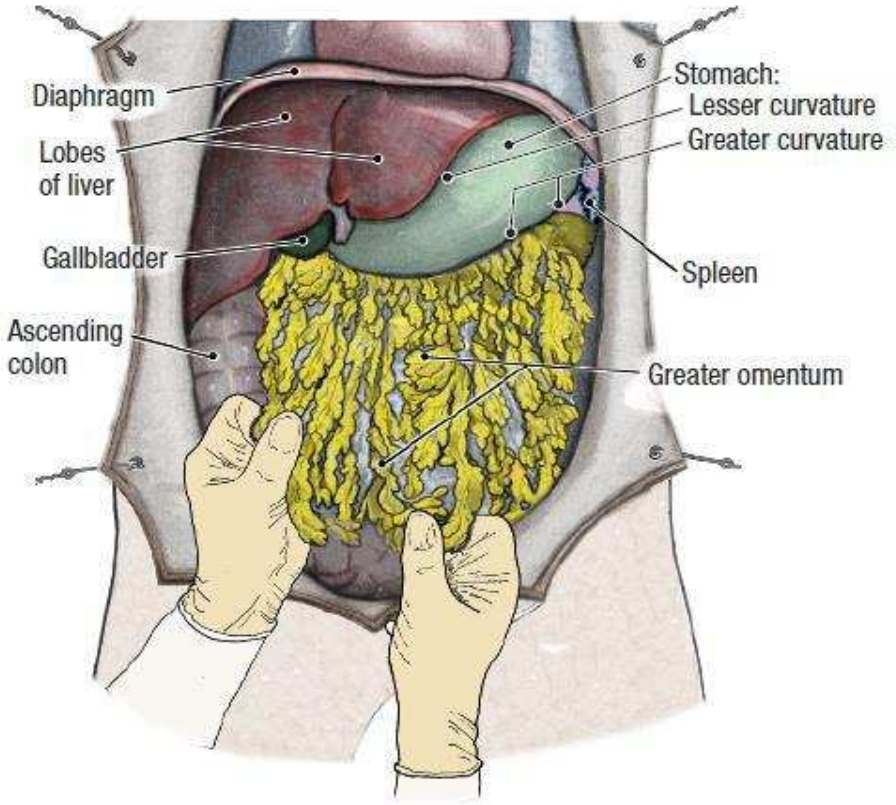
Peritoneal cavity:

The peritoneal cavity is a potential space between the parietal peritoneum and visceral peritoneum covering the abdominal organs. The peritoneal cavity is a largest serous sac, and the largest fluid filled cavity. The retroperitoneal space is behind the peritoneum of the posterior abdominal wall.

Gastrointestinal tract:

Stomach:

The stomach is a hollow muscular organ located on the left side of the upper abdomen, the overlying rib cage gives protection to the stomach from injury. Stomach lies between oesophagus and first part of duodenum. The anterior surface related to left lobe of liver, anterior abdominal wall and transverse colon.



PERITONEAL CAVITY

Stomach posterior surface is related to the structures such as the left hemidiaphragm, left kidney, adrenal , pancreas and the spleen forming the bed.

The greater curvature of stomach is supplied right gastro epiploic inferiorly and left gastro epiploic artery superiorly. The fundus stomach is supplied by short gastric artery,which arises from the splenic artery. The left gastric vein drains into portal vein ,The gastric and gastro omental veins drain into portal vein .

Duodenum: It's the shortest,widest and most fixed part of small intestine, it extends between pylorus and duodenaljejunalflexure. It is curved around the pancreas in the form of letter C. It is deep anatomic location, retroperitoneal fixation, and makes it unique.

The duodenum develops partly from foregut and partly from midgut. The opening of the bile duct into second part of the duodenum represents the junction of the foregut and midgut . Up to the level of opening, the duodenum is supplied by superior pancreaticoduodenal artery and below it by inferior pancreaticoduodenal artery. coeliac and superior mesenteric vessel supply the duodenum and it is shared with the head of the pancreas; this makes magenement difficult in both pancreatic and duodenal injuries. Duodenum divided into four parts. The first part of the duodenum begins at the pylorus, and passes backwards, upwards and to meet the second part at superior duodenal flexure. The proximal part is movable,and distal part is fixed and retro peritoneal. Distal part is covered with peritoneum only. Second part begins at superior duodenal flexure passess downwards and curves towards left at inferior duodenal flexure. It is retro peritoneal and fixed.Third part of duodenum begins at inferior duodenal flexure passes almost horizontally ends up joining fourth part in front of abdominal aorta, its fixed and retroperitoneal. Fourth part is mostly retroperitoneal and covered with peritoneum only anteriorly. By kocher maneuver second and third portions of the duodenum may be mobilized easily through this bloodless fusion plane. Trietz ligament is a fibro muscular band arises from the left crus diaphragm supports the duodeno-jejunal flexure.

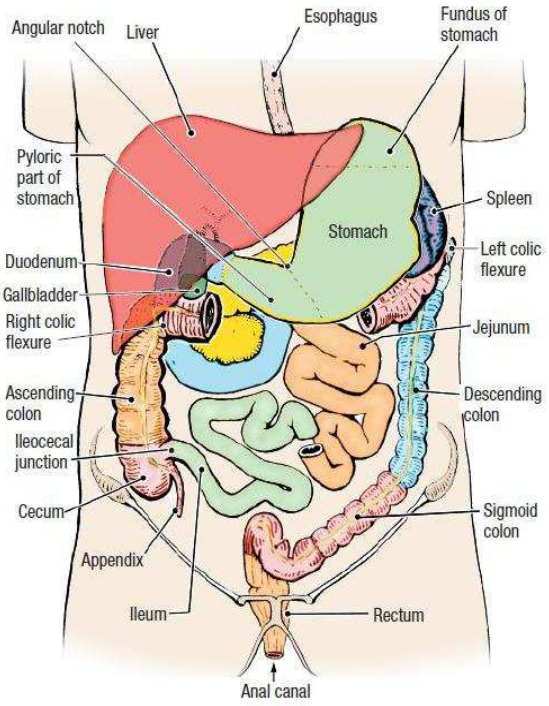
Small intestine:

The small bowel extends from pylorus to ileocaecal junction measures about 6

metres. It is freely moveable on its mesentery. The upper fixed part is

duodenum and lower mobile part forming very long convulated tube. The upper part mobile small intestine is jejunum, and ileum is lower part . The arterial supply to the jejunum and ileum is derived from jejunal and ileal branch of superior mesenteric artery

The nerve supply of the small intestine is sympathetic T9 to T11 as well as parasympathetic both of which pass through the coeliac and superior mesenteric plexuses.



Large intestine:

The large intestine extends from ileocaecal junction to anus. About 1.5 meters in long. It is divided into caecum, ascending colon, right colic flexure, transverse colon, left colic flexure, descending colon, sigmoid colon, rectum and anal canal. In the angle between the caecum and terminal part of the ileum there is a narrow diverticulum called vermiform appendix. The large intestine is wider in caliber than the small intestine. The greater part of large intestine is fixed except for appendix, the transvere colon and sigmoid colon. Blood supply to Colon is derived from the marginal artery of Drummond, it is formed by colic branches of superior and inferior mesenteric arteries.

Gall bladder:

Gall bladder is pyriform in shape situated in the inferior surface of the right lobe of the liver, acts as a bile reservoir . The gall bladder fossa extends from the porta hepatis to the inferior border of liver. The fundus of the gall bladder is covered by the peritoneum and protrudes beyond the liver. At the 9^{th} costal cartilage it will contact with anterior abdominal wall. The gall bladder is divided into three parts: Fundus, Body. Neck. The cystic duct begins at neck of gall bladder runs downwards, backwards and left,and ends by joining the common hepatic duct to form bile duct. Gall bladder supplied by cystic artery a branch of right hepatic artery.

Bladder:

Urinary bladder is a temporary store house of urine which gets emptied through the urethra. It is lined by transitional epithelium. It occupies anterior part of the pelvic cavity. Empty bladder lies within the pelvis, full extends

upwards into the abdominal cavity reaching upto the umbilicus or even higher. Empty bladder is tetrahedral in shape, empty bladder has apex directed forwards, a base directed downwards and a neck most fixed part of the bladder. It has three surfaces and four borders. As the bladder fills, apex directed upwards towards the umbilicus, neck directed downwards,two surfaces anterior and posterior. The arterial supply of bladder comes from branches of anterior trunk of internal iliac artery(superior and inferior vesical artery).

PATHOPHYSIOLOGY

PATHOPHYSIOLOGY:

Management of a patient with blunt abdominal trauma needs proper understanding on mechanism of injury ; injuries can be classified as low energy or high energy.

1. Blunt injury abdomen causes damage from a combination of shearing, compression and bursting forces. Outward forces cause Increase in intra abdominal pressure which will lead to injury of solid organs or rupture of hollow viscus.

2. Applied force causing the Compression of abdominal viscera between the abdominal wall and the vertebral column can produce a crush injury.

3. Closed abdominal injuries are caused by blunt injury abdomen occurs in fall, traffic accidents, assault.

4. Apparently trivial injury may rupture abdominal viscera,in order of liver, spleen, kidney, intestine, abdominal wall, mesentry, pancreas, diaphragm. Injury to the stomach is caused by localized blunt force applied to the epigastric or left upper quadrant.

5. Deceleration injuries occur in high speed vehicular accidents and falls from height. The organs continue to move forward ,on impact at terminal velocity, will lead to tearing of organs at sites of their attachment.

CLINICAL EXAMINATION

History and physical examination:

When a patient presents to casualty with history of road traffic accident, fall , assault with suspicion of blunt injury abdomen should be resuscitated with intravenous fluids, colloids and blood products after securing the airway. Immediate life threatening conditions such as pneumothorax should be looked for. After the resuscitation, a brief but detailed history must be recorded from the patient and relatives/ paramedics/ police/bystanders. Exact mode of injury will significantly help in diagnosis.

Blunt injury abdomen is most commonly caused in road traffic accident. Position of the victim and mechanism of injury during impact will be helpful to in diagnosing the intra abdominal injuries. Whether it was two wheeler versus two wheeler, four wheeler versus two wheeler, vehicle versus pedestrian., position of the victim, (driving or rear seat passenger) should be enquired.

Level of consciousness at the time of accident, and history of consumption of alcohol prior to the accident . Last food intake . History of seizures, ENT bleeding, vomiting should be enquired to rule out head injury. If the patient is conscious past medical history and allergic to drugs should be noted.

Systemic examination:

Early diagnosis and management is important factor for the survival and functional outcome in blunt trauma of abdomen. Associated head injury, chest injury will have significant impact over the survival and outcome of the patient.

In blunt injury abdomen patient systematic examination starts from assessing the consciousness level to associated injuries such as head injury, chest injury and extremity injury . The severity of head injury should be rapidly assessed by assessing the consciousness level, pupillary reflux,weakness of extremities

Level of consciousness is best assessed by GCS score (Glasgow Coma Scale)is best for assessing the consciousness level. It evaluate through eye opening, best motor response and verbal response. Look for ENT bleeding and should be managed accordingly. Racoon eyes indicates skull fracture. Basilar skull fracture is indicated by blood at internal auditory meatus.

Phthalmic examination should be done for all trauma cases. Ear Nose and throat examination should be done . Should check for cardiac tamponade, cardiac contusion. Tenderness on the cervical spine should be looked for fracture.

