CROSS SECTIONALSTUDY ON ACCURACY OF DIAGNOSTIC PERITONEAL PARACENTESIS IN ACUTE ABDOMEN REQUIRING EMERGENCY SURGICAL INTERVENTION

Dissertation Submitted to

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

In partial fulfilment of the regulations for the award of the degree of

M.S. GENERAL SURGERY

BRANCH - I

GOVERNMENT VELLORE MEDICAL COLLEGE

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

TAMILNADU, INDIA

APRIL 2020

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Title of the Study	-	CROSS SECTIONAL STUDY OF ACCURACY OF DIANOSTIC PERITONEAL PARACENTESIS IN ACUTE ABDOMINAL CONDITION REQUIRING EMERGENCY SURGICAL INTERVENTION IN PATIENTS PRESENTING TO GVMC HOSPITAL, VELLORE
Principal Investigator	-	Dr. T. Kamalakannan, I Year PG, MS General Surgery
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https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3468117/
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CONTENTS

INTRODUCTION

Acute abdomen refers to symptoms and signs of intrabdominal disease which are most likely to be treated best by surgical operations. Many diseases of abdomen though may look alike acute abdomen for example diabetic ketoacidosis, viral haemorrhagic fever do not require surgical treatment. Hence prpoer diagnosis of acute abdomen and indication for surgical procedure should be properly evaluated in a proper and careful manner.

Proper management of patients presenting as acute abdomen requires a timely decision about the need for surgical procedures. Indication for surgical intervention requires detailed evaluation of patients clinical history, clinical examinations, labaratory investigations and imaging modalities.

Majority of patients presenting as acute abdomen can be diagnosed clinically by presence of abdominal pain, abdominal tenderness, guarding and rigidity. Diagnostic modalities should confirm the diagnosis and it should help surgeons in decision of requirement for surgical intervention safely and accurately. Though many imaging modalities like digital x rays, USG, CT and MRI available these days which can diagnose accurately are not available everywhere or not available 24 hours in developing countries like India. Hence a diagnostic tool should be there which should be simple, easy to use, accurate and should be available bedside.

Diagnostic peritoneal paracentesis is a simple bedside procedure which can aid in the diagnosis accurately. It just requires wide bore needle and a disposable syringe which is available anywhere. The main principle in diagnostic peritoneal

paracentesis is to detect the intraperitoneal fluid collection in four quadrants of abdomen. Analysis of aspirated intraperitoneal fluid will aid in confirming the diagnosis.

Although the procedure may seem blind and chance of puncturing of bowel which is debatable, many studies have proved that chances are less likely. Even if bowels are punctured by needles subsequent leakage is very minimal causing no or very small hazard.

In spite of various studies regarding acceptance of this simple extemely useful bedside diagnostic procedure, some continue to deplore and others have not had experience in performing this procedure or do not understand the advantages and disadvantages of four quadrant aspiration in surgical acute abdomen.

AIM OF THE STUDY

1. To evaluate the acccuracy and effectiveness of abdominal paracentesis as a simple, bedside diagnostic tool in diagnosing the acute abdominal conditions requiring emergency surgical interventions.
2. Correlation of laparotomy with the abdominal paracentesis data to predict its diagnostic accuracy and effectiveness as a diagnostic tool .

REVIEW OF LITERATURE

Although diagnostic peritoneal paracentesis has been used for very long time, history of its usage are available for 100 years.

“Solomon the first person to describe the technique of abdominal peritoneal paracentesis in 1906”passed a ureteral catheter through a small trochar into the peritoneal cavity to obtain a sample of peritoneal fluid and described the procedure as a “useful one”.

The first study of the technique was done by Neuhof and Cohen in 1926 and they reported its use as a diagnostic aid in the evaluation of closed abdominal injuries, acute pancreatitis and primary pneumococcal or streptococcal peritonitis.

Accuracy of the procedure was investigated in 1960 by experimental studies on dogs. Experimental studies in dogs showed that there is a stong linear relation between the amount of fluid in the peritoneal cavity and high chance of obtaining a sample by needle paracentesis. A volume of 500 ml of free fluid in the peritoneal cavity expected to give a 78% positive paracentesisis.

Peritoneal paracentesis is a safe procedure even in cases of intestinal obstruction, where there is a chance of puncturing the bowel. Many clinical studies have shown the safety of abdominal paracentesis in intestinal obstruction.

In 1954 a experimental study conducted on dogs, where an isolated loop of segments of intestine was deliberately punctured and subsequently inflated. They found no leakage until a pressure of 260 mmHg was reached, whereas intraluminal

pressure seldom rises above 15 to 20 mm of Hg in intestinal obstruction. Therefore the chance of leakage from accidental puncture is very small.5

In 1965 a study was conducted to determine the safety of the procedure. The intestinal tract of an anesthetized dog was dilated by a continuous flow of air through an intragastric Levin tube. Twenty needles of 15 and 18 gauge were inserted deeply through the abdominal wall at scattered position over a circular area approximately 6 inches in diameter. When the abdominal wall was turned down as one large flap, it was seen that none of the needles, despite the depth of their insertion had penetrated the bowel wall.

The same author conducted another study to test the leakage from bowel if punctured accidentally. In a same anaesthetised dog, 5 needles of 15 or 18 gauge were inserted into isolated loop of jejunum. After the needles were removed, the loop was filled with diluted plasma stained with methylene blue. No leakage of plasma occurred through the needle punctures. The usual intraluminal pressures observed in the presence of complete intestinal obstruction are less than 15 mm of Hg for small intestine and 20 mm of Hg for large intestine. No leakage of plasma from the needle puncture in this loop was observed until the intraluminal pressures reached 180mm of Hg, more than ten times the pressure usually present in complete obstruction.

“Four quadrant tap was first done by Byrne in 1956.

A study conducted in 1967 describes a different technique of peritoneal tap. A polythene catheter was inserted with the aid of a trocar and cannula into the

abdominal cavity under local anaesthesia. Before aspiration, the catheter was left in the peritoneal cavity for 2 or 3 minutes and then aspirated.

An article published in 1972 describes an interesting technique of aspirating peritoneal fluid. A trocar and cannula was passed through an incision made 3-5 cms below the umbilicus in the midline under local anaesthesia into the peritoneal cavity. The trocar was then removed and a soft flexible plastic catheter (a dialysis catheter is ideal) was inserted into the peritoneal cavity and gently manipulated into the pouch of Douglas. A small sample of fluid was then aspirated. As the pouch of Douglas is the most dependent part of the peritoneal cavity, a small amount of fluid will collect their first and chances of false negative rates will be decreased.

Peritoneal tap can also be performed over the site of maximum tenderness which is particularly useful in some cases of localized collection of fluid, like in laceration of spleen where fluid will collect in left paracolic gutter.

Different authors have used different needles and syringes while doing paracentesis. “Strickler J. W. (1958) used a 14 gauge needle through which polythene tubing was threaded into the peritoneal cavity. “Giacobine J. N. (1960) used an 18-20 gauge needle and employed a gentle suction with a syringe”. Baker W. N. W. (1967) advocated the use of a 12 gauge needle attached to 2-5ml syringe and needle introduced without anaesthesia”. “Prout W. C. (1968) had used a needle without a catheter and does not recommend a complicated apparatus as it was not practicable for routine usage.13” “Trivedi D. R. et al. (1971) used an 18 gauge needle 5 cm long with 10ml syringe with normal saline to prevent accidental entry of air into the

peritoneal cavity.14" "McPartlin J. F. (1971) used a needle with a 5 ml syringe under local anaesthesia and aspiration continued till the needle was withdrawn.10"

Most of the workers have taken paracentesis as positive when, quantity larger than 0.5 ml of any fluid has been aspirated from the peritoneal cavity or if the fluid is obviously pathological.

Negative paracentesis is the main drawback of the peritoneal paracentesis, quoted in the literature. Though, the positive peritoneal tap indicates intraabdominal pathology, negative tap does not rule out abdominal pathology .Explanation given to this statement was that peritoneal paracentesis is a blind procedure. There are chances of needle tip not entering the fluid level or minimal fluid in the peritoneal cavity or collection of fluid in the pouch of Douglas or localised collection of the fluid, not amenable to needle paracentesis.

No life threatening complication has been reported in the literature. Only a few complications had been encountered. Prout W. C. in 1968 reported three complications; Hematoma of anterior caecal wall and adjacent mesentery, inferior epigastric artery puncture with a small hematoma of the abdominal wall and a punctured iliac vessel.

McDonald J. in 1961 encountered a case of hematoma of the rectus sheath.Many authors reported no complications even though bowel was punctured during the procedure. Steinberg B. (1941) reported that intestinal loops are pushed away by the point of the needle and even a deliberate experimental attempt to puncture the bowel was not accomplished.17 In contrast to the above statement, Siler V. E. (1960) reported that, there is always some degree of trauma to the abdominal viscera and the lumen of intestine is more frequently entered. He mentions that, the gut has the ability to seal the punctures readily with very little contamination of the peritoneal cavity.(1)

ANATOMY AND PHYSIOLOGY OF THE ABDOMINAL CAVITY

EMBRYOLOGIC AND PHYSIOLOGIC CONSIDERATIONS

The structures developing initially as midline structures, the visceral pain is felt along the midline of the abdomen. The structures which are segmental in origin, the pain originating from that segment will corresponds to the same segments.

The developing gastrointestinal tract can be into three regions based upon the blood supply and nerve supply, relationships which are maintained from embryonic to adult life.

Development stage	Gestational week	Outline of development	Congenital anomalies resulting from adverse development
Stage 1	5th–8th week	The midgut loop, mesentery and the SMA 'herniate' into umbilical cord The midgut loop rotates 180 degrees counter-clockwise	**Atresia** – usually esophageal (1/4000 births), duodenal or anal **Mesenteric cysts** **Diverticula** – congenital, incl. ileal (Meckel's) and jejunal **Duplication** – e.g. of colon (rare)
Stage 2	10th–12th week	Midgut returns to abdominal cavity and rotates a further 90 degrees Small intestine lies to the right of the cavity Cecum is still outside the abdomen, but gradually enters the abdomen and rests in the RUQ	**Congenital omphalocele** – intestines fail to return to abdomen (hernia) **Non-rotation** – colon left side, cecum midline, small bowel left **Incomplete rotation** – cecum LUQ, fixed colon (may lead to volvulus) **Reversed rotation** – transverse colon posterior to duodenum **Malrotation** – leading to increased risk of volvulus and obstruction
Stage 3	By 12th week	Cecum descends into the RIF Ascending and descending colon becomes anchored by peritoneum to the posterior abdominal wall Ligament of Treitz develops (duodeno-jejunal flexure) Small bowel mesentery retracts to its permanent position	**Cecal anomalies** – undescended/mobile/hyperdescended cecum **Colon/ileocecal mesentery** – laxity and hypermobility increasing risk of volvulus **Internal hernias** – where colonic fixation is incomplete

SMA, superior mesenteric artery; RUQ, right upper quadrant; LUQ, left upper quadrant; RIF, right iliac fossa

DEVELOPMENT OF GUT

The embryonic gut is developed from endoderm during fourth gestational week . The gut is divided into foregut, midgut, and hindgut. Excluding duodenum, which is a foregut structure, the rest of small intestine is developed from the midgut. The gut initially communicates with the yolksac.Eventually the communication between these two structures narrows by the sixth week to form the vitelline duct.

During the fourth week of gestation, mesoderm of the embryo splits. The mesodermal portion adherent to the endoderm develops into the visceral peritoneum, while the portion adherent to the ectoderm develops into parietal peritoneum. This mesodermal division forms coelomic cavity which is the precursor of the peritoneal cavity.