Chest: The patient should be naked. Careful examination of the thorax should be done to identify any asymmetry movements of hemithorax . Communicating wounds with the peritoneal cavity should be identified. chest compression test should be done to identify fracture of ribs.

Respiratory system and cardiovascular system should be auscultated to identify any abnormality in breath sounds and heart sounds

Abdominal injury site will have a Tenderness it should be elicited. peritoneal irritation can be identified by examining rebound tenderness. Generalized distension of the abdomen is a late feature of generalized peritonitis.

Pelvic compression should be done to identify the pelvic fracture, it will idea for thinking about bladder injury. On per rectal high riding or non-palpable prostate indicates injury to postmembranous urethra, presence of blood should be examined.

External genitalia and testis should be examined carefully.

Percussion: shifting dullness should be elicited for identifying free fluid in peritoneal cavity.

Auscultation: In diaphragmatic rupture bowel sounds will be heard in the chest. Absent bowel sound may be pathagnomonic feature of diffuse peritonitis.

Pelvis: External genitalia and scrotum should be thoroughly examined. Per rectal examination for presence of blood and high riding prostate.

Vascular system: Major arteries should be examined for bleeding and hematoma due to disruption. Palpation of Distal pulses should be done. Spleen is most common solid organ and most common abdominal organ to get injuried . In hollow viscus small bowel and mesentry is most commonly injuried. Frequency of with abdominal organs injury in a blunt abdominal trauma, according to international series.

Organ	Relative incidence (%)
Spleen	45
Liver	34
Mesentery	11
Renal	08
Pancreas	09
Small bowel	09
Colon	08
Duodenum	04
Vascular	04
Stomach	03

CARE OF THE VICTIM AT THE ACCIDENT SITE:

Aim: Resuscitation and emergency transportation to trauma handling center as quickly as possible. Paramedical staff accompanying the ambulance unit should be well trained to resuscitate and shift the patient to regionalized trauma center as quickly as possible. Morbidity and Mortality can be significantly reduced by early diagnosis and management.

The following measures should be done at the site of accident to stabilize the patient. First Goal would be to prevent second accident.

1. Exsanguinating external hemorrhage
2. Ensure airway with cervical spine control.
3. Breathing and ventilation
4. Circulation and hemorrhage
5. Disability and exposure

INITIAL RESUSCITATION OF PATIENTS AT HOSPITAL:

Blunt abdominal patient may have polytrauma.

Hence goals of management in the order of priority.

1. Life saving measures

2. Limb saving measures.

3. Disability minimizing measures

Patient suffered from abdominal injury can be generally classified into following categories based on their physiological condition after initial resuscitaion.

1. **Hemodynamically normal-** investigations can be completed before treatment is planned

2. **Hemodynamically stable -** investigation should be more limited. It is aimed at establishing whether the patient can be managed non operatively ,whether angio embolization can be used,whether surgery is required

3.Hemodynamically unstable- investigations need to be suspended as immediate surgical correction of the bleeding is required.

Adequate airway

All trauma patients should have their cervical spine immobilized and protected throughout. An immediate assessment of the patient airway is made**.** A compromised airway requires a stepwise progression, first clearing the airway by suctioning secretions or blood, followed by simple airway manoeuvres such as jaw thrust, chin lift and insertion of an oropharyngeal or nasopharyngeal airway. Advanced airway manoeuvres includes insertion of cuffed endotracheal tubes.This require rapid sequence intubation by anaesthetic team. Emergency intubation of severely injuried trauma patient is extremely difficult and demanding skill.

Breathing:

This implies normal respiration and pulmonary circulation. Normal breathing will in disrupted in chest wall injury, pneumothoarx, hemothorax, flail chest, tracheobronchial injuries . Patient should receive high flow oxygen at a rate of 6-8 liters of oxygen/ min by mask or nasal catheter.

Hemothorax and pneumothorax should be drained by intercostal drainage through underwatersealed bag.

Circulation:

Generalized hypoperfusion is fatal if persistent. It may result from hypovolemic, cardiogenic and neurogenic shock. All patient should receive two large bore intravenous cannula. Blood should be taken for cross matching.

Initial aim of resuscitation is to maintain the blood supply to the vital organs, the brain ,heart and kidneys. For brief period this can achieved with target systolic blood pressure of more than 90 mmHg.

The main source hemorrhage should be identified and controlled as soon as possible. Severely injured hypovolemic patient should be resuscitated with blood and blood products. The major site of hemorrhage in trauma patients are chest, abdomen, pelvis, and long bones.

The so called whole body CT remains the gold standard investigation in multiple injury patient. There is norole in selective imaging of severely injured person. Some patients will be haemodynamically unstable on arrival that they need immediate surgical control before CT scan. A FAST scan may be helpful in the scenario to locate the bleeding but that should not delay in shifting operation theatre.

All patients undergoing immediate laparotomy should have pelvic binder. A correctly placed pelvic binder will not interfere in trauma laparotomy. Response to therapy should be monitored by monitoring the CVP and urine output

Complete examination:

After having treating life threatening injuries, patient should be re-examined for diagnosing other injuries. The patient must be adequately exposed to allow a thorough and systematic clinical examination during the secondary survey but they must be kept warm. Trauma patients are frequently hypothermic and this will further increase coagulopathy. Log rolling patients with severe pelvic fractures may harm the patient by disturbing established clot. Log rolling should not occur until pelvic fracture is excluded radiographically .

DIAGNOSTIC METHODS

Diagnostic methods in blunt abdominal injury.

1. Four quadrant tapping
2. Focused abdominal ultrasound
3. X-ray chest and abdomen.
4. Abdomen USG.
5. CT abdomen.
6. Angiographic imaging.
7. Radionuclide studies.
8. Diagnostic Laparoscopy.

1. **Four quadrant abdominal tap:**

Under aseptic precautions aspiration done by using a large bore needle (18G) in right and left hypochondrium and right and left iliac fossa. Accuracy for 4 quadrant ia about 80%. Aspiration of single drop of blood that does not clot is diagnostic of hemoperitoneum. But a negative tap does not rule out hemoperitoneum.

2. Fast

Focused abdominal ultrasound is a technique whereby ultrasound imaging is used to assess the torso for the presence of free fluid ,either in the abdominal cavity and is extended into the thoracic cavity and pericardium. As quality portable ultrasound machines have been helpful in early diagnosis of blunt injury abdomen. eFAST is usually a rapid, reproducible, portable and non invasive bedside test and can be performed at the same time as resuscitation.

UTILISATION OF FAST

- FAST sensitivity of 85% for detection of any intraabdominal injury.
- detects free fluid in the abdomen or pericardium.
- Will not reliably detect less than 100ml of free blood
- FAST in the hypotensive patient is an effective screening tool, does not directly identify the injury to hollow viscus.

Advantages:

- No radiation, no contrast.
- Widely available

Disadvantage:

It is unreliable for assessment of retroperitoneum. Cannot realiable in excluding injury in penetrating trauma. Studies have shown usg abdomen inferior to DPL in assessing blunt injury abdomen.

Conclusion:

USG abdomen can be used as adjuvant to DPL in the diagnosis of blunt injury of abdomen.

3. <u>Plain radiography and contrast studies:</u>

Radiological evaluation in blunt injury abdomen ,compared to other investigations found to be limited but chest radiograph may help in diagnosing abdominal injury like ruptured hemidiaphragm or pneumoperitoneum.

Pelvic x ray and chest x ray will help in demonstrating fractures of thoracolumbar spine. Presence of transverse fracture of vertebra indicates high suspicion of hollow viscus injury in blunt abdominal trauma.

Presence of air in peritoneum and retroperitoneum will indicate perforation in the duodenum or hollow viscus. presence rib fracture, pelvic fracture, spinous process fracture should be looked for.

Spleen structural outline should be looked for, about 800ml of fluid needed to identify intraperitoneal collection in blunt injury abdomen.

Fluid zone between descending or ascending colon formed distinctly in lateral peritoneal wall ,colon will be diaplaced medially called as flank stripe sign

On a supine radiograph presence of fluid or blood in the peritoneal recess represents dog ear sign. The appearance is due to convex soft tissue density represent blood or fluid, separated from bladder by a thin line of extraperitoneal fat.

Hemoperitoneum causes small bowel producing ground glass appearance and shifting towards the centre of the abdomen will be due hemoperitoneum.

Diaphragmatic trauma:

First sign of a ruptured left diaphragm will be indicated by malposition of nasogastric tube.

Mediastinal shift to opposite side of the injury, bowel loops seen above the diaphragm.

X ray diagnostic in both intra and retroperitoneal rupture. Duodenal intramural hematoma also be diagnosed by radiographic examination.

4.Ultrasound of abdomen1:

As portable quality ultrasound machines has been used in widely in diagnosing blunt injury. Will be helpful in identifying precise location of solid organ injury. Presence free fluid can diagnosed with the help of ultrasound which is widely used nowadays as a screening tool in a case of blunt injury.

Advantages -

- No constrast
- No radiation

But studies has shown ultrasound inferior to DPL and can be used as screening tool in blunt injury due to its portability and no use of radiation

5.Computarized tomography of abdomen (CT scan): Gold standard investigation in blunt injury abdomen is CT. Contrast CT plays very important in diagnosing the solid organ injury and hollow viscus injury, it gives precise location of injury. Plays important role in decision making

1. Its remains inappropriate investigation for unstable patients.
2. If duodenal injury is suspected from the mechanism of injury, oral contrast may be helpful .

3. If rectal injuries and distal colonic injury is suspected in the absence of blood on the rectal examination, rectal contrast may be helpful.

Advantages:

It is an excellent means to diagnose intraperitoneal hemorrhage. It gives excellent views of spleen and liver permitting precise anatomic diagnosis of solid viscus injury. It is also the best in diagnosis of retroperitoneal injury. Stomach, duodenum, pancreas can be diagnosed with high degree of accuracy. Intravenous contrast permits excellent imaging of the kidneys and ureters.

Disadvantages:

The retroperitoneal colon injury is rarely delineated.

Requires a proper set up and proper interpretation of films. Scanning abdomen takes a minimum of 45-60 minutes and it is difficult to monitor the patient during the investigation. In hemoperitoneum more than 100ml of blood in the cavity will be detected.

6. Radionuclide imaging:

This non-invasive nature of isotope studies makes them attractive as a screening procedure. The reduced radiation dosage permits repeat and follow up studies with safety. But the obvious disadvantages are, they are not freely available in most centers and are dependent on the availability of an expert radiologist.

7. Arteriography:

Arteriography was main tool prior to CT scan and ultrasound. Its use is now limited for the evaluation of solid intra abdominal and pelvic arterial bleeding in patients with pelvic fractures. Therapeutic embolization can be carried when needed. Abdominal aortography or selective visceral arteriography is useful in the diagnosis and management of intra abdominal bleeding after laparotomy for trauma. Contraindications to do arteriography is obvious need for laparotomy, unstable patient or allergic to the contrast agent. The primary advantage is to prevent negative laparotomy.

8. Laparoscopy or diagnostic laparotomy:

Laparascopy may be a valuable screening investigation in the stable patients. May be used as screening , diagnostic as well therapeutic. It has distinct advantage over a paracentesis because it provides visualization of the site and extent of bleeding. In unstable patient it as no role.

Enzymes studies: Amylase and alkaline phosphatase levels of the effluent from DPL when equal or greater than the serum level is suggestive of injury to bowel, liver or pancreas.