The developing intestine herniates out of the coelomic cavity during the fifth gestational week and undergoes a counterclockwise rotation about the axis of superior mesenteric artery. In the process of continuous Intestinal rotation, the developing transverse colon passes anterior to the developing duodenum. Final positions of the small intestine and colon results from a 270 degree counter clockwise rotation of the developing intestine and its return into the abdominal cavity.(2)

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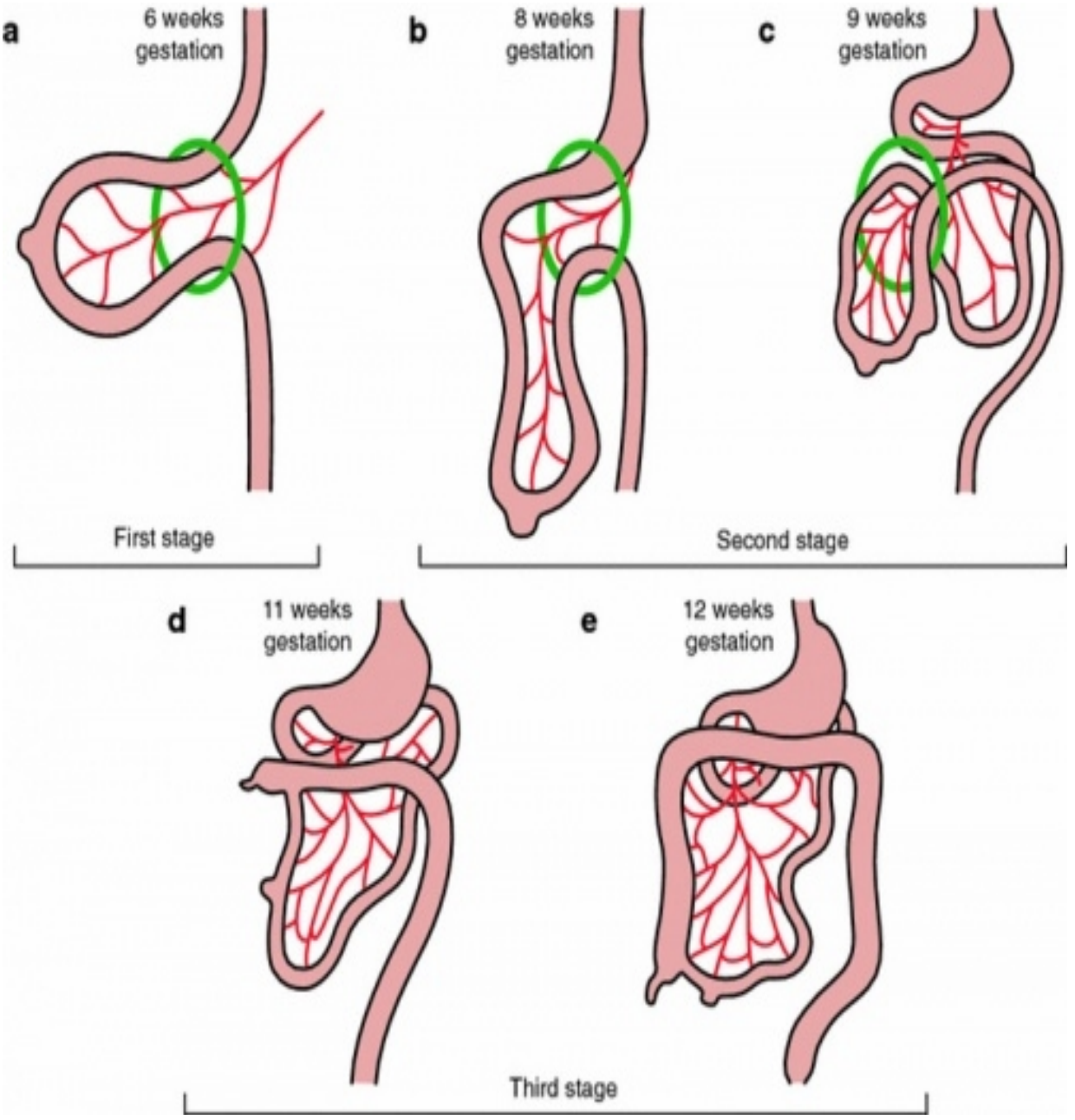
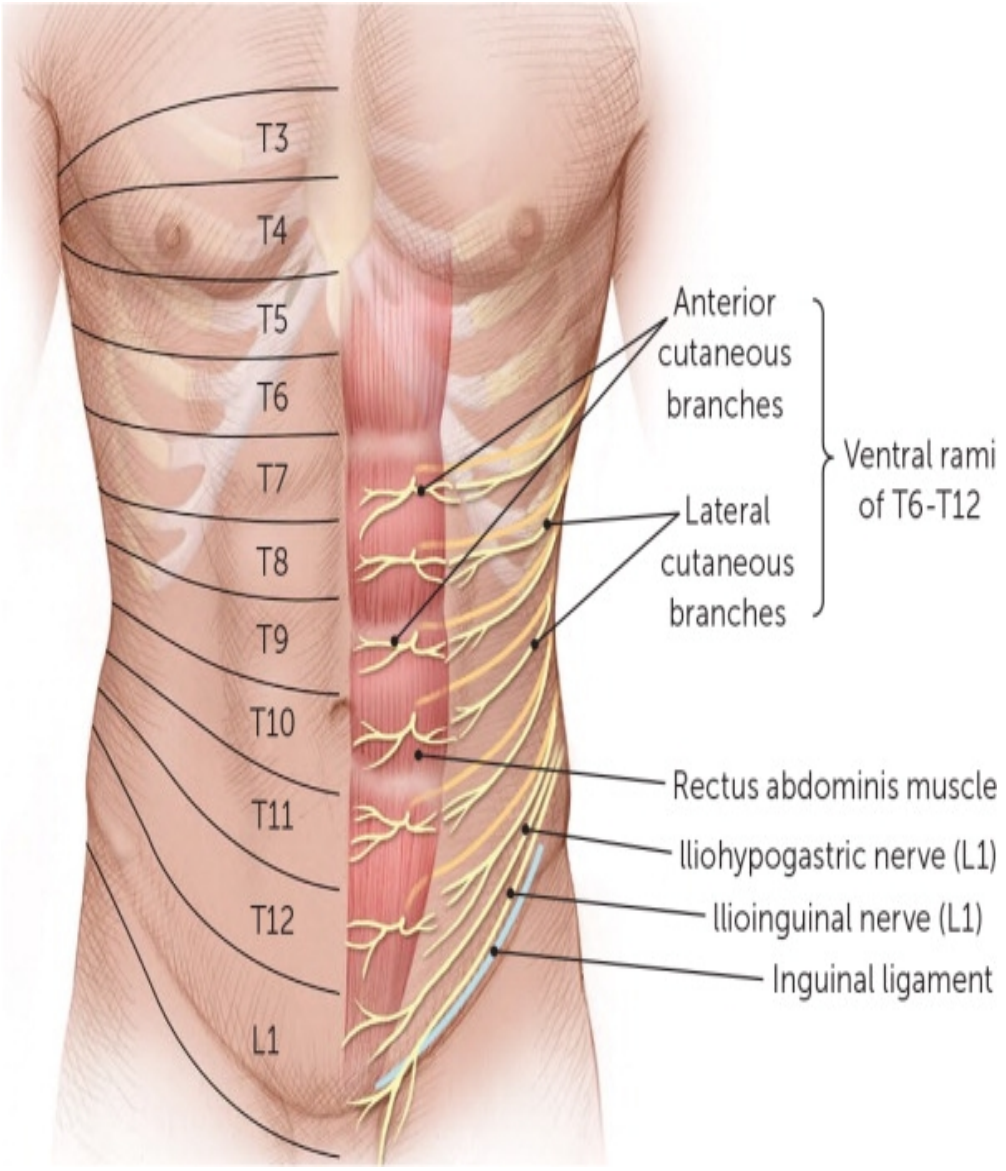

a
6 weeks gestation
b
8 weeks gestation
c
9 weeks gestation
First stage
Second stage
d
11 weeks gestation
e
12 weeks gestation
Third stage

DERMATOMAL SENSORY INNERVATION OF

ANTERIOR ABDOMINAL WALL



CLASSIFICATION OF ABDOMINAL PAIN

Abdominal pain can be classified as visceral , somatoparietal and referred pain

Visceral peritoneum is supplied by autonomic innervation and parietal peritoneum is supplied by somatic innervation. This difference explains character of the pain associated with irritation or inflammation.

Somato Parietal pain is more sharp, intense, severe, persistent and more precisely localized than visceral pain, as the nerve impulses mediating parietal pain travel within somatosensory spinal nerves and react the spinal cord in the peripheral nerves corresponding to the cutaneous dermatomes from T6 to L1. Lateralization of parietal pain is because of unilateral innervation of given part of the parietal peritoneum.

On the other side, painful stimuli involving the visceral peritoneum which is due to stimulation of visceral nociceptors , is perceived as a vague, dull aching, cramping or aching, poorly localised to the periumblical, epigastriumn or hypogastrium, depending on the embryonic origin of organ involved. Visceral pain is often associated with secondary autonomic effects such as nausea, diaphoresis, vomiting.

Visceral pain is felt in the midline as these organs transmit sympathetic sensory afferents to both sides of the spinal cord. The visceral pain is poorly

localized as the innervation of most viscera is multisegmental and contains fewer nerve receptors.

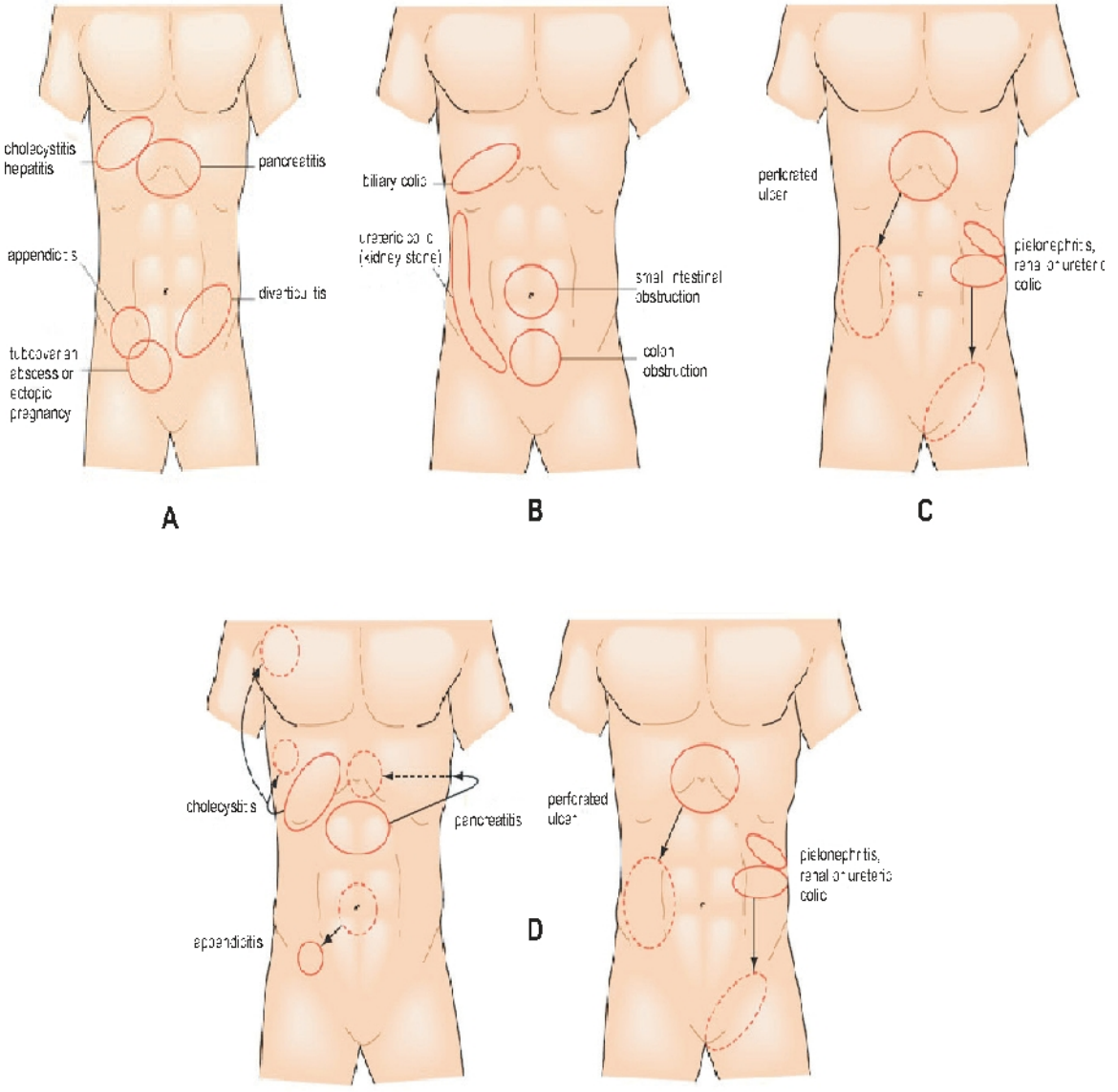
Visceral pain usually implies the presence of significant intraabdominal diseases. A transition from visceral to somatic pain implies extension of the underlying disease process to include the parietal peritoneum and urgent need for operative intervention. Hence it is essential to distinguish between localised somatic pain and diffuse somatic pain. Surgical conditions associated with localised peritonitis may require urgent operation, the degree of urgency is far less than in diffused peritonitis, which generally indicates a surgical emergency.

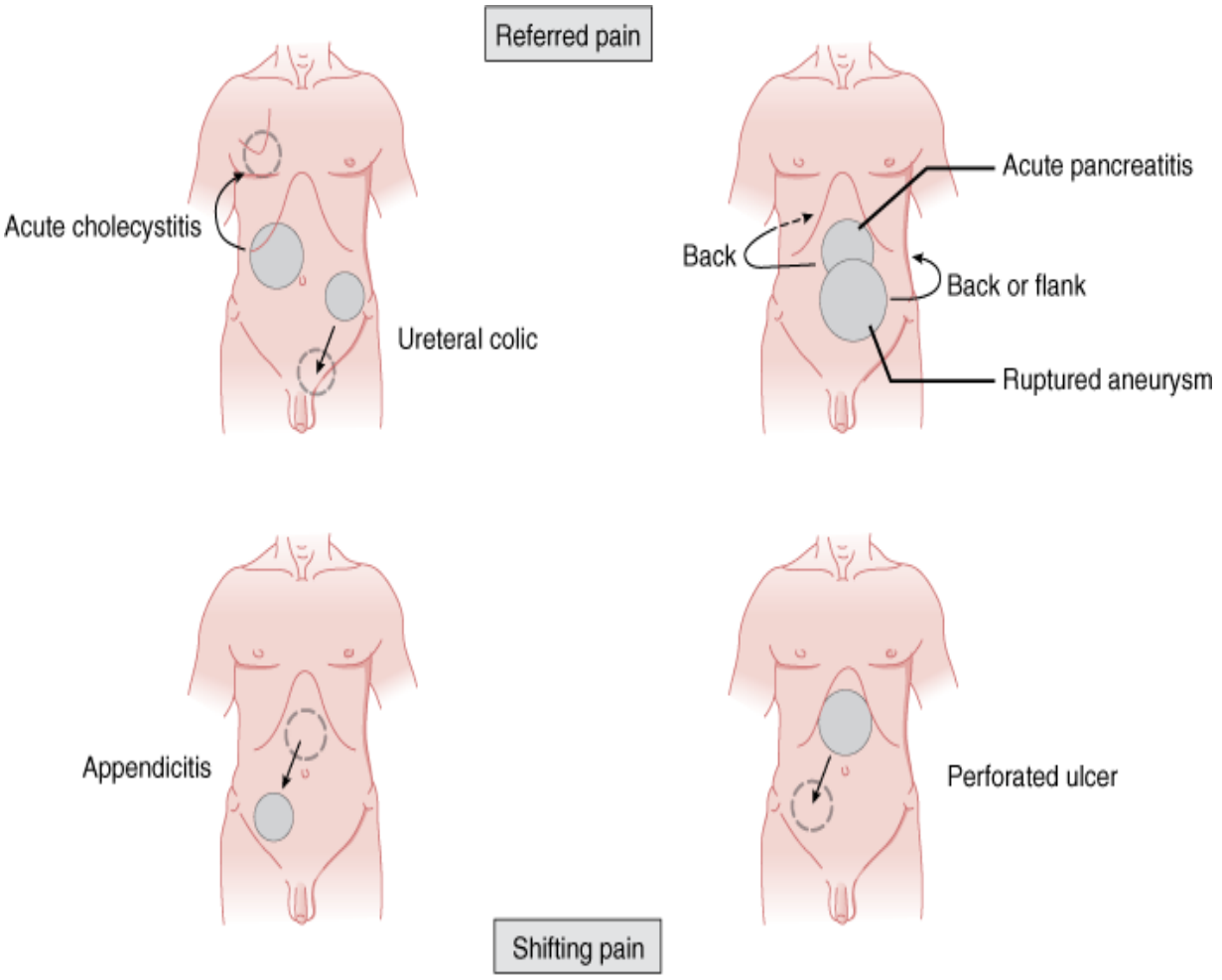
Pain of foregut origin (stomach, duodenum and biliary tree) is perceived in the epigastrium, midgut pain (intestine, appendix, right colon) in the periumbilical origin and hind gut pain (left colon and rectum) in the hypogastrium respectively. (3)

SITES OF REFERRED PAIN	Organ involved	Examples
Right shoulder	Diaphragm, Gallbladder, liver	Biliary colic, perforated ulcer, pneumoperitoneum
Left shoulder	Diaphragm, Spleen, Stomach, Pancreatic tail, Splenic flexure of Colon	Splenic rupture, Pancreatitis
Back	Pancreas, Duodenum, Aorta	Pancreatitis, ruptured abdominal aortic aneurysm
Coccyx	Uterus, Rectum	Uterine colic
Groin or genitalia	Kidney, Ureter, Iliac arteries	Ureterolithiasis

A third type of the pain is referred pain which is perceived at a site distant from the source of stimulus. Referred pain is perceived at a site removed from the anatomic location of the disease but in a region that shares a common embryonic origin.

PAIN SITES OF VARIOUS DISEASES





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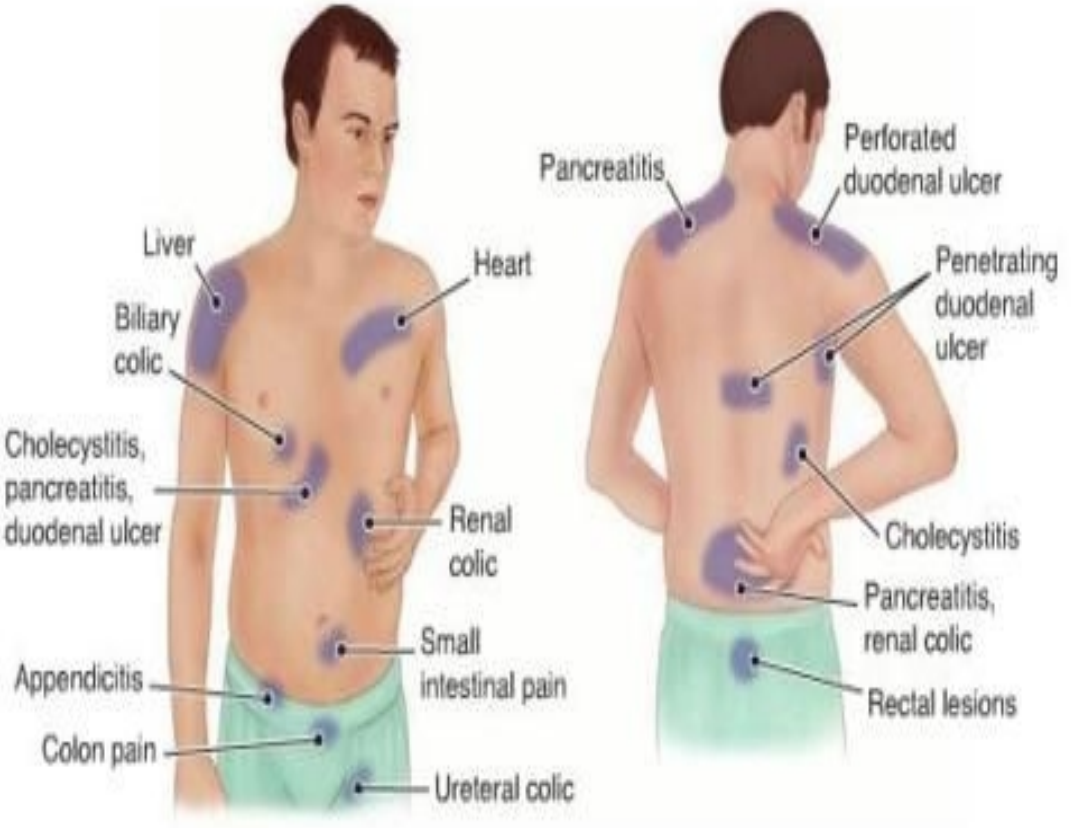
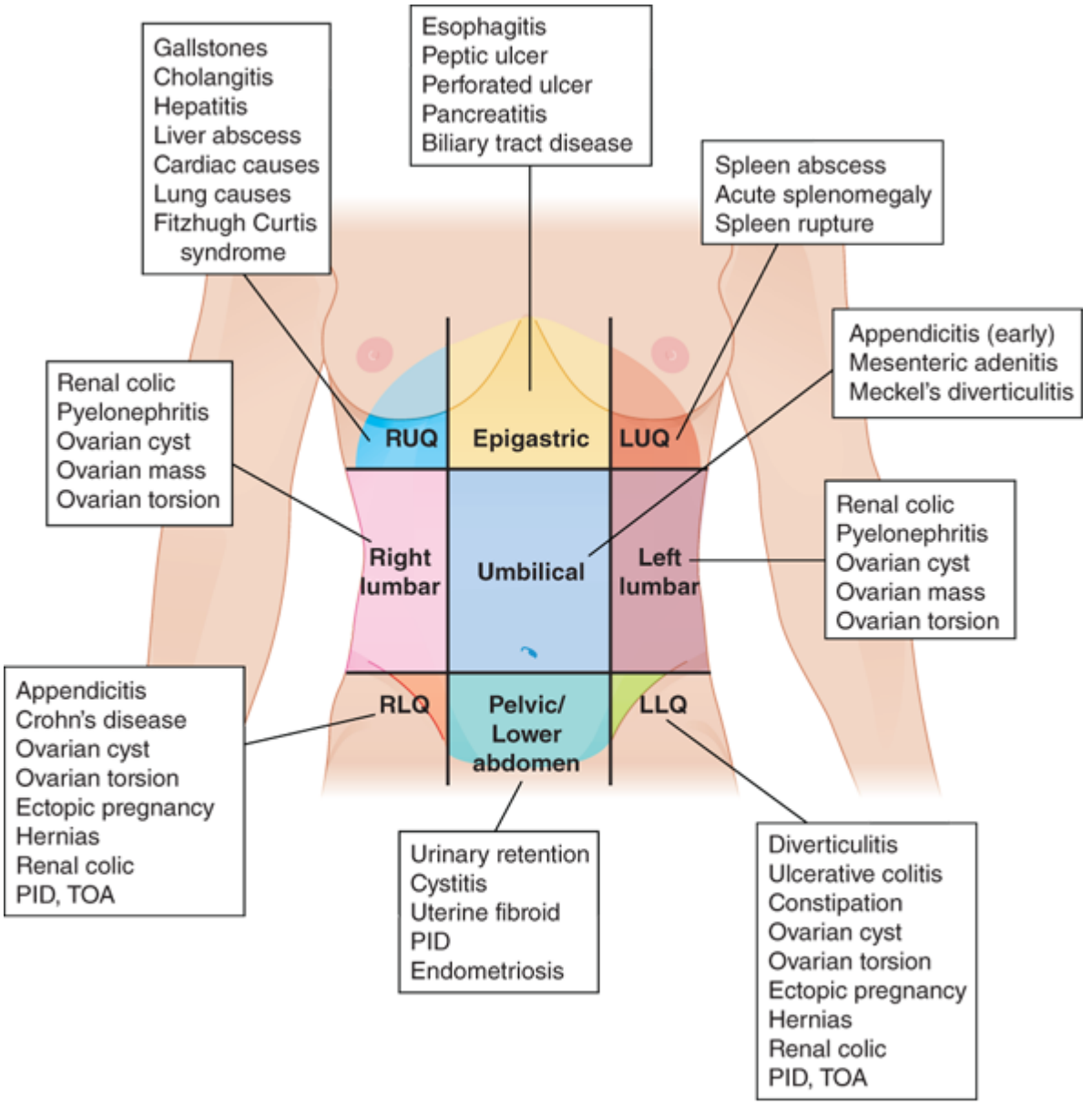