Routine investigations: Hemoglobin, hematocrit, blood grouping and Rh typing, serum amylase and alkaline phosphatase, urinalysis, blood urea, serum creatinine, blood sugar, chest x ray and ECG are to be done.

MANAGEMENT OF INDIVIDUAL ORGAN INJURIES

STOMACH

Blunt gastric injuries most commonly occur after motor vehicle or motor pedestrian accidents. Injuries have also been reported after cardiopulmonary resuscitation, falls and direct violence particularly involving child abuse.

The most common mechanism of injury is a sudden increase in intraluminal pressure resulting from a direct blow to a full stomach in which case the rupture occurs along the anterior surface of the stomach or the greater curvature. In CPR, the injury is due to compression of the stomach against the vertebral column. Shearing of the walls of the stomach with rapid deceleration occur at the gastro esophageal junction, gastric necrosis due to avulsion of gastro epiploic vessels.

Diagnosis: A nasogastric tube placed during the resuscitation phase, serves both diagnostic and therapeutic functions. The return of gross blood on nasogastric aspirate is suggestive of an upper gastrointestinal injury. The NG tube also serves therapeutic function by decompressing the stomach. Patients may present with signs of peritoneal irritation or shock. Gas under the diaphragm in plain x ray abdomen is seen, but is not a constant finding. Peritoneal lavage is usually positive for blood or gastric contents. Contrast studies or computed studies are rarely needed.

MANAGEMENT:

Perioperative antibiotics prophylaxis should be instituted and is continued for 12 to 24 hours after operation. On opening the abdomen with a midline incision, control of hemorrhage is the first priority, followed by containment of enteric spill.

Priority is given to management of other intra abdominal injuries in case they are found, as gastric injuries are rarely life threatening. Enteric spill from gastric injuries is controlled by Babcock and figure of eight stitch temporarily.

When exploring the abdomen, the entire stomach should be examined carefully with special attention to gastro esophageal junction, greater curvature at the omental and splenic attachment, lesser curvature at the gastrohepatic ligament, posterior wall of the stomach.

Most of the blunt injuries of the stomach can be managed by simple debridement and repair. Partial or complete transection and devascularization injuries though rare may need resection. Repair is accomplished by two layer inverting closure. Inner layer is a continuous absorbable using chromic catgut or polyglycolic acid suture. Care should be taken not to narrow the gastric lumen . Consideration may be given to performing a pyloroplasty in wounds involving the pylorus. A gastric drainage procedure should also be performed for injuries along the lesser curvature when damage to the vagal nerves has occurred.

Repairs in other areas of the stomach are rarely difficult because of the mobility of the stomach and its rich blood supply. These injuries generally heal rapidly and without complication. Drainage of these wounds is not indicated. Before closure of the abdomen, the peritoneal cavity should be irrigated to remove

gross contamination. Gastric decompression, through nasogastric suction is maintained until bowel function returns.

Complications: are intraperitoneal abscesses, disruption of gastric repair, fistula formation, missed injuries, hemorrhage and obstruction of gastro esophageal junction or pylorus.

DUODENUM:

Blunt duodenal injuries are rare since it is a deep seated retroperitoneal organ in the abdomen. It is frequently associated with injuries adjoining to the pancreas. It is associated with high mortality and morbidity late diagnosis and surgery. CT is the diagnostic modality for duodenal injuries, the only sign maybe gas or fluid collection in the periduodenal space and leakage of oral contrast administration of which may improve accuracy of diagnosis. A force that impacts the duodenum against the vertebral column would produce a crushing injury, i.e a direct blow to the abdomen by the steering wheel.

A bursting injury results when the intraluminal pressure exceeds the bowel wall strength. This injury occurs as a closed loop obstruction, with a seat belt harness acting as the obstructing point.

A shearing force can also cause rupture of the intramural duodenal blood vessels with accumulation of blood in the sub mucosal layer commonly seen in children, alcoholics and patients with coagulopathies and in child abuse.

Estimated from literature, duodenal injuries occur in 4.3%of all patients with abdominal injuries. Mortality in patients with duodenal injuries ranges from 13 to 28%. Morbidity of the duodenal wound is measured primarily as the incidence of duodenal fistula.

Usually associated injuries are present. The second portion of the duodenum is more commonly affected and pose greater technical difficulty for surgical management. The small thin walled duodenum has marginal blood supply shared with pancreas. Therefore it is not amenable to sound technical closure and parts of it are very difficult to respect.

It is also fixed at two points, the portal triad and ligament of Trietz, there by subjecting it to deceleration injuries. Pancreas is invariably affected when duodenum is involved by crush injuries. High volume and high toxicity of duodenal contents account for disastrous effect when break in the duodenal wall occurs. The incidence of fistula following repair ranges from 2 to 14%.

Diagnosis: a high index of suspicion is required when evaluating patients with history of blow to upper abdomen especially in a patient with steering wheel injury to abdomen. Abdominal discomfort may be out of proportion to physical signs.

May be associated with late signs of rebound tenderness, abdominal rigidity, referred pain in the back can occur.

Investigations:

1. Serum amylase is sensitive but non specific for duodenal injuries, is elevated in 50% of patients with duodenal injuries.
2. Needle paracentesis or lavage will often be positive for blood, bile or bowel contents. A negative peritoneal lavage does not exclude all duodenal injuries.
3. X ray erect abdomen may show intraperitoneal air, retroperitoneal air around kidney, or air in the biliary tree.

4. An emergency upper gastrointestinal series with water soluble material (gastrograffin) is a good way to exclude a duodenal injury

5. CT scan with contrast may demonstrate small amounts of retroperitoneal gas and extravasated intestinal contrast material.

Grading system (mild and severe) has been designed to characterize duodenal injuries, which basically includes the parameters like:

1. Agent: blunt or penetrating injury.
2. Size: the involved circumference of the duodenum.
3. Character of the injury (simple laceration or destruction of the duodenal wall).
4. Associated injuries to the biliary tract, pancreas or major vascular structure. Evaluation of the severity of the injury:

Mild Severe

Agent Stab Blunt or missile

Size <75% of wall >75% of wall

Site D3, D4 D1, D2

Injury-repair interval (hr) <24 or >24

Adjacent injury No CBD injury CBD injury

Treatment:

The duodenum must be adequately explored to exclude injuries if there is a retroperitoneal hematoma in the right upper quadrant. Other signs requiring exploration include crepitus or bile staining along the lateral margin of the duodenum, retroperitoneal edema, petechiae or fat necrosis in the

retroperitoneum or right mesocolon, retroperitoneal phlegmon and discoloration. If these signs are present, the duodenum should be completely mobilized using Kocher maneuver and reflection of the right colon mesentery, if necessary, to see the third and fourth portions of the duodenum. Duodenorrhaphy or simple repair will be successful in 70-85% of these wounds. A one or two layer closure can be used. A one layer closure with a Weinberg stitch may be particularly helpful in avoiding luminal narrowing in the pyloric channel area.

Simple small laceration of the duodenum can be repaired primarily in two layers, inner continuous absorbable sutures 2-0 and outer non absorbable 3-0 silk. It should be closed transversely. The periduodenal area should be drained.

The addition of tube decompression to simple closure remains controversial. Tube duodenostomy can be accomplished directly through the duodenal wall in proximity to the site of injury, by placement of a transnasal sump tube through the pylorus onto the duodenum or by retrograde insertion of a sump tube through a Witzel tunnel jejunostomy.

Large injuries of the duodenum are more difficult to repair. Injuries involving more than 50% of the duodenum should not be primarily closed, because it could compromise the lumen. If duodenum has been transected edges should be trimmed and two layer primary anastamosis done provided transection is not in proximity to the ampulla of vater.

Large injuries of duodenum can also be treated with a jejunal patch by bringing a jejunal loop and laying it on the area of injury so that the serosal of jejunum buttress the duodenal repair. If duodenum alone has been injured, a rare occurrence, the patient has to undergo a duodenojejunostomy to the

defunctional Rou-en Y limb of jejunum. If there are associated injuries to pancreas or biliary tract pancreatico duodenectomy may be necessary and the necessary pancreatic, gastric and biliary anastamosis to be done. When pancreatic injury is associated, raising the concern of digestive action of pancreatic enzyme on the repair, pyloric exclusion is done to defunctionalise the duodenum and protect the repair from activated pancreatic enzyme. The procedure involves, antrectomy, oversewing of the duodenal stump, tube decompression at the duodenum and biliary tract and gastro jejunostomy to restore gastro intestinal continuity.

Intramural duodenal hematoma: the treatment is usually non operative. The first step is excluding a perforation. Once this is done, the patients are placed on nasogastric suction, intravenous fluids and possibly intravenous hyperalimentation. Most of the patients are improved by 5 days. Surgery is appropriate for cases that are still obstructed after 7 to 10 days of treatment or that have evidence of perforation.

Small bowel injuries:

Owing to the large volume of peritoneal cavity occupied by the small bowel, it is the intra abdominal organ most frequently injured with penetrating trauma and it is the third most frequently injured organ (following the liver and spleen) in blunt trauma. Small intestinal injury occurs in 5-15% of cases in blunt abdominal trauma but the incidence varies according to socioeconomic status and geographic location. Three mechanisms involved in causing small bowel injuries are crushing, shearing and bursting injuries.

Small bowel injury scale is as follows:

Grades Injury description

I Hematoma Contusion or hematoma without devascularisation Laceration Partial thickness, no perforation

II Laceration Laceration<50% of circumference

III Laceration Laceration>50% of circumference without transection IV Laceration Transection of small bowel

V Laceration Transection of the small bowel with segmental Tissue loss or Devascularized segment.

Diagnosis: the diagnosis of blunt injury to the small intestines is often difficult due to lack or late appearance of physical signs. It may take several hours before classical signs of peritonitis are evident, given the typically slow leakage of intestinal contents, which are minimally irritant to the peritoneum. Impaired sensorium due to head injury may add to the difficulty.

Pain abdomen following blunt injury, tenderness, guarding, and rigidity of varying grade should arouse the suspicion of small gut injury till not proved otherwise by various diagnostic tests. An upright chest x ray will demonstrate gas under the diaphragm in 20-50% of cases.

Management: Midline incision is preferred. The entire small intestine must be carefully examined from the ligament of Trietz to ileocecal valve, including all mural surfaces and mesenteric attachements.

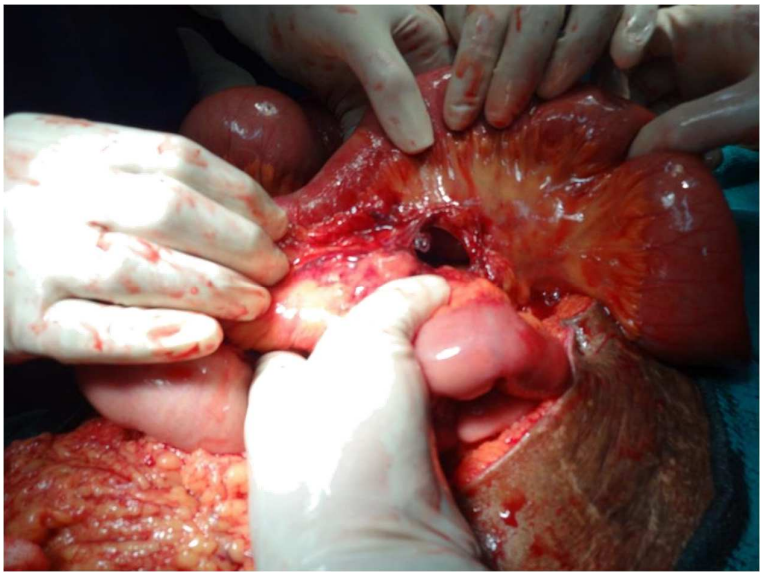
Perforations: most perforations are closed by primary repair. Edges are debrided till it bleeds and two layers closure done. i.e inner layer of absorbable and outer layer of silk. When there are multiple perforations in a close area or

the closure of large laceration results in narrowing, resection anastamosis is done. Resection anastamosis should not be performed in last 15cms of ileum due to precarious blood supply. Rather end to side ileocolic anastamosis is preferred. Peritoneal cavity must be liberally irrigated with warm saline and particulate matter removed. Drains are optional.