Liver
Heart
Biliary colic
Cholecystitis, pancreatitis, duodenal ulcer
Renal colic
Small intestinal pain
Appendicitis
Colon pain
Ureteral colic
Pancreatitis
Perforated duodenal ulcer
Penetrating duodenal ulcer
Cholecystitis
Pancreatitis, renal colic
Rectal lesions



Source: J.E. Tintinalli, J.S. Stapczynski, O.J. Ma, D.M. Yealy, G.D. Meckler, D.M. Cline: Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 8th Edition
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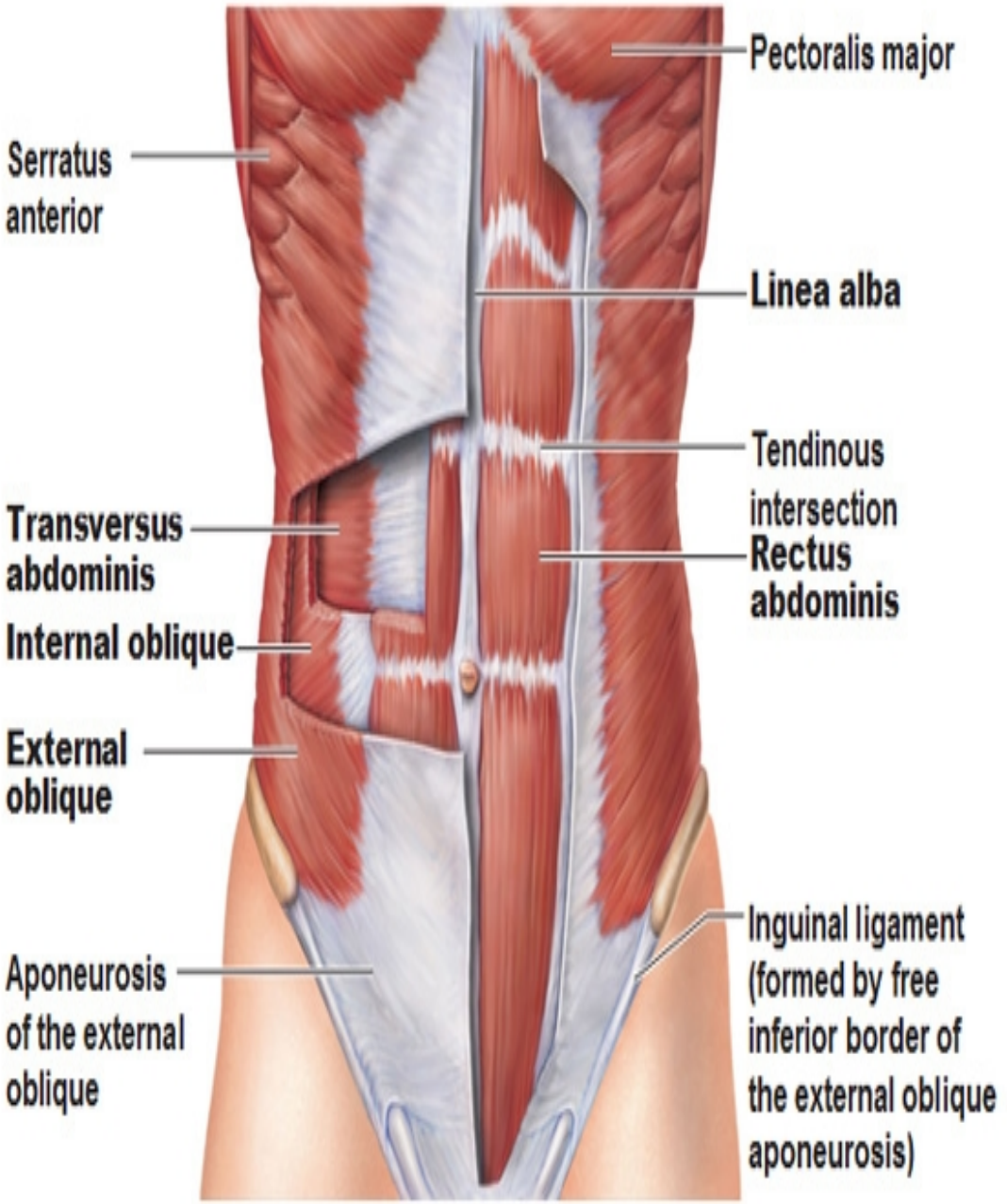
ANATOMY OF ABDOMINAL WALL AND THE PERITONIAL CAVITY

ANATOMY (4)

Abdomen extends from the diaphragm to the pelvic base. Abdomen can be diviced into abdomen proper and lesser pelvis.

BOUNDARIES OFABDOMEN PROPER

ANTERIOR	:	Rectus Abdominis
		pyramidalis
		aponeurotic parts of the externus, internus and transversus abdominis.
LATERAL	:	parts of three flat muscles,
		Iliacus muscle
		Iliac bones
POSTERIOR	:	Lumbar vertebral column
		Psoas major
		Quadratus lumborum
ABOVE	:	Diaphragm
BELOW	:	Lesser pelvis


Pectoralis major
Serratus anterior
Linea alba
Tendinous intersection
Transversus abdominis
Rectus abdominis
Internal oblique
External oblique
Aponeurosis of the external oblique
Inguinal ligament (formed by free inferior border of the external oblique aponeurosis)

LAYERS OF ANTERIOR ABDOMINAL WALL (5)

Layers of the anterior abdominal wall pierced during peritoneal tap from outside to inside.

1. Skin
2. Superficial fascia

a) Fatty layer – Camper

b) Deep Membranous – Scarpa

3. External oblique – muscle, aponeurosis
4. Internal oblique muscle
5. Transverses abdominis muscle
6. Fascia transversalis
7. Extra peritoneal fatty tissue
8. Peritoneum

ABDOMINAL QUADRANTS

The abdomen is divided into nine quadrants by imaginary planes, two horizontal and two parasagittal.

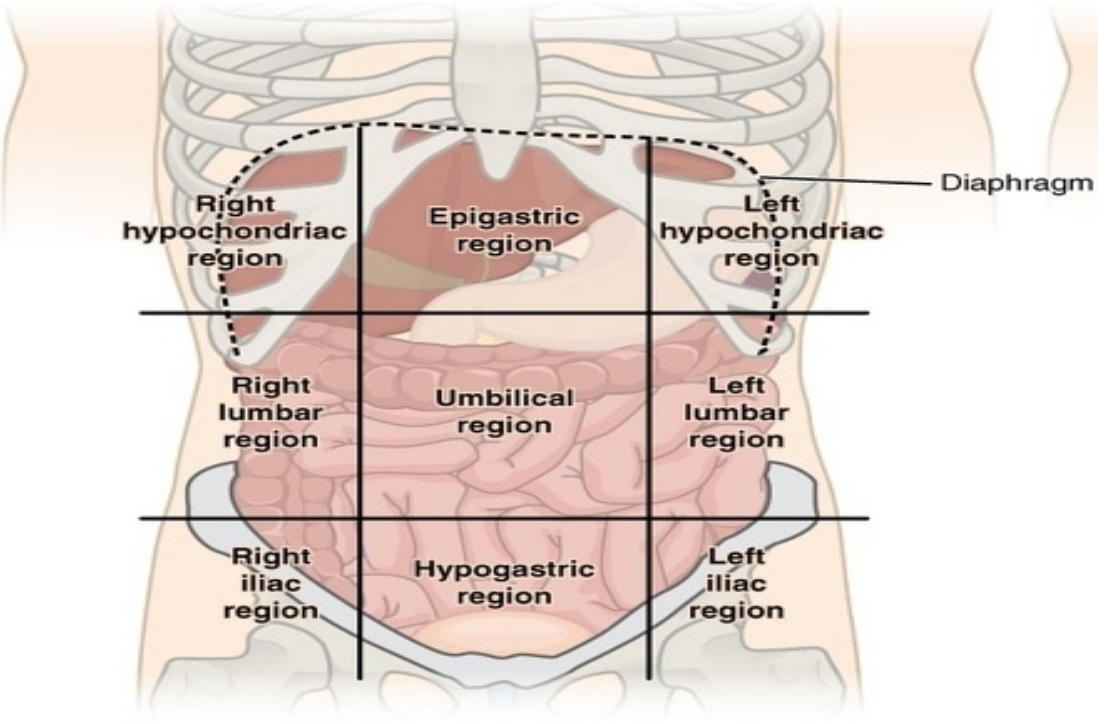
The upper, horizontal transpyloric plane (of Addison) is a line encircling the body midway between the suprasternal notch and the symphysis pubis or hand's breadth below the xiphisternal joint. It passes through the lower border of the first lumbar vertebral body and coastal margins at the tips of the ninth coastal cartilages.

The lower horizontal, transtubercular plane is a line round the trunk level with the iliac tubercles, which passes through the upper border fifth lumbar vertebral body

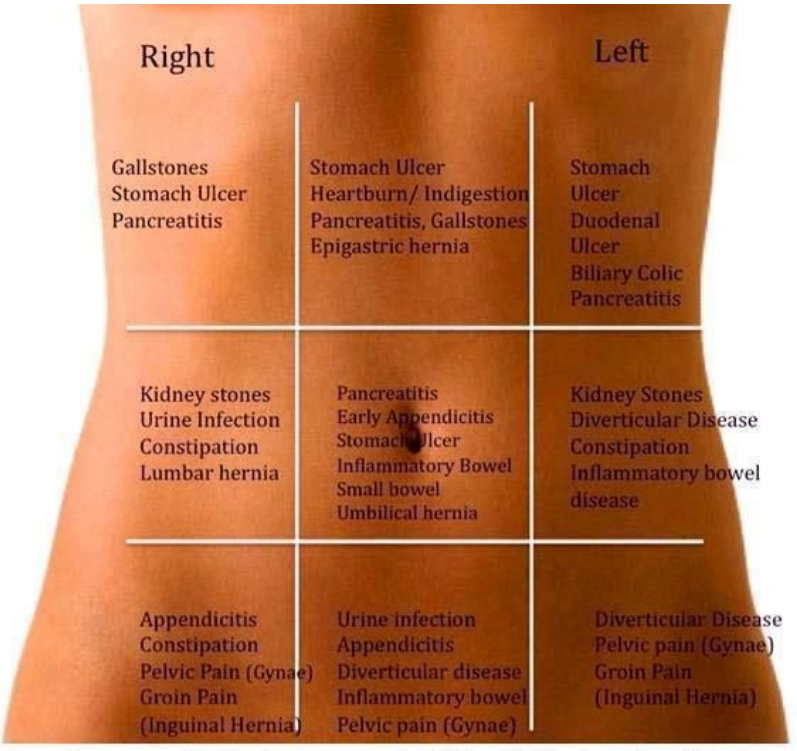
The abdomen is divided into three imaginary zones which inturn is further subdivided into three by the right and left lateral planes indicated, on the surfaces by vertical lines through points midway between the anterior superior iliac spines and symphysis pubis.

NINE QUADRANTD OF ABDOMEN(6)

1. *Right hypochondrium,*
2. *Epigasrium,*
3. *Left hypochondrium,*
4. *Right lumbar*
5. *Umblical*
6. *Left lumbar*
7. *Right iliac*
8. *Hypogastrium*
9. *Left iliac*



(a) Abdominopelvic regions



Quadrants of Abdomen and d/d of Abdominal Pains

PERITONEUM AND PERITONEAL CAVITY(7)

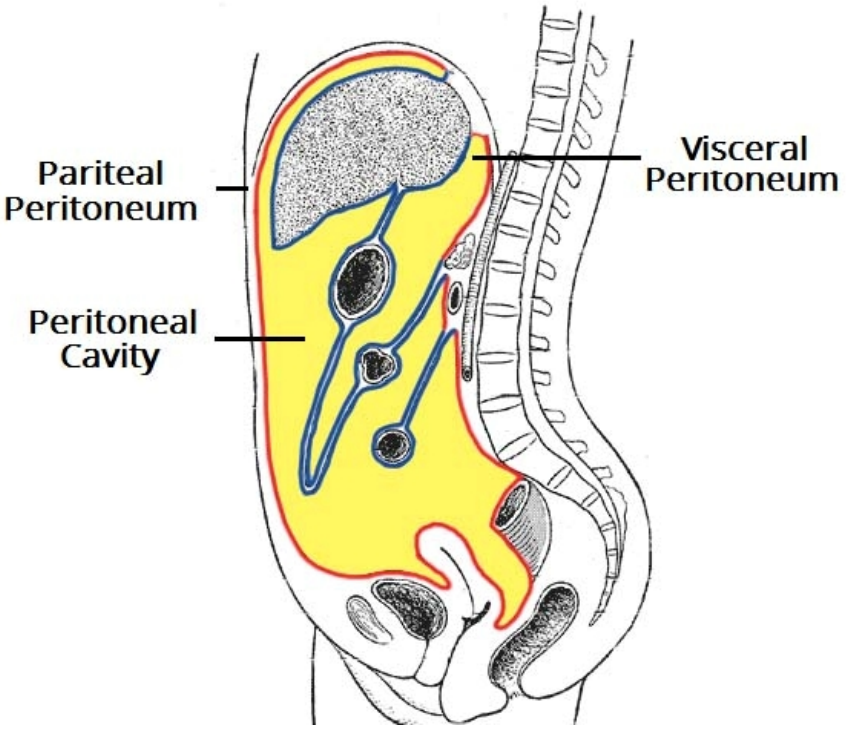
The peritoneum is a single sheet of simple squamous epithelium which is termed as mesothelium (mesodermal origin). The peritoneum, largest and most complexly arranged serous membranes, is an empty and intricately folded sac, lining the abdomen which is reflected over the viscera.

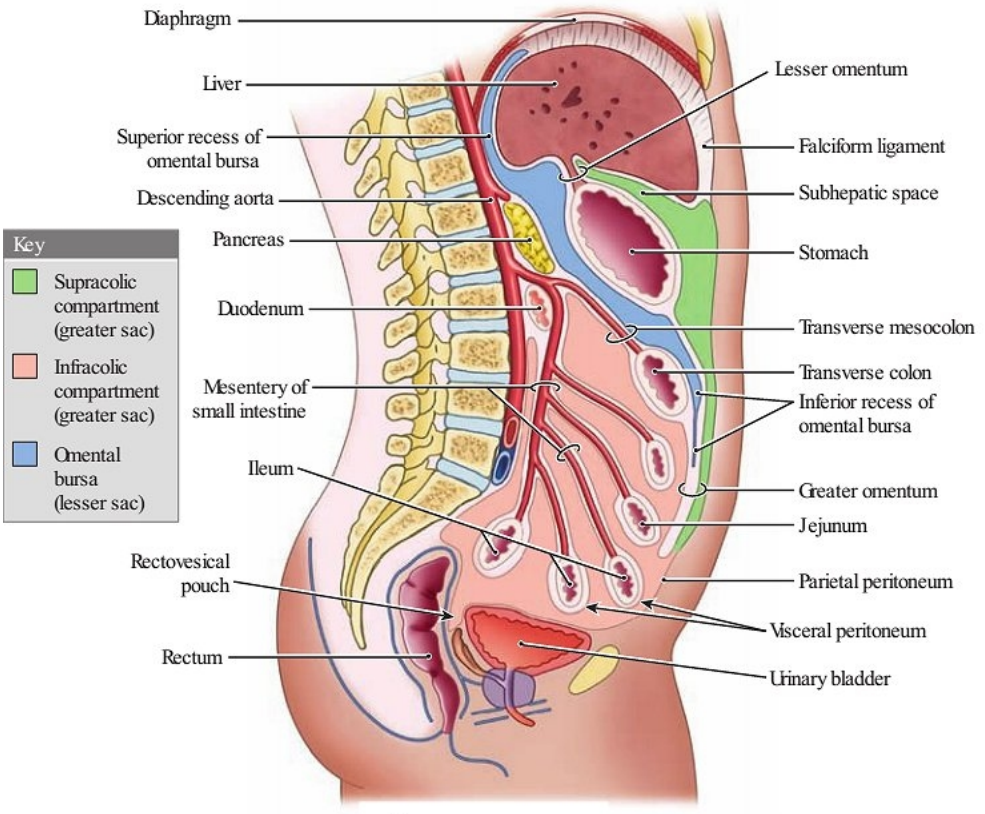
It is a closed sac in male. On the contrary the lateral ends of the uterine tubes open into the sac's potential cavity in females.

Peritoneum is divided into,

1) Parietal peritoneum

2) Visceral peritoneum





A. Right Lateral View

Parietal peritoneum lines the surfaces of anterior, posterior, lateral abdominal wall , inferior surface of diaphragm and pelvis.

Parietal peritoneum is reflected over the viscera as the visceral peritoneum which lines intraperitoneal organs.

The free surface of parietal peritoneum is covered by mesothelium. The mesothelial cells secrete serous fluid allowing gliding movements of the viscera.peritoneal cavity contains < 100 ml of sterile serous fluid in normal healthy adult.

Over the diaphragm, the mesothelial cells contains unique anatomic and functional arrangement. The smooth layer of cells is interrupted by huge number of intercellular gaps called stomata. Stomata are seen only on the muscular portion of the diaphragm.

Factors influencing diaphragmatic uptake of fluid and particles.(8)

1. Mesothelial cells contain the contractile filaments, actin, on paralysing , enlarges in size.
2. Most important is the state of diaphragmatic contraction. On exhalation, the diaphragm relaxes, the stomata open, and due to negative pressure induced by the diaphragm on upward movement, fluid and particulate material are sucked up to the open stomata and then to the substernal lymph nodes and from their to the thoracic duct.
3. Presence of inflammation increases stomata patency by inducing mesothelial cell retraction.

The diaphragmatic lymphatic plays a major role in the absorption of fluid and particulate matter from the peritoneal cavity, both under normal circumstances and during peritonitis. The bacteria and toxins in the peritoneal fluid in peritonitis will be absorbed into the systemic circulation, which results in eventual spread of the infection.

Hence peritoneum is a bidirectional, semipermeable membrane

- The peritoneum maintains the amount of fluid in the peritoneal cavity
- It promotes the sequestration and removal of bacteria from the peritoneal cavity
- It facilitates the migration of inflammatory cells from the microvasculature to the peritoneal cavity.

Peritoneal Fossae and Recesses

Paraduodenal Fossae

The peri- or paraduodenal fossae are "pockets" of the peritoneum on the posterior abdominal wall adjacent to the duodenal-jejunal junction, particularly to the left of the These fossae are enigmatic embryologically, anatomically, and clinically. They are inconstant:

any, all, or none can be found in any one person. The boundaries of these fossae are complex; length, depth, and direction are all involved in naming the actual anatomic entities

Remember, the paraduodenal fossa may be intimately related with the inferior mesenteric vein.

Foramen of Winslow

The epiploic foramen of Winslow is an open, normal aperture. It has the following

Boundaries:

Superior: Caudate process of liver and inferior layer of coronary ligament (rare extension to coronary ligament with hernia)

Anterior: Hepatoduodenal ligament and hepatic triad (portal vein, hepatic artery, common bile cystic duct also present in free edge of lesser omentum)

Posterior: IVC

Inferior: First part of duodenum and transverse part of hepatic artery

Ileocecal Fossae

The superior and inferior ileocecal folds form the ileocecal fossae. A third fossa, known the retrocecal or subcecal fossa, may occasionally appear.

The superior ileocecal fossa has the following boundaries:

Anterior: Ileocecal fold and ileocecal artery

Posterior: Mesentery of terminal ileum and lateral right (ascending) colon

Medial: Below the terminal ileum

The inferior ileocecal fossa has the following boundaries:

Anterior: Ileocecal fold

Posterior: Mesoappendix

Inferior: Medial continuation of ileocecal fold

Superior: Terminal ileum and mesentery

The retrocecal or subcecal fossa, when present, has inconstant boundaries which depend on depth and its medial and lateral expansion. It is found between the

right colic gutter and the posterior surface of the cecum at the ileocecal gutter. It does not exist in the presence of a mobile cecum.

ACUTE ABDOMEN

About half a million people in western people, between 5 and 10 patients are admitted to a surgical ward each and every day with acute abdominal pain. One or two more will complain of acute abdominal symptoms after an accident.

Julian Britton terms it as the illness starting suddenly and presenting to a hospital within three or five days of the onset of symptoms".

Jones S. R. describes the acute abdomen as "signs and symptom of intra-abdominal disease usually treated best by surgical operation".