Mural damage without perforation: the management of contusions and intramural hematomas of the small intestines require assessment for consideration of resection and anastamosis verses leaving the intestines in situ and opting for observation and second look surgery. Clinical judgement by observing the involved segment for signs of intestinal viability such as active peristalsis and color through out the procedure is important. Small mucosal hematoma (<1cm), nonexpanding may be turned in by a series of interrupted sutures. For larger mucosal hematoma transmural debridement/ segmental resection should be done whenever there is doubt regarding viability.

Mesenteric hematoma: assessment should be done to define the size, stability, i.e. is it expanding or non expanding, contained or has ruptured the mesenteric folds.

Exploration is required for large, expanding and uncontained hematoma.



MESENTRIC TEAR

At exploration, the involved mesentery proximal to the hematoma (towards the base) should be examined and if possible site of vascular control defined. Manual compression is then applied to that hematoma, bisecting it. Following careful evacuation of clot, bleeding points are individually controlled with silk sutures. Viability of intestine distal to the area of vascular damaged must be determined and accordingly dealt with.

Injuries to the base of mesentery associated with large hematoma may cause severe bowel ischemia to the entire length of small bowel. Collateral flow is often inadequate to maintain viability. Resection under these circumstances is unsuccessful and vascular repair by interposition or patch graft of the involved vessels is mandatory. When large areas of ischemic bowel are in question one may opt for second look surgery/ re laparotomy.

Complications: post operative complications are missed injury, bleeding, suture line leak, anastomotic disruption, fistula formation, obstruction and abscess. Missed injuries can be avoided if one carefully screens the whole intestine from ligament of Trietz to ileocecal junction. One should be careful towards the mesenteric border of the intestines where small perforation may be missed. **Hemorrhage:** intraluminal blood loss may occur at suture lines, anastamosis, or areas of bowel contusion. Hemoglobin may fall, tachycardia may be present and patient may have malena or hematochezia depending on the amount of blood loss. If the patient does not respond to conservative treatment reexploration should not be delayed.

Colon and rectal injuries:

Colon and rectal injuries: blunt abdominal trauma to the colon is rare and constitutes about 4-6% of all blunt abdominal injuries usually caused by road traffic accidents. The injury involves more than one organ system.

Mechanism of injury: the bowel may be compressed against vertebral column or burst by a sudden blow against a distended loop. Sudden deceleration may tear the bowel or disrupt its mesentery. Crush injury may damage the colon or rectum in two ways. Pelvic fracture may produce perforation of the rectum by bone spicules, and occasionally, an explosion injury associated with valsalva at the time of crush may occur. Mortality rate ranges from 3-10%.

The extra peritoneal rectum is usually injured in association to the pelvis. This portion of the rectum is more or less fixed to the pelvis; thus may sustain severe

injury in common with pelvic fracture. The site of trauma in intra peritoneal injury to the large bowel is usually near the junction of the mobile and fixed portion such as junction of the sigmoid and descending colon. Injury may be to the bowel or mesentery. Injuries to the mesentery results in hemorrhage; if to the bowel; it results in contusion, intra mural hematoma or laceration (partial or complete). Most of the injuries will be recognized and dealt as acute problem. Few may manifest later as colocutaneous fistula and post traumatic stenosis. Injuries to extra peritoneal rectum are due to:

1. Fractured pelvis lacerating the rectum by a bony spicule.
2. Avulsion at the rectum as a result of tremendous bursting force. Avulsion may be partial or complete. Organ injury scale for colon and rectum is as follows.

Colon injury scale:

Grade Injury description

I Hematoma Contusion or hematoma without devascularisation

Laceration Partial thickness, no perforation

II Laceration <50% of circumference

III Laceration >50% of circumference without

transection IV Laceration Transection of the colon

V Laceration Transection of the colon with

tissue loss Advance one grade for multiple

injuries upto grade III

Rectum injury scale:

Grade Injury description

I Hematoma Contusion or hematoma without devascularization Laceration Partial thickness laceration

II Laceration <50% of

circumference III Laceration

>50% of circumference

IV Laceration Full thickness with extension into the

perineum V Laceration Devascularized segment

Diagnosis of the injuries:

Following injury varying intensity of pain in abdomen is present. Tenderness, guarding and rigidity may or may not be present. Shock is due to blood loss as a result of other associated injuries and not due to colonic injuries. Occasionally, symptoms of peritonitis may take few hours or days to develop. There may be blood on finger on per rectal examination or tenderness in pelvic peritoneum may be noticed. When bleeding is present per rectal examination should be followed by proctoscopy and rigid sigmoidoscopic examinations. Plane x ray may show gas under the diaphragm. USG abdomen may not contribute much. Enema with water soluble contrast CT scan in selected cases may be done where the symptoms are minimal and the diagnosis is doubtful. High index of suspicion and repeated clinical examination is mostly rewarding. Clinical deterioration in the patient's status, increased abdominal tenderness, an evolving pattern of sepsis, and development of paralytic ileus or mechanical obstruction are common findings in patients with either a missed injury or

delayed perforation. And majority of colon injuries are diagnosed intra operatively.

Surgical options available are:

1. Primary closure without colostomy.
2. Primary closure with de functioning colostomy.
3. Resection and anastamosis.
4. Exteriorisation of injured colon/colostomy.
5. Exteriorised repair.

Risk factors:

Shock, fecal contamination, associated injuries, interval from injury to repair, mechanism of injury, severity of colon injury and location of injury.

Methods of repair:

Primary repair (simple suture): simple suture is resumed for clean low velocity injuries that require debridement and involve less than 25% of the colon circumference. The criteria are minimum blood loss, minimum fecal contamination, within 8 hours of injury.

Accepted contraindications for primary closure are:

- Prolonged or persistence hypotension
- Greater than 6 hour delay between injury and surgical intervention
- Gross fecal spillage
- Extensive damage to abdominal or retroperitoneal muscle
- Significant hemoperitoneum
- Multiple coexistence visceral injuries
- Devitilization of more than one fourth of the colon wall

- Impairment of blood supply to the injured segment
- Colon injury grade 3 or more

Most of the authors report primary repair in 50-65% of their patients. The technique involves thorough and meticulous debridement of the wound edges followed by a standard two layer closure (an inner layer of running or interrupted absorbable sutures followed by an outer layer of interrupted silk Lembert sutures). Prior to facial closure, the abdomen is liberally irrigated with saline and all particulate matter is removed. Drains are normally not indicated. The skin and subcutaneous tissue may be closed primarily with or with out a subcutaneous drain/ or by delayed primary method.

Primary resection and anastamosis: this procedure is ideal when there are extensive wounds of the right colon. Right hemicolectomy with ileocolic anastamosis can be accompanied with reasonable dispatch and an acceptable rate in the majority of patients. Hemodynamically unstable patients should have ileostomy, if, taking time for anastamosis will jeopardize their survival. Primary anastamosis may be performed in the left colon following resection of extensively damaged portion but it should be protected by a proximal colostomy.

Colostomy: indications for colostomy are: when the condition of the patient precludes taking the time to make a repair or anastamosis; when a distal anastamosis may be tenuous, when extensive distal destruction of the colon would require a low rectal anastamosis. It may be accomplished by:

1.Exteriorization

2.Defunctioning colostomy

3.End colostomy and Hartmann procedure.

Exteriorization of the colon: it is the most rapid method available for managing a colon injury. Even in the fixed portions of the colon, mobilization can be accomplished quickly. If exteriorization is selected as an option, a small lateral incision is made and the two limbs of the mobilized colon are brought out as a double barreled colostomy.

Defunctioning colostomy: it is performed by separating the limbs and bringing each out as a single stoma.

Exteriorized repair: this procedure should be reserved for the rare patient on whom primary repair is in question. It is usually done when there is anti mesenteric injury from the mid ascending colon down to the sigmoid.

Rectal injuries:

Blunt injury to rectum is typically a crushing or compressive force applied to the pelvis or lower abdomen, as would occur when the victim has been struck or run over by a motor vehicle. Patients with massive blunt pelvic trauma should be viewed with a strong index of suspicion. Abdominal x ray should be obtained to see for retroperitoneal air. Procto sigmoidoscopy is done for direct visualization of the injury.

Peritoneal irritation, gross blood on rectal examination or full thickness injury noted on proctosigmoidoscopy is indication for operation. Patients with an

expanding abdominal girth or gross positive peritoneal lavage should be operated on.

Management:

Early definitive surgical management is indicated in any patient with following condition:

- Endoscopically visualized anorectal injury, regardless of associated injuries.
- A possible anorectal injury; clinically suspected but not identified.
- Open pelvic fracture, whether or not anorectal injury has been identified.

Management of rectal injury rests on the three D's:

- Diversion
- Debridement
- Drainage

Diversion: this is the most important step in the management of the injured rectum. A total diverting loop colostomy is adequate. Some surgeons use diverting colostomy, only when the injury is above the levators or dentate line. For anorectal injuries, below the dentate line, routine colostomy is not indicated.

Debridement and suturing: if anorectal injury is readily accessible to transanal approach, wound approximation using a single layer of running 3/0 absorbable suture may be attempted. If the sphincter mechanism has been injured, muscle approximation is performed using interrupted horizontal mattress 3/0 absorbable sutures. The anal mucocutaneous junction is left open for drainage purposes.

Rectal injuries can be closed relatively easily through the abdominal incision by opening the peritoneum and freeing the upper rectum as is done in elective resection. Repair of intraperitoneal rectal injury may be undertaken using the same criteria as in colon injury.

Drainage: should be presacral and through the perineum by penrose type drains or suction drainage and should be brought out just anterior to the coccyx.