The most powerful aid to the clinician in arrival of decision in the acute abdomen is detailed history taking and clinical examination plays a primary role, with investigations playing a secondary role. The diagnostic accuracy in the acute abdomen is low which can be improved by up to 20% using computer aided diagnosis. This improvement is associated with reduction in management errors. The clinical data (history taking and clinical examination) are collected on a structured profoma and then entered into a computer, which produces a list of possible clinical diagnosis. (9)

CAUSES OF ACUTE ABDOMEN(10)

The intra-abdominal surgical causes of the acute abdomen can be divided into five major general categories:

1. Hemorrhage
2. Inflammation / infection
3. Perforation
4. Ischemia
5. Obstruction

INTRA-ABDOMINAL CAUSES OF THE ACUTE ABDOMEN

HEMORRHAGE

- Ruptured aortic aneurysm
- Ruptured visceral aneurysm
- Ruptured tumour
- Ruptured solid organ (spleen, liver)
- Postoperative bleeding
- Ruptured ectopic pregnancy
- Ruptured ovarian cyst with hemorrhage

INFLAMMATION / INFECTION

I. Diffuse peritonitis

- Chemical :
  - Perforated peptic ulcer,
  - Bile leak,
- Infection :
  - primary bacterial peritonitis
  - Secondary bacterial peritonitis with foreign body

    (e.g., peritoneal dialysis catheter)

II. Localized peritonitis

- Appendicitis
- Cholecystitis
- Pancreatitis
- Meckel’s diverticulitis
- Diverticulitis
- Intra-abdominal abscess
- Mesenteric lymphadenitis
- Pelvic inflammatory disease
- Gastroenteritis
- Hepatitis
- Tubo-ovarian abscess
- Acute ileitis
- Colitis

PERFORATION

- Gastrointestinal tract
- Esophagus
- Stomach
- Duodenum
- Small intestine
- Colon
- Gallbladder

ISCHEMIA

- Intestinal
- Arterial embolus
- Mesenteric vein thrombosis
- Closed loop obstruction
- Splenic infarction
- Hepatic infarction
- Omental or Mesentric ischemia / infarction
- Infarction of appendix epiploica
- Torsion of the ovary
- Torsion of a uterine fibroid

OBSTRUCTION

Gastrointestinal:

- Adhesions,
- Hernia,
- Tumour,
- Volvulus,
- Intussusception,
- Faecal Impaction

Biliary obstruction:

- Stones,
- Tumour,
- Hemobilia

EXTRA-ABDOMINAL DISEASES THAT CAN MIMIC AN ACUTE ABDOMEN(11)

THORACIC

- Pneumonia
- Empyema
- Myocardial infarction

METABOLIC

- Porphyria
- Diabetes mellitus
- Addisonian crisis
- Uremia

TOXIN-INDUCED

- Lead poisoning
- Arsenic poisoning
- Snake and spider venom
- Insect bites
- Tetanus
- Drugs

GENITOURINARY

- Pyelonephritis
- Upper urinary tract obstruction
- Torsion of the testicle
- Epididymitis
- Torsion of testicular appendages

HEMATOLOGIC

- Sickle cell crisis
- Leukemia

NEUROLOGIC

- Spinal cord tumour
- Osteomyelitis of spine
- Herpes zoster

ABDOMINAL WALL

- Hematoma

PSYCHOGENIC

SURGICAL ASPECTS OF INTRA ABDOMINAL TRAUMA

Abdominal trauma can be due to,

- Traumatic o Blunt injury o Penetrating injury
- Nontraumatic (Instrumentation Injury)

BLUNT INJURY ABDOMEN (12)

Solid organs are more likely to be damaged by compression from blunt trauma rather than the hollow viscera in blunt trauma. Hence spleen, liver, kidney and pancreas are especially vulnerable meanwhile the small intestine, colon, rectum are less likely to be involved.

The outstanding features of injuries to solid organs are hemorrhage and shock.

Shock follows the development of peritonitis in hollow viscous injury. Most common fixed points specially likely to rupture are the retroperitoneal portion of the duodenum, upper foot of jejunum, caecum, hepatic and the splenic flexures of the colon.

Trivial blows might lead to quite serious injuries. Sometimes the spleen may be ruptured by a single blow. This is unlikely in hollow viscera, which do not perforate with trivial injuries.

Williams and Sergent, after experimental and clinical practice, have studied the mechanism of intestinal injury in trauma. They found that intraperitoneal pressures were always greater than the intraluminal pressures of the gut.

The injuries almost always occurred anterior to the spine and were always prevented, if the striking force stopped short of spine. Hence the shearing between two opposing surfaces is the primary cause of intestinal injury owing to blunt trauma.

The experience with explosive decompression, these workers found that, in dogs, there were no intestinal injuries even if, the gut has been previously distended or obstructed.

Non-traumatic perforating wounds involve viscera in proportion to the volume of each of viscera occupies. Consequently in comparison with blunt trauma, there is a great increase in the frequency of wounds of the small bowel and colon.

SPLEEN (13)

Spleen is the commonest organ injured in intra abdominal injuries.

It may be injured by a trivial trauma, such as a blow over the abdomen or the more extensive thoracoabdominal injuries by road traffic accidents.

Diagnosis of splenic injury in penetrating trauma is easy but often challenging in blunt injures.

The clinical manifestations are signs of shock with local evidence of periotoenal irritation. The signs of shock may be delayed for a variable period (subcapsular hematoma) sometimes imposing great challenge in the diagnosis.

Only 30-40% of patients with splenic injuries develops hypotension of below 100 mm of Hg of systolic pressure. Many patients with splenic injuries develop

hypotension and tachycardia in sitting posture. Tenderness, guarding ,distention is present in only about 50-60% of patients with splenic rupture.

The other clinical signs are Kehr's sign and Balance sign. X-ray evidence of fracture lower ribs, fundic gas shadow displacement only give a clue to the diagnosis, which can be confirmed by abdominal paracentesis.

Delayed rupture of spleen was first described by Baudot in 1902.

Asymptomatic interval between abdominal injury and rupture of spleen is known as 'Latent period of BAUDOT'.

The causes of this delayed rupture according to Baudot were,

1) Subcapsular hematoma gradually increasing in size until it causes a delayed rupture.
2) The initial bleeding from a splenic laceration ceased spontaneously but began several days or weeks when the perisplenic hematoma becomes dislodged.

The concept has been challenged recently by Delen and Polley and

Benjamin. They have reported delayed rupture of spleen is seen in less than 1% of their 600 patients. They concluded that, high incidence of delayed rupture which was originally due to delay in diagnosis rather than delayed rupture

GRADING OF SPLENIC INJURIES

Grade	Type	Criteria
1	Hematoma Laceration	Subcapsular, <10% surface area Capsular tear, <1 cm parenchymal depth
2	Hematoma Laceration	Subcapsular, 10%-50% surface area Intraparenchymal, <5 cm in diameter 1-3 cm parenchymal depth; does not involve a trabecular vessel
3	Hematoma Laceration	Subcapsular, >50% surface area or expanding; ruptured subcapsular or parenchymal hematoma >3 cm parenchymal depth or involved trabecular vessels
4	Laceration	Laceration involving segmental or hilar vessels and producing major devascularization (>25% of spleen)
5	Laceration Vascular	Completely shattered spleen Hilar vascular injury that devascularizes spleen

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LIVER

Liver is the largest and the most vascular organ in the abdomen . Profound hemorrhage impose a serious threat to life. It has to be suspected in all patients with penetrating or blunt trauma to the lower chest or upper abdomen.

In penetrating injuries, liver is the second most common organ involved, commonest being the small bowel. In blunt trauma, liver is next commonly injured after the spleenwhich is the commonest organ involved.Unlike spleen ,spontaneous rupture of liver is very rare.

The most common site of laceration of liver is the upper border of the right lobe of liver. The rent may be small or ragged and deeply extending through the liver substance or there may be complete rupture of the liver which is extremely rare and several pieces of it may lie amidst the blood stained coils of intestine.

CENTRAL RUPTURE OF LIVER

There may be a deep contusion in the liver, although external appearance may be completely normal Sometimes following forceful torsion.. These cases are extremely difficult to diagnose and are likely to produce profound traumatic haemobilia.

Liver injury should be suspected in any patient with history of injury to the upper abdomen developing signs of shock with guarding and tenderness of the upper abdomen. In penetrating injuries, the site and direction of the wound will support the diagnosis. Though this is not true with patients who sustained blunt trauma particularly in unconscious patients with associated injuries. In these cases that peritoneal tap clinches the diagnosis. Diagnostic tap gave 95% accuracy in MOHALL and SHRIES series in 1965. (14)

GRADING OF LIVER INJURIES

Grade	Injury type	Injury description
I	Haematoma	Subcapsular <10 % surface
	Laceration	Capsular tear <1 cm parenchymal depth
II	Haematoma	Subcapsular 10–50 % surface area; intraprenchymal, <10 cm diameter
	Laceration	1–3 cm parenchymal depth, <10 cm in length
III	Haematoma	Subcapsular >50 % surface area or expanding, ruptured subcapsular or parenchymal haematoma. Intraprenchymal haematoma >10 cm
	Laceration	>3 cm parenchymal depth
IV	Laceration	Parenchymal disruption 25–75 % of hepatic lobe
	Vascular	Juxtavenous hepatic injuries i.e. retrohepatic vena cava/centrl major hepatic veins
VI	Vascular	Hepatic avulsion

Advance one grade for multiple injuries up to grade III
AAST liver injury scale (1994 revision)

SMALL BOWEL

Injury to the small bowel is the commonest of all the injuries to the gastrointestinal tract,. Although commonest small bowel injuries are less dangerous than duodenal and colonic injuries.

Patients with small bowel injuries commopnly present with signs of peritonitis due to contamination of the peritoneal cavity with ileal contents. Sometimes patients may present with signs and symptoms of hemorrhagic shock in which there is associated mesenteric laceration.

The mortality and morbidity of patients with bowel injury eventually increases when there is associated mesenteric laceration in addition to the rupture of the bowel or multiple injuries of bowel

An early diagnosis can be established in these cases, when there is clinical suspicion of bowel injury by doing peritoneal tap. The presence of amylase and coliform organisms in aspirated fluid confirms the diagnosis of bowel perforation. (15)

GRADING AND SCORING OF SMALL BOWEL INJURIES

Grade[a]	Type of Injury	Description of Injury	AIS-90
I	Hematoma	Contusion or hematoma without devascularization	2
	Laceration	Partial thickness, no perforation	2
II	Laceration	Laceration <50% of circumference	3
III	Laceration	Laceration ≥50% of circumference without transection	3
IV	Laceration	Transection of the small bowel	4
V	Laceration	Transection of the small bowel with segmental tissue loss	4
	Vascular	Devascularized segment	4

AIS = Abbreviated Injury Score.

[a]Advance one grade for multiple injuries up to grade III.

PANCREAS

Pancreatic Injuries Injury to the pancreas is relatively uncommon, occurring in less than 2% of blunt abdominal trauma patients, although a prevalence of up to 12% has been reported. Pancreatic injuries may be difficult to diagnose clinically. Although uncommon, early diagnosis is crucial, since delayed complications such as fistula, abscess, sepsis, and hemorrhage may lead to significant mortality, occurring in up to 20% of cases. Most deaths occur within the first 48 hours following the traumatic event, usually due to acute hemorrhage from injury to the portal vein, splenic vein, or inferior vena cava. In contrast, death due to delayed complications is usually due to sepsis and multiorgan failure. The pancreas is vulnerable to crushing injury in blunt trauma due to impact against the adjacent vertebral column. Two-thirds of pancreatic injuries occur in the pancreatic body, and the remainder occur equally in the head, neck, and tail. Isolated pancreatic injuries are rare, and associated injuries, especially to the liver, stomach, duodenum, and spleen, occur in over 90% of cases. Not uncommonly, three or more organs are involved. In adults, over 75% of blunt injuries to the pancreas are due to motor vehicle collisions. In children, bicycle injuries are common, and child abuse may result in pancreatic injuries in infants. Symptoms and clinical findings are often nonspecific and unreliable. The classic triad of fever, leukocytosis, and elevation of serum amylase levels is rarely encountered (1). Elevation of serum amylase and lipase levels may be seen in only up to 73% and 82% of cases, respectively (4). Moreover, amylase and lipase levels in diagnostic peritoneal lavage samples may be falsely negative, due to the retroperitoneal location of the pancreasrelated fluid collections, which usually

cannot be sampled with lavage. The main source of delayed morbidity and mortality from pancreatic trauma is disruption of the pancreatic duct. Injuries that spare the pancreatic duct rarely result in morbidity or death. Disruption of the pancreatic duct is treated surgically or by therapeutic endoscopy with stent placement, while injuries without duct involvement are usually treated nonsurgically. Likewise, complications such as fistulas and abscesses are more likely to occur in patients with damage to the pancreatic duct. The risk of abscess or fistula formation in patients with disruption of the pancreatic duct approaches 25% and 50%, respectively. Conversely, patients without duct injuries develop abscess or fistula in less than 10% of cases. As such, it is critical that imaging focus on the integrity of the duct or findings that suggest damage to the pancreatic duct. Injuries to the pancreatic head are almost twice as likely to be fatal (28%) than injuries to the tail (16%), likely due to the involvement of the inferior vena cava, superior mesenteric vein, or portal vein associated with pancreatic head injuries. In addition, the location of injury influences the surgical approach. Since the proportion of islet cells is highest in the tail of the pancreas, removal of greater than 50% of the pancreas may lead to glucose regulation abnormalities, and pancreas-sparing procedures are often attempted in these cases. Duct injuries occurring in the tail of the pancreas may be treated successfully by partial pancreatectomy with little risk of endocrine or exocrine dysfunction. Pancreatitis occurs in 6%–10% of cases and may lead to significant morbidity and mortality, particularly in patients with hemorrhagic pancreatitis. Treatment of pancreatitis consists of bowel rest, nasogastric suction, and nutritional support.(16)

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Table 6. American Association for Surgery in Trauma pancreatic trauma grading system

Grade	Pancreatic injury
Grade I	Haematoma with minor contusion/laceration but without duct injury
Grade II	Major contusion/laceration but without duct injury
Grade III	Distal laceration or parenchymal injury with duct injury
Grade IV	Proximal laceration or parenchymal injury with injury to bile duct/ampulla
Grade V	Massive disruption to pancreatic head

STOMACH

Injuries to the stomach from blunt trauma are very unlikely because of relative lack of fixation and it's protected position. However, perforation injuries of the stomach are not infrequent. Diagnosis can be established in addition to the usual procedure by aspirating bile fluid by the peritoneal tap.