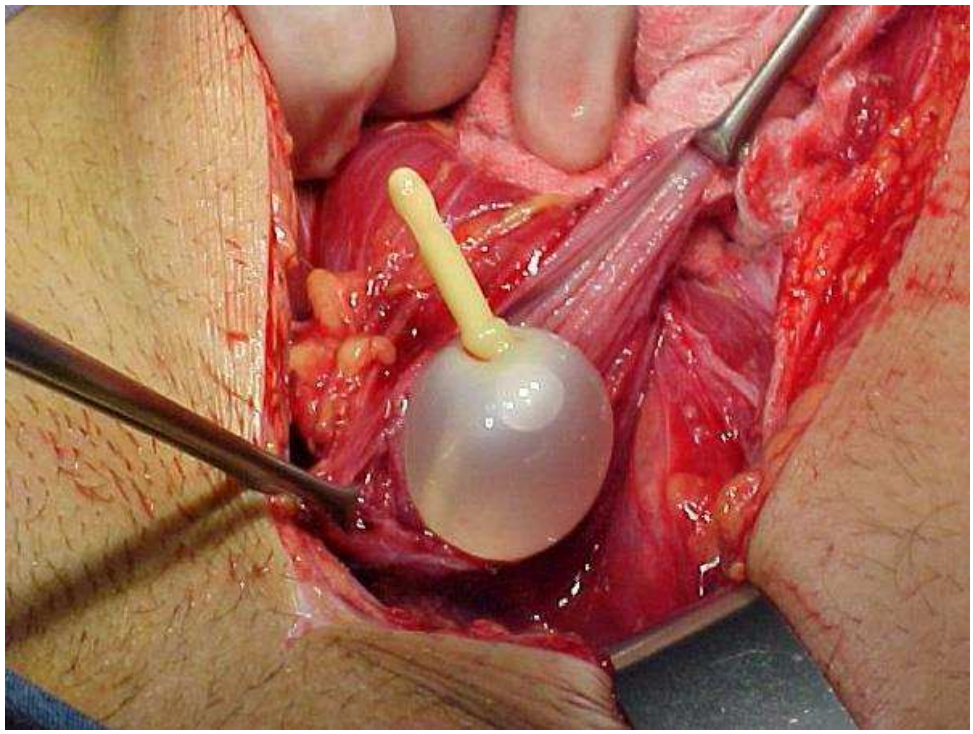
Distal wash out: is accomplished by irrigating the distal colostomy stoma with dilute povidone solution through dilated anus until effluent is clear.

Bladder injuries: Urinary bladder is located deep within the bony pelvis and hence blunt trauma to bladder is rare. It commonly occurs following application of blunt external force to a fully distended bladder and usually associated with fracture pelvis. Classically described as intraperitoneal or extraperitoneal injury; depending on the site of injury. Extraperitoneal injuries occur in 75% of the cases and are generally in association with fractures of the pelvis. About 8 to 10% of pelvis fractures cause bladder injury due to laceration by the bony fragments. Intraperitoneal injury to the bladder occurs in about 25% of cases and follows application of blunt force to a fully distended bladder or in motor cycle accidents or fall from height.

Clinical features: Presentation of bruising over the lower abdomen, tenderness which is not well localized. Extravasation of urine and inability to void urine or hematuria may be present.

Diagnosis: Plane X ray pelvis confirms presence of fracture pelvis and the Position of the fracture fragments. Cystogram is diagnostic. 250-300 ml of sterile contrast material is used to distend the bladder. Free flow of contrast in

the peritoneal cavity is classical, highlighting the bowel loops in intraperitoneal rupture. Drainage films with empty bladder will establish presence of residual extravasation of urine in extraperitoneal rupture of the bladder.



Management:

Extraperitoneal rupture: Open primary repair of the bladder in one or two layers with absorbable sutures is preferable.

Intraperitoneal rupture: Open primary repair of the bladder in one or two layers with absorbable sutures is preferable. It allows for inspection of the abdominal viscera for associated injuries which can also be taken care of. Supra pubic bladder catheter is kept and perivesical space is drained. 10-14 days later a cystogram is done to look for any leak.

MATERIALS AND METHODS

SOURCE OF DATA:-

This study is a prospective study of Patients coming with blunt injury abdomen due to RTA or TTA or Fall from height or Fall of heavy object to Department of General surgery in Govt Stanley medical college and hospital between may 2018 to may 2019

METHODS OF COLLECTION OF DATA: -

Data were collected from the patients by their clinical history, clinical examination with appropriate investigations on those patients who were admitted. Post operative follow up was done to note for complications. After initial resuscitation of the trauma victims, a careful history was taken to document any associated medical problem. Routine blood and urine tests were carried out in all the patients. Documentation of patients, which included, identification, history, clinical findings, diagnostic test, operative findings, operative procedures, complications during the stay in the hospital and during subsequent follow-up period, were all recorded on a proforma specially prepared. Demographic data collec ted included the age, sex, occupation and nature and time of accident leading to the injury.

After initial resuscitation and achieving, hemodynamic stability, all patients were subjected to careful examination, depending on the clinical findings; decision was taken for further investigations such as four-quadrant aspiration, diagnostic peritoneal lavage, x ray abdomen and ultrasound.

The decision for operative or non operative management depended on the outcome of the clinical examination and results of diagnostic tests.

Patients selected for conservative management were placed on strict bed rest, were subjected to serial clinical examination which included hourly pulse rate, blood pressure, respiratory rate and repeated examination of abdomen and other systems. Appropriate diagnostic tests especially ultrasound of abdomen was repeated as and when required.

OBSERVATIONS AND RESULTS

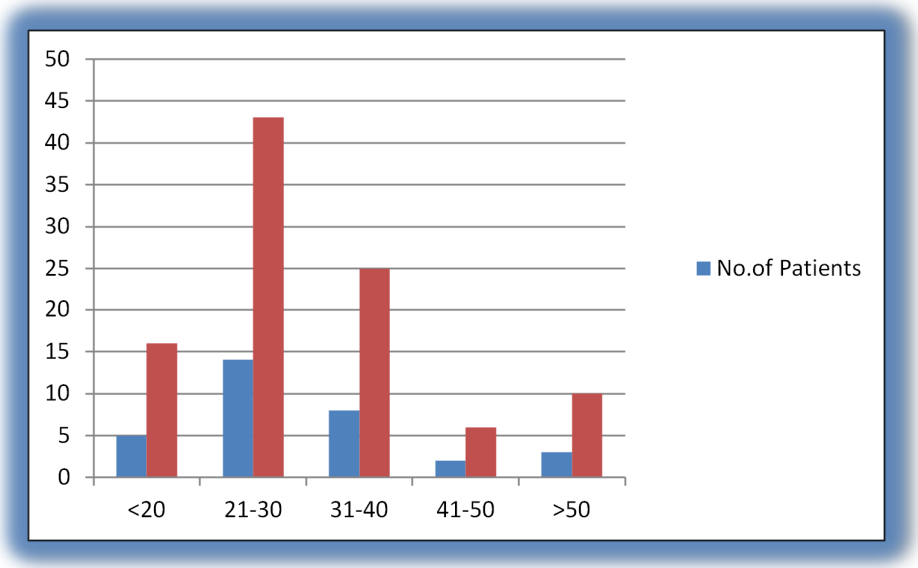
Patients coming with blunt injury abdomen due to RTA or TTA or fall from height or fall of heavy object to Department of General surgery in Stanley medical college and hospital between may 2019 to may 2019. 947 patients were taken up for study out of which 32 patients had hollow viscus injury with incidence of 3.3%.

A) AGE INCIDENCE:

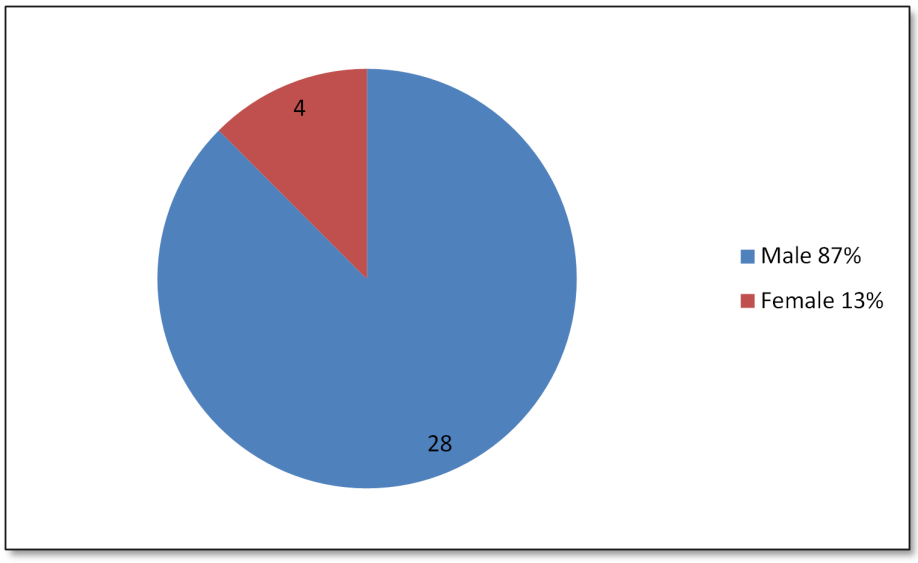
AGE GROUP (yrs)	NO.OF PATIENTS	PERCENTAGE (%)
11-20	05	16
21-30	14	43
31-40	08	25
41-50	02	06
>50	03	10

In this series, the majority of the patients belonged to 21-30 years age Group followed by 31-40 years age group

AGE INCIDENCE



B) **SEX INCIDENCE:-**



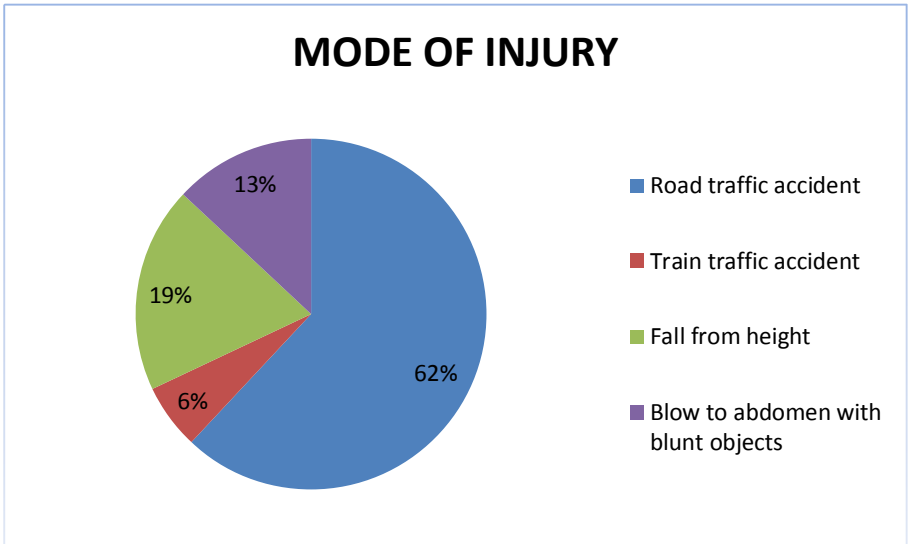
In the 32 cases, 28 cases were males, with females accounting for only about 4 cases.