Stomach injury scale

Grade*	Description of injury	AIS-90
I	Contusion or hematoma	2
	Partial thickness laceration	2
II	Laceration in GE junction or pylorus <2 cm	3
	In proximal one third of stomach <5 cm	3
	In distal two thirds of stomach <10 cm	3
III	Laceration >2 cm in GE junction or pylorus	3
	In proximal one third of stomach ≥5 cm	3
	In distal two thirds of stomach ≥10 cm	3
IV	Tissue loss or devascularization <two thirds of stomach	4
V	Tissue loss or devascularization >two thirds of stomach	4

* Advance one grade for multiple lesions up to grade III.
GE, gastroesophageal.

DUODENUM

Duodenum may be injured like other viscera by blunt trauma or penetrating injuries. The characteristic feature of penetrating duodenal wounds is that other organ are involved (pancreas, colon, liver, kidney and intestines.)

Duodenal injuries may be intraperitoneal or retroperitoneal. The retroperitoneal are most cumbersome to diagnose and associated with high mortality. The most common areas of rupture are the two extremities of the duodenum, particularly where the duodenum crosses the spine just proximal to the Trietz ligament.

Traumatic hematoma of the duodenum most commonly occurs in the second part.

Th diagnosis of an intraperitoneal rupture of duodenum is similar to a perforated duodenal ulcer. Gas shadow may be present or absent in Plain X-ray of the abdomen. The abdominal paracentesis will confirm the diagnosis.

Retroperitoneal injuries are more difficult to diagnose. Plain X-ray of abdomen may reveal Gas around the kidney to some extent. Like other retroperitoneal injuries (kidney and pancreas) are very difficult to diagnose by peritoneal tap. (17)

Duodenum organ injury scale (AAST)

Grade		Injury Description
I	Haematoma Laceration	Involving single portion of duodenum Partial thickness, no perforation
II	Haematoma Laceration	Involving more than one portion Disruption < 50% of circumference
III	Laceration	Disruption 50-75% of circumference of D2 Disruption 50-100% of circumference of D1, D3, D4
IV	Laceration	Disruption > 75% of circumference of D2 Involving ampulla or distal common bile duct
V	Laceration Vascular	Massive disruption of duodenopancreatic complex Devascularization of duodenum

D1 : 1st portion ; D2 : 2nd portion ; D3 : 3rd portion ; D4 : 4th portion of duodenum.

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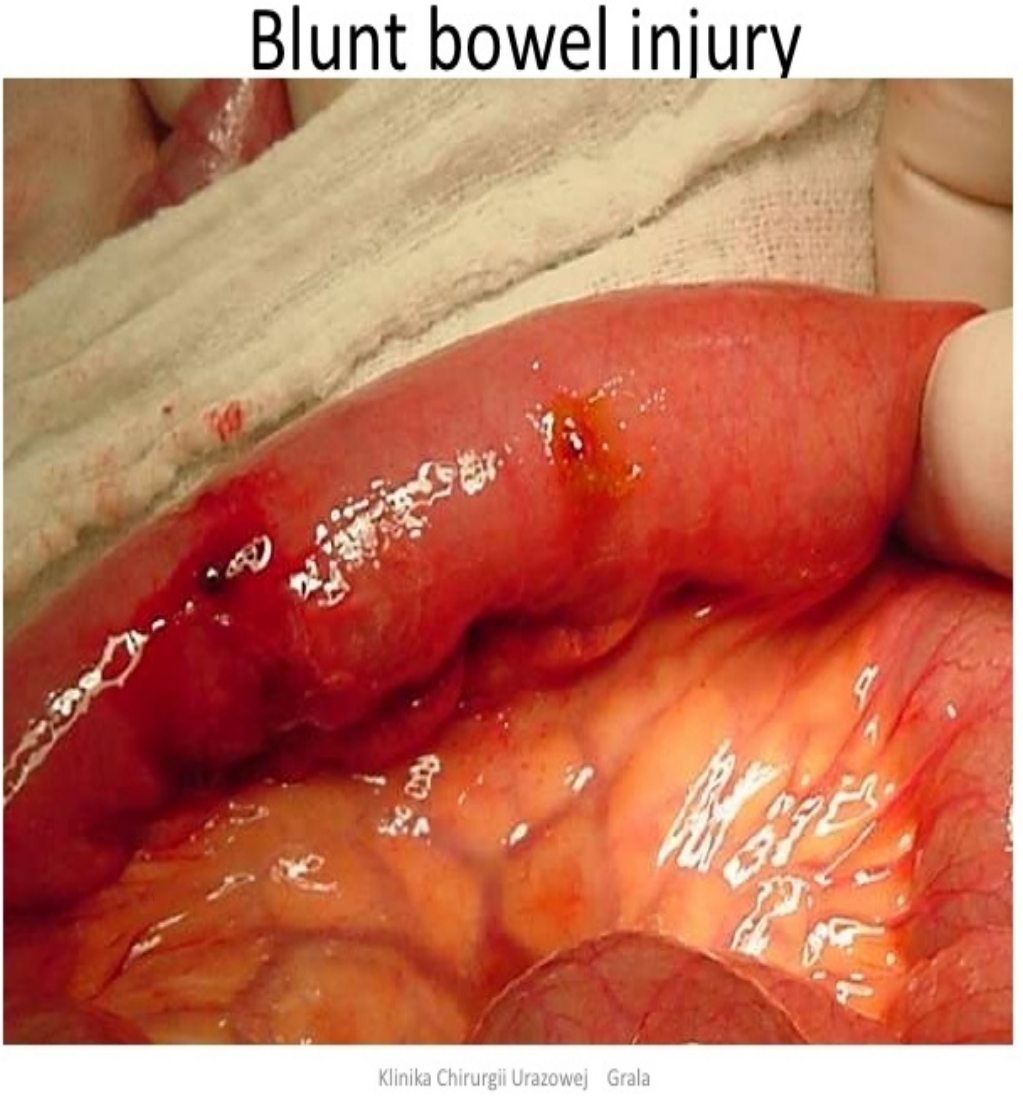

Blunt bowel injury
Klinika Chirurgii Urazowej Grala

‘COLON:

Acute injuries of the colon and rectum may follow penetrating or blunt trauma. A systematic diagnostic approach to problems of abdominal trauma is necessary. Specific examination of colon and rectum is necessary to diagnose injury. Rectal examination and sigmoidoscopy plays a vital role in examining these patients. Abdominal paracentesis may aid in the diagnosis.

Grade	Injury Description
I	(a) Contusion or hematoma without devascularization (b) Partial thickness laceration
II	Laceration ≤50% of circumference
III	Laceration >50% of circumference
IV	Transection of the colon
V	Transection of the colon with segmental tissue loss

BILIARY SYSTEM

Though perforation of gall bladder due to blunt trauma is uncommon, it may be injured in penetrating trauma.

The closed injury to the extra hepatic biliary system is due to shearing force applied to the common bile duct or due to impingement of the bile duct between the vertebral column and a crushing force to the abdominal wall. Aspiration of bile or nonclotting blood on peritoneal tap confirms the diagnosis.

Blunt abdominal trauma may result in injury to the biliary tract, including the gallbladder and intrahepatic and extrahepatic bile ducts. The most common location of biliary injury is the gallbladder, followed by the common bile duct and the intrahepatic ducts. Injury to the gallbladder occurs in up to 2%–3% of blunt trauma patients undergoing laparotomy. The low prevalence may be due to the protective effect of the liver. Gallbladder injury is highly associated with additional injuries. Liver, splenic, and duodenal injuries are most common, occurring in up to 91%, 54%, and 54% of cases, respectively. Blunt trauma may also result in injury to the intrahepatic and extrahepatic bile ducts, although this is rare. As with gallbladder injury, bile duct injuries are usually associated with injuries to other organs. Gallbladder and bile duct injury may occur due to torsion, shearing, or compression forces. Although the gallbladder is protected by the liver, certain factors may increase the risk for injury. Distention of the gallbladder in a preprandial state increases biliary pressure, making the gallbladder more vulnerable to compression injury.

Extrahepatic duct injuries may occur at sites of anatomic fixation, such as the intrapancreatic portion of the common bile duct, frequently after blunt impact or acute deceleration, possibly with compression against the spine. Elevation of the liver following blunt trauma may cause stretching of the relatively fixed common duct. Injuries to the intrahepatic bile ducts are seen only in patients with severe liver lacerations. In the acute setting, gallbladder injury may be associated with cystic artery transection, leading to major blood loss. Delayed complications of gallbladder and/or bile duct injury, such as sepsis, may result from biliary leakage. Sterile bile within the peritoneum undergoes continuous peritoneal reabsorption and may initially lead to surprisingly few symptoms. It has been reported that 50% of patients with bile in the peritoneum at surgery have no localizing symptoms preoperatively. Since bile in the peritoneum usually does not cause symptoms until infected, bile leakage may occur for weeks or months before being detected clinically. When signs and symptoms are present, they are nonspecific and include vague abdominal pain, nausea, vomiting, and occasionally jaundice. With extrahepatic bile duct injury, diagnosis may be particularly difficult; up to 20% of such injuries are not detected at surgery. Injuries to the gallbladder may be classified into one of three main categories: contusion, laceration/perforation, or complete avulsion. In general, contusions are considered to represent intramural hematomas, are the mildest form of gallbladder injury, and are treated conservatively. Lacerations and perforations are full-thickness wall injuries, requiring cholecystectomy. Avulsion of the gallbladder may involve variable portions of the gallbladder, cystic duct, and artery and may lead to major blood loss.

OTHER VISCERAL INJURIES

Injuries to retroperitoneal organs such aspancreas and kidneys are very difficult to diagnose and extremely rare. They usually do not produce any intraperitoneal signs.

Intraperitoneal rupture of urinary bladder and ruptured ectopic pregnancy produce signs and symptoms of shock with lower abdominal tenderness, rigidity and guarding. Peritoneal tap aids in diagnosing and differentiating as the bladder rupture produces intraperiotneal extravasation of urine and the ruptured ectopic pregnancy the blood.

Injuries to major vessels like aorta, inferior vena cava etc is usually fatal.