GENDER	NO OF PATIENTS	PERCENTAGE
Male	28	87%
Female	4	13%

C) MODE OF INJURY:

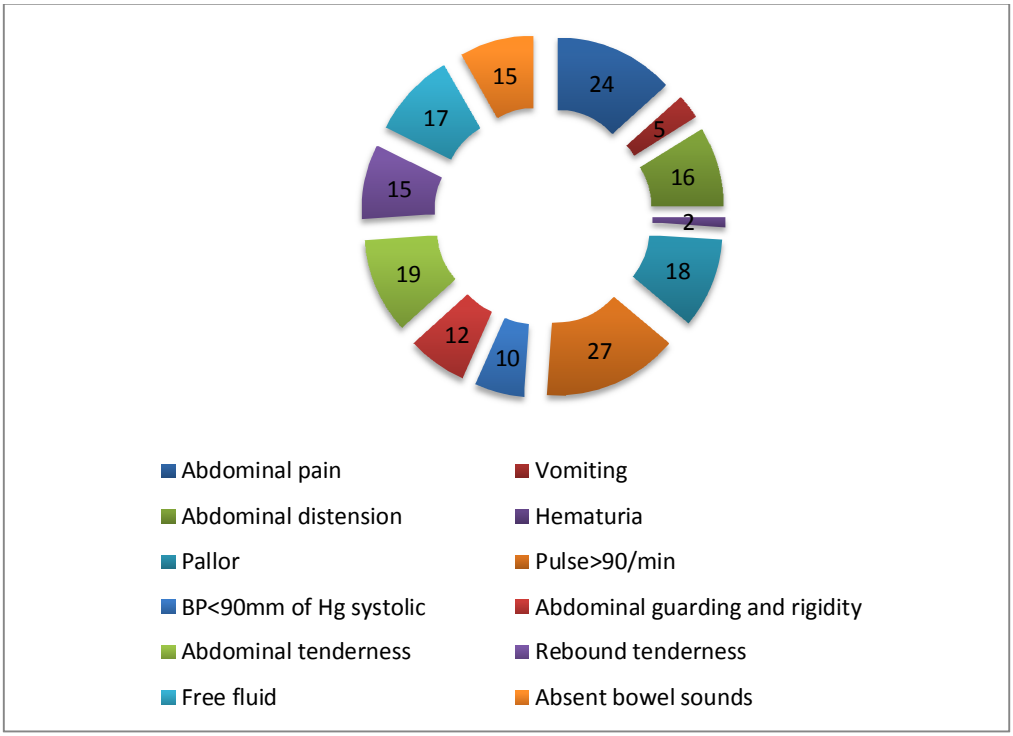
CAUSATIVE AGENT	NO.OF CASES	PERCENTAGE (%)
Road traffic accident	20	62
Train traffic accident	2	6
Fall from height	6	19
Blow to abdomen with blunt objects	4	13

Road traffic accident was responsible for 62% of blunt abdominal trauma cases, while fall from heights accounted for 19% of cases and blow with blunt object was responsible for 13% of injuries.



E) SYMPTOMS AND SIGNS:-

The following fig. shows the incidence of various symptoms and signs



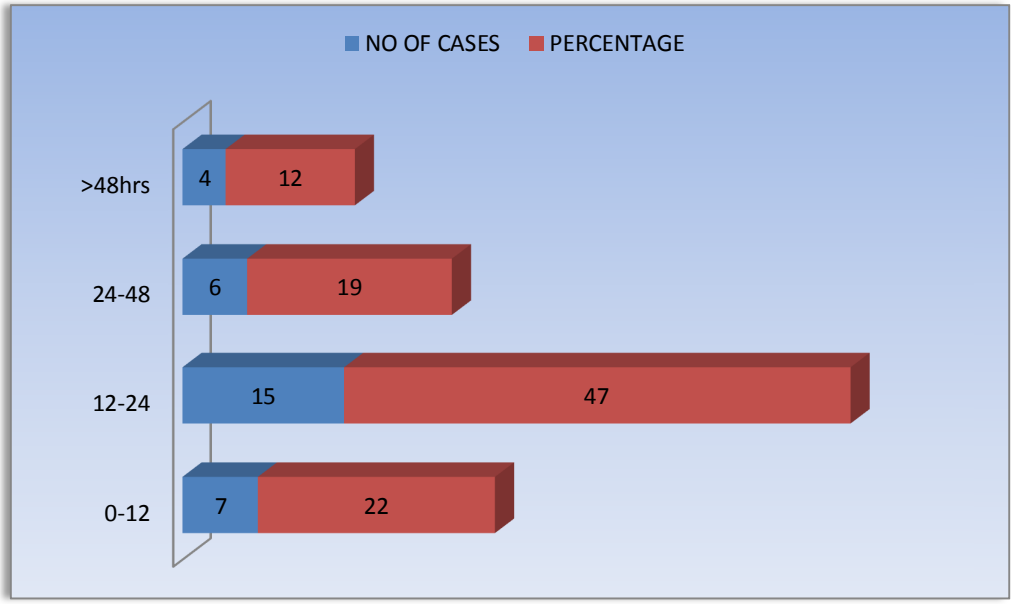
SYMPTOMS AND SIGNS	NO OF PATIENTS
Abdominal pain	24
Vomiting	5
Abdominal distension	16
Hematuria	2
Pallor	18
Pulse>90/min	27
BP<90mm of Hg systolic	10
Abdominal guarding and rigidity	12
Abdominal tenderness	19
Rebound tenderness	15
Free fluid	17
Absent bowel sounds	15

Majority of the patients presented with abdominal pain (75%) and abdominal tenderness (60%).

LATENT PERIOD:-

Latent period is the interval between the time of injury to the time of surgery.

LATENT PERIOD



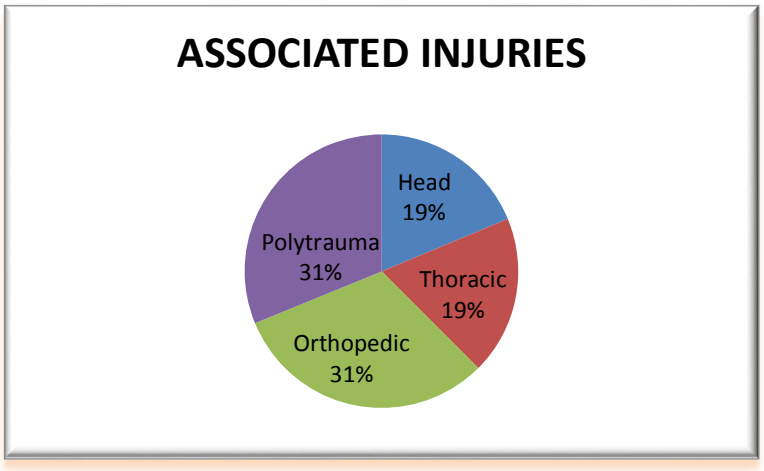
HOURS	NO OF CASES	PERCENTAGE
0-12	07	22%
12-24	15	47%
24-48	06	19%
>48 hrs	04	12%

Average latent period seen in the present study is between 12-24 hours.

Majority of patients (47%) were taken for surgery between 12-24 hours of latent period.

ASSOCIATED INJURIES:

INJURIES	No of Patients	Percentage
Head	3	10%
Thoracic	3	10%
Orthopedic	5	15%
Polytrauma	5	15%

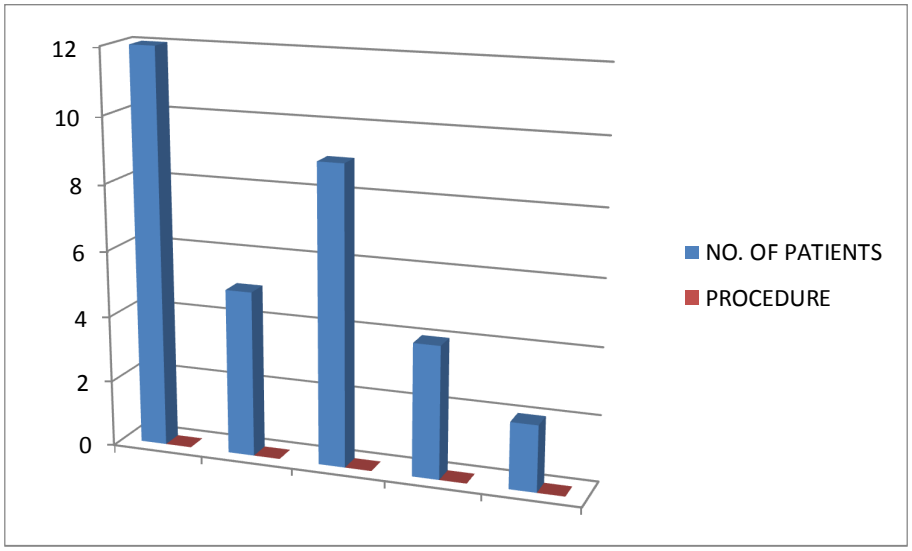


Associated extra abdominal injuries were found in 15 cases. The common extra Abdominal injuries were extremity fractures, pelvic fractures, head injury, chest injuries Including rib fractures.

INVESTIGATIONS

INVESTIGATIONS:

Most of the patients diagnosed with X–ray or CECT abdomen and remainder of patients diagnosed and taken up for surgery by X ray & USG findings and serial clinical examination.

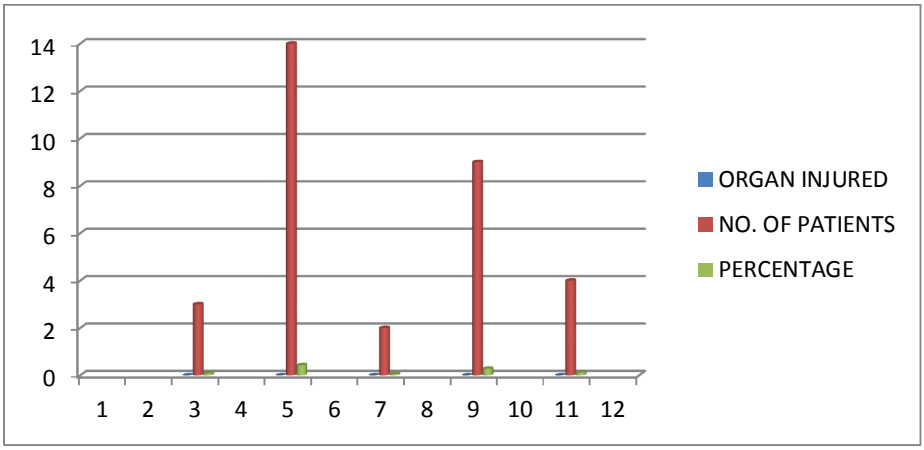


INVESTIGATIONS	NO. OF PATIENTS DIAGNOSED	PERCENTAGE
X ray -Air under diaphragm	16	50%
Four quadrant Taping	14	43%
FAST	13	40%
USG	18	56%
CT	14	82%

A CT was considered positive for HVI if there was presence of bowel wall thickening, bowel perforation, free intraperitoneal air, free fluid without solid organ injury, and mesenteric laceration or hematoma.

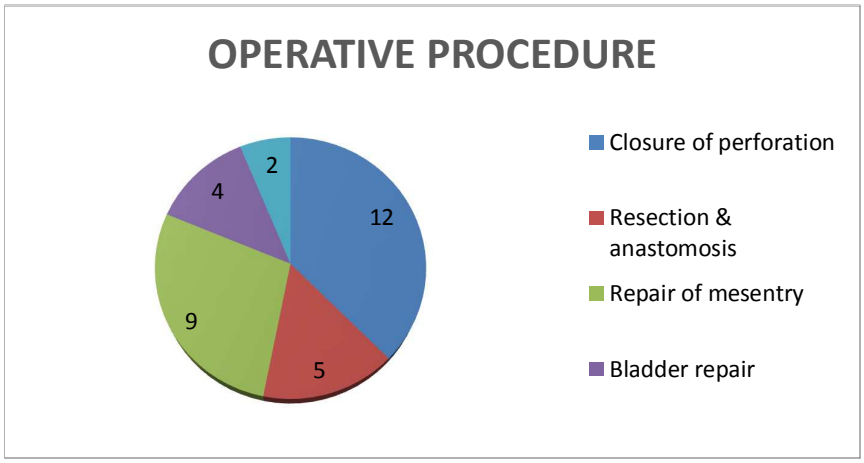
OPERATIVE FINDINGS:

ORGAN INJURED	NO. OF PATIENTS	PERCENTAGE
Gastric injury	3	9%
Small bowel injury	14	43%
Large bowel injury	2	6%
Mesenteric injury	9	28%
Bladder injury	4	12%



Most common injury is the small bowel injury accounts for 52 % of patients. Followed by next most common finding is the mesenteric injury .

OPERATIVE PROCEDURES:



PROCEDURE	NO. OF PATIENTS	PERCENTAGE
Closure of perforation	12	38%
Resection & anastomosis	5	16 %
Repair of mesentry	9	28%
Bladder repair	4	12%
Colostomy	2	6%

The above table shows the various operative procedures carried out among the patients who underwent exploratory laparotomy. Bowel perforations were treated with 2 layered closure, with 5 patients requiring resection and anastamosis. Omental and mesenteric injuries were treated by simple suturing and ligating the

Bleeding points. Bladder injuries were repaired by 2 layered closures under the supervision of urologist.

In the present series of 32 cases, two case of duodenal perforation was found which was simple and was closed by 2 layered closures. We could not find any case of disruption of the biliary tract and pancreatic injury in this series.

POST OPERATIVE COMPLICATIONS:

The following table shows the postoperative complications and their relative incidences in patients who underwent exploratory laparotomy.

POST OPERATIVE COMPLICATION	NO. OF CASES	PERCENTAGE
Wound dehiscence	2	8%
Wound infection	4	11%
Respiratory complication	2	6%

MORBIDITY AND MORTALITY:

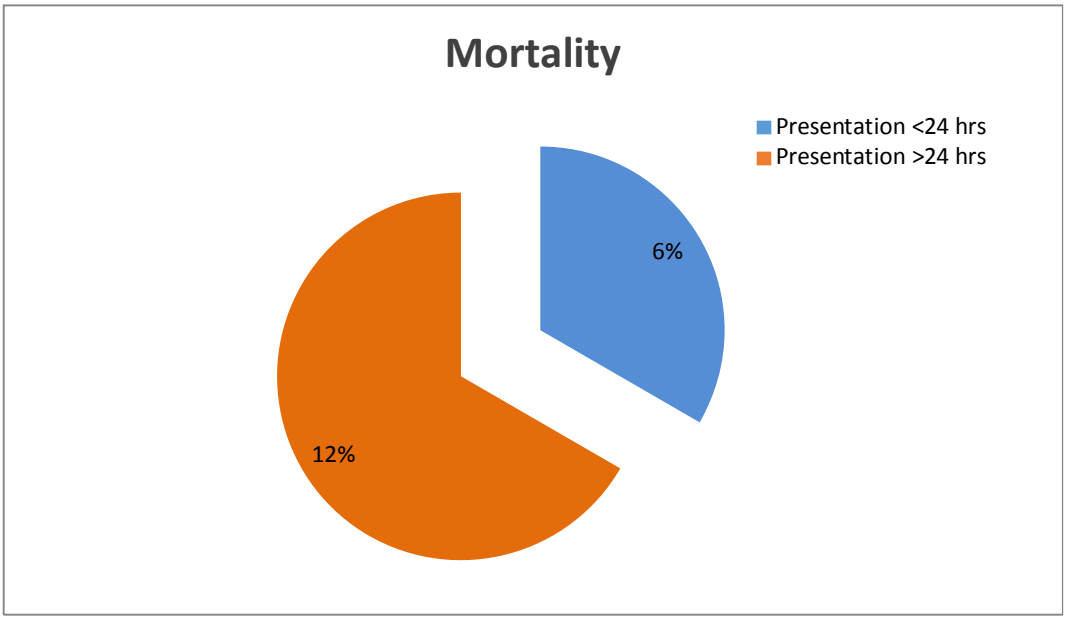
The mean range of stay of patients in the hospital ranged from 11-20 days (15 days). The range varied from 2 days to more than 30 days.

The following table shows the duration of stay of patients with blunt abdominal trauma including those who died.

DURATION OF HOSPITAL STAY

DURATION OF HOSPITAL STAY(days)	NO. OF PATIENTS	PERCENTAGE
1-10	09	28%
11-20	15	47%
21-30	5	16%
>30	3	9%

MORTALITY:



Mortality	No of patients	Percentage
Presentation <24 hrs	2	6%
Presentation >24 hrs	4	12%

A total of 6 patients died in the present study. All patients belonged to operative group and died in the post operative period, majority of them due to peritonitis and septicemia. This shows the disadvantages of delayed presentation due to missed injuries causing delayed treatment. Therefore the mortality in the present study is 18%.

Mortality	**No of patients < 24 hrs**	**No of patients >24 hrs**
Small bowl injury	1	3
Large bowel injury	1	0
Due to associated Injury	0	1

DISCUSSION

DISCUSSION

AGE INCIDENCE:

The following table compares the incidence of blunt abdominal trauma in various age groups in the present series to that of the Davis et al

AGE GROUP (yrs)	PRESENT STUDY (%)	DAVIS ET AL
11-20	16	19
21-30	43	24
31-40	25	15
41-50	06	13
>50	10	9

In this series, the majority of the patients belonged to 21-30 years age group, followed by 31-40 years age group comparable with davis et al study. Therefore it can be concluded that the young and the productive age group people are the usual victims of blunt abdominal trauma.

SEX INCIDENCE:

GENDER	PRESENT STUDY	DAVIS ET AL
Male	87%	70%
Female	13%	30%

From the above table, it can be seen that the males are the more common victims of blunt abdominal trauma. When compared to other studies the incidence of males is much more than those of the females, as, in India males are the chief bread earner for the family and are involved in outdoor activities most of the times.

MODE OF INJURY:

CAUSATIVE AGENT	PRESENT STUDY	DAVIS ET AL	KHANNA ET AL
Road traffic accident	62%	70%	57%
Train traffic accident	6%		
Fall from height	19%	6%	15%
Blow to abdomen with blunt Objects	13%	17%	33%

The above table clearly depicts that the road traffic accident is the most common mode of injury. This is due to the rapid development in technology, in all fields including automobile industry where the first priority has been given to speed rather than safety.

SIGNS AND SYMPTOMS:

In the present study, abdominal pain was the most common presenting complaint accounting for 75% and abdominal tenderness was the most common sign accounting for 60% of cases. But the signs and symptoms in abdominal injuries are notoriously unreliable and are often masked by concomitant head

injuries, chest injuries and pelvic fractures. Significant injuries to the retroperitoneal structures may not manifest signs and symptoms immediately and be totally missed even on abdominal x rays. In Davis et al study, 43% of patients had no specific complaints and no signs or symptoms of intra abdominal injury when they first presented to the emergency room. But 44% of those patients eventually required exploratory laparotomy and 34% of patients had an intra abdominal injury. This emphasizes the importance of careful and continuing observation and repeated examination of individuals with blunt abdominal trauma.

LATENT PERIOD:

Latent period is the interval between the time of injury to the time of surgery. Average latent period seen in the present study is between 12-24 hours. Majority of patients (47%) were taken for surgery between 12-24 hours of latent period. 2 patients were taken for surgery after 5 days of injury as they were initially put on conservative management. Since their condition deteriorated on repeated clinical examinations, they had to be taken up for delayed exploratory laparotomy.

ASSOCIATED INJURIES:

INJURIES	PRESENT STUDY	DAVIS ET AL	KHANNA ET AL
Head	10%	9%	12%
Thoracic	10%	27%	24%
Orthopedic	15%	15%	27%
Polytrauma	15%	6%	

Associated extra abdominal injuries were found in 16 cases. The common extra abdominal injuries were extremity fractures, pelvic fractures, head injuries and chest injuries including rib fractures. The above table shows the comparison of the present study incidences of associated injuries with other studies.

INVESTIGATIONS:

FOUR QUADRANT ASPIRATION:

Found to be positive in 14 cases and negative in 18 cases. Therefore the sensitivity of this investigation in the present study is 43%. Correct results (positive or negative), as determined by subsequent laparotomy, were obtained in 86% of cases in Davis ET al study.

PLAIN X RAY ABDOMEN:

Gas under diaphragm was found in 16 cases out of 19 bowel perforations detected at laparotomy. So the sensitivity of plain x ray abdomen in detecting the pneumoperitoneum is 84% in the present study. Davis et al reported that in their series, abdominal x ray showed air under diaphragm in 21% of cases in most common injury missed is the mesenteric injury and diagnosed by CT scan of abdomen and serial cinical examination .

ULTRASOUND EXAMINATION:

A total of 32 patients were subjected for ultrasound examination, out of which 18 patients had scan detected abnormal findings that includes solid organ injuries and free fluid without solid organ injuries. Therefore ultrasound is more reliable in detecting solid organ injuries and free fluid in the abdomen. In Yoshi H et al study, the sensitivity of ultrasound in detecting injuries in blunt abdominal injury patients is about 94.6%.

ORGANWISE INJURY:

ORGAN INJURED	PRESENT STUDY	WOLFMAN ET AL	KHANNA ET AL
Gastric injury	9%	4%	
Small bowel injury	43%	34%	57%
Large bowel injury	6%		
Mesenteric injury	28%	26%	47%
Bladder injury	12%	4%	
	30%	40%	61%

The above table compares the incidences of the organs involved in blunt abdominal trauma in the present study to that of the international series. Small bowel was involved in 43% of cases, followed by mesentric injury.

OPERATIVE PROCEDURES:

Bowel perforations were treated with 2 layered closure, with 12 patients requiring resection and anastamosis. Omental and mesenteric injuries were treated by simple suturing and ligating the bleeding points. Bladder injuries were repaired by 2 layered closures under the supervision of Urologist.

In the present series of 32 cases, two case of duodenal perforation was found which was simple and was closed by 2 layered closures. We could not find any case of disruption of the biliary tract and pancreatic injury in this series .

MORTALITY:

A total of 6 patients died in the present study. 4 patients died in group which presented more than 24 hrs. This shows the disadvantages of delayed presentation due to missed injuries causing delayed treatment. Therefore the mortality in the present study is 18%. This is comparable with other series published in our country (Khanna et al). The mortality rate in Davis et al study is 13.3%, Di Vincenti et al study (1968) was 23%. Cox et al study reports a mortality rate of 10%.

Mortality	Present study	Davis et al study	Di Vincenti et al study
Presentation >24 hrs	18%	13.3%	23%.

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

This was a prospective study of 947 cases of blunt abdominal trauma in Stanley medical college and hospital between May 2018 to May 2019. 947 patients taken up for study out Of which 32 patients had hollow viscus injury with incidence of 3.3% From this study, the following conclusions can be made.

1. Males are predominantly affected. It is mostly seen in the age group of 21-30 years which form the young and productive group. These patients are usually from lower socio economic income group.

2. Road traffic accident forms the most common mode of injury. Hence measures should be taken to prevent these accidents and care of the victims at the accident site. Well established trauma care centers should be established at least at every District hospital. Measures for early transport of the patients from the accident site to the trauma center should be undertaken.

3. A thorough and repeated clinical examination and appropriate diagnostic investigations lead to successful treatment in these patients.

4. In bowel injury, operative management remains the main stay of treatment.

5. Plain erect x ray abdomen is a valuable investigation taken for gastrointestinal injuries.

6. Ultrasound examination gives a clear picture of solid organ injury and free fluid. Four quadrant aspiration is a simple and an important tool for diagnosis.

7.Most of the patients diagnosed with CECT abdomen and remainder of patients diagnosed by X ray & USG findings and serial clinical examination.

8. The most common injured viscera in the present study is small bowel and they were managed by simple suturing.

9. Mesenteric injury is the second most common injury and majority of them were managed by simple repair. Few of them were managed by resection anastomosis due to unviable bowel.

10.Bladder injury was seen in a small proportion of patients associated with pelvic fracture. They are repaired under supervision of urologist.

12. Multiple organs were involved in most of the cases rather than an isolated organ injury.

13. Associated extra abdominal injuries like head, thoracic and orthopedic injuries were found in 34 cases in the present study. These greatly influenced the morbidity and mortality of the patients.

14. Post operative complications like wound infection, dehiscence, respiratory infections and fecal fistula are common in blunt abdominal trauma.

15.Among the total mortality of 10 pts, 7 patients died in group which presented more than 24 hrs. This shows the disadvantages of delayed presentation due to missed injuries causing delayed treatment. The mortality in the present study is 16%.

ANNEXURE

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PLAGARIASM CERTIFICATE

URKUND

Urkund Analysis Result

Analysed Document: thesis final Document (9).docx (D57467440)
Submitted: 10/22/2019 5:02:00 PM
Submitted By: llalithkumar@gmail.com
Significance: 17 %

Sources included in the report:

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Instances where selected sources appear:

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GOVERNMENT STANLEY MEDICAL COLLEGE & HOSPITAL,CHENNAI -01

INSTITUTIONAL ETHICS COMMITTEE

TITLE OF THE WORK : STUDY ON INCIDENCE OF HOLLOW VISCUS PERFORATION IN BLUNT INJURY ABDOMEN.

PRINCIPAL INVESTIGATOR : DR. LALITH KUMAR,
DESIGNATION : PG IN MS GENERAL SURGEY,
DEPARTMENT : DEPARTMENT OF GENERAL SURGERY,
GOVT. STANLEY MEDICAL COLLEGE.

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 11.05.2018 at the Council Hall, Stanley Medical College, Chennai-1 at 10am.

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

MEMBER SECRETARY,
IEC, SMC, CHENNAI

GOVT.STANLEY MEDICAL COLLEGE, CHENNAI- 600 001

INFORMED CONSENT

DISSERTATION TOPIC

"STUDY ON INCIDENCE OF HOLLOW VISCUS PERFORATION IN BLUNT INJURY ABDOMEN''

PLACE OF STUDY: GOVT. STANLEY MEDICAL COLLEGE, CHENNAI
NAME AND ADDRESS OF PATIENT:

I, _____ have been informed about the details of the study in my own language.

I have completely understood the details of the study.

I am aware of the possible risks and benefits, while taking part in the study.

I understand that I can withdraw from the study at any point of time and even then, I will continue to receive the medical treatment as usual.
I understand that I will not get any payment for taking part in this study.

I will not object if the results of this study are getting published in any medical journal, provided my personal identity is not revealed.

I know what I am supposed to do by taking part in this study and I assure that I would extend my full co-operation for this study.

Name and Address of the Volunteer:

Signature/Thumb impression of the Volunteer
Date:

Witnesses:
(Signature, Name & Address)
Date:

Name and signature of investigator: (Dr.LALITHKUMAR.L):

GOVT.STANLEY MEDICAL COLLEGE, CHENNAI- 600 001
INFORMED CONSENT

DISSERTATION TOPIC

"STUDY ON INCIDENCE OF HOLLOW VISCUS PERFORATION IN BLUNT INJURY ABDOMEN''

PLACE OF STUDY: GOVT. STANLEY MEDICAL COLLEGE, CHENNAI
NAME AND ADDRESS OF PATIENT:

நான், _____

எனதுசொந்தமொழியில்ஆய்வுவிவரங்களைபற்றிதெரிவிக்கப்பட்டது.

நான்முற்றிலும்ஆய்வுவிவரங்களைபுரிந்துகொண்டேன்.

ஆய்வுபங்கெடுத்துக்கொண்டுள்ள நான், சாத்தியமான அபாயங்கள் மற்றும் பயன்களை அறிந்து இருக்கிறேன்.

நான் எந்த நேரத்திலும் ஆய்வு இருந்து திரும்ப முடியும் மற்றும் அதன் பின்னர், நான் வழக்கம் போல் மருத்துவ சிகிச்சை பெற தொடரும் என்று புரிந்துகொள்ள.

நான் இந்த ஆய்வில் பங்கு எடுத்து எந்த பணம் பெறமுடியாது என்று புரிந்து.

நான்ஆட்சேபிக்கிறேன்மாட்டேன்இந்தஆய்வின்முடிவு,
எந்தமருத்துவஇதழில்கிடைக்கும்என்றால்,
என்தனிப்பட்டஅடையாளவெளிப்படவில்லைவழங்கப்படும்.

நான்இந்தஆய்வுபகுதியாகஎடுத்துசெய்யவேண்டும்என்றுஎனக்குநான்இந்த ஆய்வுஎன்முழுஒத்துழைப்புநீட்டிக்கஎன்றுஉறுதியளிக்கிறேன்.

பெயர்மற்றும்தொண்டர்முகவரி:

தொண்டர்கையொப்பம்/பெருவிரல்ரேகை
நாள்:

சாட்சிகள்:
(கையொப்பம், பெயர்மற்றும்முகவரி)
நாள்:

பெயர்மற்றும்புலன்விசாரணைகையொப்பம்:(டாக்டர்)

PROFORMA

Name : Age : Sex :

IP NO: D.O.A:

Wt: Ht:

Mode of injury:

List of injuries;:

Chest x ray and x ray abdomen erect;

Ct abdomen

Diagnosis

Management

Post operative period

INCLUSION CRITERIA FOR THE STUDY:

1. Patient presenting with history of blunt injury over abdomen
2. Road traffic accident with suspected hollow viscus injury
3. Age group 13-70

EXCLUSION CRITERIA :

1. Peadiatric age group
2. Penetrating injuries
3. Age group more than 70

SAMPLE SIZE

All patients admitted in ward within the study period according to inclusion criteria

MASTER CHART

S.No.	NAME/IP No.	Age/Sex	Mode of injury	IP (In hrs)	ASSOCIATED INJURIES	Hb	PLAIN X RAY ABDOMEN	USG	4 QT	CT	Clinical Diagnosis	Laprotomy findings	Operaative procedure
1	sharma	21,M	RTA	8	-	10.7	N	FF	+ve	Pneumoperit oneum Bowel wall thickening FF	BIA with HVI	Ileal perforation	Perforation Closure
2	Sodalai	45,M	RTA	22	polytrauma	11.1	AUD	FF	+ve	Not done	BIA with HVI	Jejunal perforation	R & A
3	viswanathan	28, M	ASSAULT	15		9.8	AUD	FF	+ve	Not done	BIA with HVI	Duodenal perforation	Perforation closure
4	yuvaraj	22 M	RTA	24	Left hemothorax	10	N	FF	+ve	Hemoperiton eum Grade I splenic injury	BIA	Mesenteric tear	Closure Of Mesenteric tear
5	Krishna	24 M	RTA	4	-	10.8	N	FF	-ve	Not done	BIA	Jejunal perforation	Perforation Closure
6	Mariyappan	40 M	RTA	17	-	9.6	AUD	N	-ve	Not done	BIA with HVI	Jejunal perforation	Perforation Closure
7	Raman	42 M	FFH	23	-	11.2	N	FF	+ve	Solid organ normal	BIA	Mesenteric tear	Closure Of Mesenteric tear
8	Kartheshwaran	20 M	RTA	13		9.6	AUD	FF	ve	Not done	BIA with HVI	Ileal perforation	Perforation Closure

9	Kalifullah	34 M	TTA	8	-	8.9	AUD	N	ve	Not done	BIA with HVI	duodenal perforation	Perforation Closure
10	sathish	38 M	RTA	21	polytrauma	10.1	N	N	ve	FF	BIA	Mesenteric tear	Closure Of Mesenteric tear
11	krishnakumar Ar	24M	RTA	48	-	11.4	AUD	N	ve	N	BIA	Ileal perforatin	R & A T
12	Siva	32M	RTA	18	-	12.1	AUD	FF	ve	Not done	BIA with HVI	Descending colon perforation	Colostomy
13	Babu	33 M	RTA	14	-	8.2	N	N	ve	Not done	BIA	Bladder rupture	Bladder repair
14	Ramesh	29 M	BWB	60	Rt humerus #	9.3	AUD	N	ve	Not done	BIA with HVI	Gastric perforation	Perforation Closure
15	Mageshwari	20 f	RTA	20	-	11.1	AUD	FF	ve	FF	BIA with HVI	Jejunal transection	R & A
16	Kannan	37 M	RTA	26	Rt hemothorax	7.9	AUD	FF Liver laceration	ve	Not done	BIA with HVI with liver injury	Jejunal perforation with liver laceration	Perforation Closure
17	Ravi	25, M	TTA	5	Head injury	9.4	N	N	ve	N	BIA	Mesenteric tear	Closure Of Mesenteric tear

18	Yuvaraj	29, M	FFH	65	polytrauma	10.3	AUD	FF Liver injury	ve	Not done	BIA with HVI with liver injury	Ileal transection with grade 1 liver injury	Perforation Closure
19	Manoharan	19 M	RTA	26		9.9	AUD	N	ve	Not done	BIA with HVI	Gastric perforation	Omental patch closure
20	Sudhakar	23, M	FFH	38	-	9.6	N	FF	ve	FF	BIA	Mesenteric tear with bladder rupture	Bladder repair with closure of mesenteric tear R
21	Kannan	55, M	RTA	54	-	9.2	AUD	N	ve	Not done	BIA with HVI	Ileal perforation	Perforation Closure
22	Arivalagan	14, M	RTA	15	Head injury	11.2	N	FF	ve	FF	BIA	Mesenteric tear	Closure Of Mesenteric tear
23	Rajan	26, M	FFH	16	Temporal lobe contusion	9.6	AUD	FF	ve	Not done	BIA with HVI	Ileal perforation	R & A
24	Karthik	28, M	RTA	27	polytrauma	9.6	N	FF	ve	FF	BIA	Mesenteric tear	Closure Of Mesenteric tear
25	Kumar	35, M	RTA	15	Lt hemothorax	10.6	AUD	FF	ve	Not done	BIA with HVI	Jejunal perforation	R & A

26	Dhanapal	28, M	BWB	8	-	8.6	N	N	ve	FF	BIA	Mesenteric tear	Closure Of Mesenteric tear
27	Kantha	52 F	RTA	20	Lt ulnar #	9.5	N	N	ve	Pneumoperit oneum	BIA with HVI	Gastric perforation	Perforation Closure
28	Bhuvanesh Wari	32, F	RTA	19	-	7.6	N	N	ve	FF	BIA	Mesenteric tear	Closure Of Mesenteric tear
29	Gopal	57M	FFH	6	polytrauma	10.8	N	N	ve	FF	BIA	Mesenteric tear	Closure Of Mesenteric tear
30	Annamalai	26, M	BWB	66	Pelvic #	10.9	AUD	FF	ve	Intraperitoneal rupture of bladder	BIA with HVI	Sigmoid colon perforation with Bladder injury	Colostomy with Bladder Repair
31	Stephen	19, M	RTA	5	Pelvic #	11.8		FF	ve	Intraperitoneal rupture of bladder	BIA with HVI	Bladder injury	Bladder Repair
32	Amudha	27 F	FFH	13	Pelvic #	9.8	N	FF	ve	Intraperitoneal rupture of bladder	BIA with HVI	Bladder injury	Bladder Repair