CROSS SECTIONAL STUDY OF ACCURACYOF DIAGNOSTIC PERITONEAL PARACENTESIS IN ACUTE ABDOMINAL CONDITION REQUIRING EMERGENCY SURGICAL INTERVENTION IN PATIENTS PRESENTING TO GVMC HOSPITAL VELLORE

Primary objectives	To evaluate that peritoneal paracentesis is simple, bedside and accurate diagnostic aid in diagnosing acute abdomen

Inclusion criteria	All the patients who present with acute abdomen including blunt trauma to abdomen will be included for the study and Those who give consent for the study.
Exclusion criteria	1. All pregnant patients. 2. All patients confirmed of acute intestinal obstruction 3. All patients with extensive operative abdominal scar 4. All patients with acute non perforative biliary tract disease. 5. All patients with renal or ureteric calculi. 6.All patients with diagnosed coagulation disorders 7.all paediatric age group<12 yrs

METHODOLOGY

All the patients with inclusion criteria will be subjected for standard four quadrant paracentesis. A 5ml syringe fitted with a 20 guage intravenous needle will be used for the test. Test will be considered positive if the volume of tap is more than 0.5ml or if the tap is obvious pathological like pus irrespective of volume the tap. The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis will be done using appropriate statistical tests and medical software.

INVESTIGATIONS

Complete history,

clinical examination

Routine blood investigations:

Complete blood Count, HBSAg, HIV,

Specific investigations like, x-ray erect abdomen/chest, USG abdomen/CT abdomen depending on need according to provisional clinical diagnosis

METHODOLOGY

All acute abdominal cases admitted to the emergency surgical wards in GOVERNMENT VELLORE MEDICAL COLLEGE from 2018 to 2019 were included in the study. A total of 50 cases were studied during this period. All patients with acute abdominal pain, both traumatic and non traumatic, age more than 12 years and patients with shock and suspicion of acute abdomen were included in the study.

Patients were evaluated by.

1. **Accurate history was taken with respect to the**
    - Pain - Onset, type, site, progress, aggravating and relieving factors.
    - Vomiting
    - Distention of abdomen
    - Bowel and bladder disturbance
    - Menstrual disturbance.
2. **Vital signs of the patient were recorded.**
3. **Detailed clinical examination to look for**
    - abdominal tenderness,
    - guarding,
    - rigidity,
    - obliteration of liver dullness
    - peristalitic sounds.

Based on the history and clinical examination, provisional clinical diagnosis was made out and routine baseline investigations like CBC, blood sugar, urea , creatinine, liver function tests were done in all patients.

Specific investigations like erect X-rays abdomen, USG abdomen and pelvis and CT was done depending on provisional diagnosis and their requirement.

EXCLUSION CRITERIA

1.Pregnant female patients.

2.Patients diagnosed as acute intestinal obstruction

3. patients with extensive abdominal scar

4. patients with acute non perforative biliary tract disease and acute gastritis

5. patients with renal or ureteric calculi.

6. paediatric age gruop(<12 yrs)

Before the patient was subjected to the four quadrant peritoneal tap, erect X-ray abdomen was done, reasons being, the theoretical chances of air being either introduced into the peritoneal or sucked from the peritoneal cavity while performing the procedure.

REQUIREMENTS OF PARACENTESIS

Peritoneal paracentesis is a simple bedside procedure, which requires minimal experience. The procedure requires no sophisticated material. It can be carried out without causing much discomfort to the patient. The advantage is that, it can be performed in anywhere in the hospital wards and can be repeated.

All that is required is:

- A 5 or 10 ml disposable syringe to which 18 or 20 gauge or venflon needle is attached.
- An antiseptic swab.

PROCEDURE OF THE PARACENTESIS

After getting consent from the patient and their relatives

- ❖ Urinary bladder is emptied before the procedure either by asking the patient to empty or by foleys insertion
- ❖ Abdomen is exposed to reveal all the four quadrants.
- ❖ Abdomen is arbitrarily divided into four quadrants.
- ❖ The procedure is performed without local anesthesia.
- ❖ The site of the paracentesis is located and swabbed with a povidone – iodine followed by spirit.
- ❖ The abdomen is almost always entered lateral to the lateral border of the rectus sheath.
- ❖ The first puncture is always made in the right lower quadrant followed by left lower quadrant, right upper and left upper quadrant in that order.

- The syringe is introduced perpendicularly into the abdomen with slow even pressure, sudden loss of resistance indicates the entry of needle into the peritoneal cavity.
- Aspiration is done and any sspirate into the syringe is looked for.
- If nothing aspirated immediately, the vaccum in the syringe is maintained for some time to get a positive tap, when the amount in the peritoneal cavity is small.
- Despite of this, if fluid was not drawn, the needle is withdrawn slowly, maintaining the steady suction within the syringe, as the fluid will be more frequently encountered just beneath the anterior parietal peritoneum than in the depth of the peritoneal cavity.
- Initially tap is performed in the right lower quadrant, if negative, the next site of choice would be the left lower quadrant followed by right upper quadrant and finally in the left upper quadrant. In cases of four quadrant tap being negative/dry, the decision for further management will be based on clinical and radiological investigation. If the decision for surgery is made, peritoneal tap will be done in operating room before inducing the patient. 37
- Then the aspirated fluid was transferred to a sterile container and sent to the microbiological lab for fluid analysis

CRITERIA FOR POSITIVE TAP:

The tap is regarded as "positive";

1) If opaque fluid in excess of 0.5 ml has been obtained.
2) The fluid is obviously abnormal (i.e)if aspirated fluid contains bile, pus, haemorragic or feculent etc.
3) On peritoneal fluid cytology, if aspirated fluid contains cell count WBC > 500 cells/cu.mm or/and RBC > 1 lakh cells/cu.mm ; cell count ratio (ratio between WBC and RBC count in lavage fluid divided by the ratio of the same parameters in the peripheral blood) > 1 considered as positive microscopic findings.

CRITERIA FOR NEGATIVE / DRY TAP

a. If no fluid was aspirated from any of the four quadrants considered as dry tap.
b. If peritoneal fluid cytology shows WBC < 100 cells/cu.mm or/and RBC < 50,000 cells/cu.mm ; cell count ratio (ratio between WBC and RBC count in lavage fluid divided by the ratio of the same parameters in the peripheral blood) < 1 considered as negative microscopic findings.

FLUID ANALYSIS

The fluid aspirated from the peritoneal cavity was analysed macroscopically and microscopically.

Naked eye examination (macroscopic) of the nature of the fluid, odour and texture were relied upon to arrive at a conclusion. Depending upon the nature, odour and texture of the fluid, diagnosis of site of pathology was made.

Microscopic examination of the fluid by cytology. 42

MACROSCOPIC FLUID ANALYSIS :

Aspirated fluid grossly analysed for colour, nature, odour and texture of the fluid.

PHYSICAL CHARACTERISTICS OF THE ASPIRATED FLUID IN PERITONEAL TAP

BILE STAINED FLUID

- Perforated duodenal ulcer.
- Perforated gall bladder
- Perforated bile duct
- Perforated gastric ulcer
- Spontaneous bile peritonitis

BLOOD STAINED FLUID WITHOUT TRAUMA

- Adult pancreatitis
- Mesenteric embolism

BLOOD WITHOUT TRAUMA

- Ruptured ectopic gestation
- Ruptured lutein cyst.
- Spontaneous rupture of spleen.
- Rupture of an aneurysm.

CLEAR STRAW COLOURED FLUID:

- Gastroenteritis.
- Tuberculous peritonitis.

PORRIDGE LIKE MATERIAL

- Ruptured dermoid cyst of ovary and mesentry

CRYSTAL CLEAR FLUID

- Ruptured hydatid cyst

ODOURLESS PURULENT FLUID

- Perforated peptic ulcer.
- Unperforated acute appendicitis
- Salphingitis
- Suppurating mesenteric lymph nodes
- Early cases of diverticulitis with perforation
- Pneumococcal peritonitis.

PURULENT FLUID WITH ODOUR

- Perforated appendix
- Perforated colonic diverticulitis
- Perforated meckels diverticulitis.
- Distal small bowel and large bowel perforation.

Frank blood

Withdrawal of pure blood that fails to clot on standing means that a significant intraperitoneal hemorrhage has occurred. Accidental puncture of a blood vessel does occur but can readily be distinguished by the fact that blood from this source clots within few minutes.

Purulent fluid

This may vary from the offensive frank pus obtained from a perforated appendix or diverticulitis of the colon, to the thin turbid fluid associated with localised inflammatory disease**.**

Bile stained

Bile stained fluid is seen in upper gastrointestinal perforations and biliary tree injuries**.**

Serosanginous fluid

This type of tap is seen in strangulated hernia and acute pancreatitis.

Odour

A feculent smell is due to perforation of large intestine. In intraperitoneal rupture of urinary bladder, there will be a uriniferous odor. Foul smell is seen in primary peritonitis.

Texture

In perforated gastric or duodenal ulcer, the fluid tends to be turbid or purulent with flecks of amorphous fibrinous material. In pancreatitis, the fluid will be turbid with fat globules.

MICROSCOPIC ANALYSIS (CYTOLOGY) :

The aspirated fluid is sent to lab in a sterile container for cytology.

The peritoneal fluid is analysed for total WBC and RBC count and cell count ratio was also obtained.

If cytology shows, WBC > 500 cells/cu.mm or/and RBC > 1 lakh cells/cu.mm; cell count ratio (ratio between WBC and RBC count in lavage fluid

divided by the ratio of the same parameters in the peripheral blood) > 1 considered as positive microscopic findings.

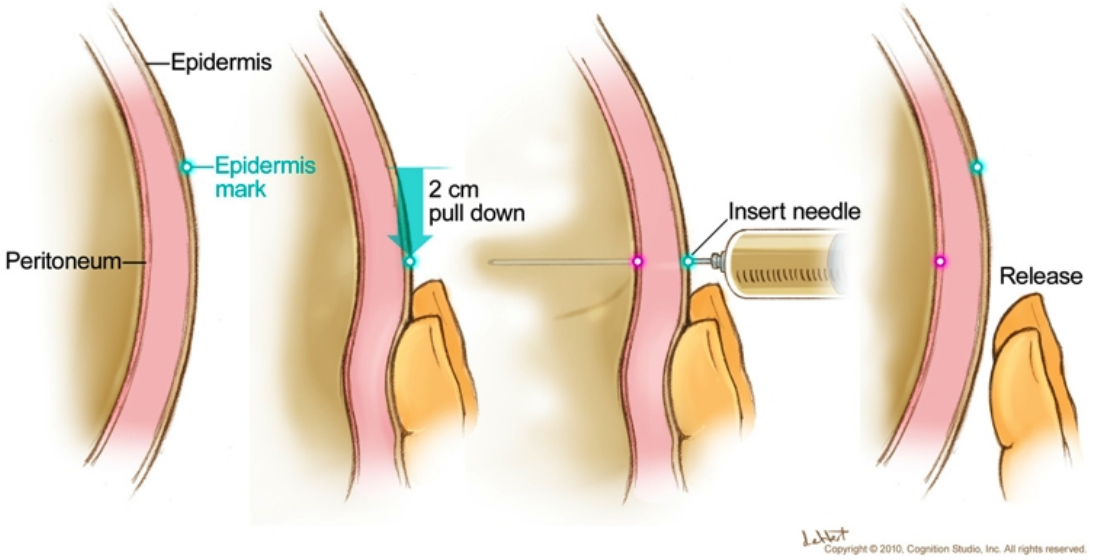
If peritoneal fluid cytology shows WBC < 100 cells/cu.mm or/and RBC < 50,000 cells/cu.mm; cell count ratio (ratio between WBC and RBC count in lavage fluid divided by the ratio of the same parameters in the peripheral blood) < 1 considered as negative microscopic findings.

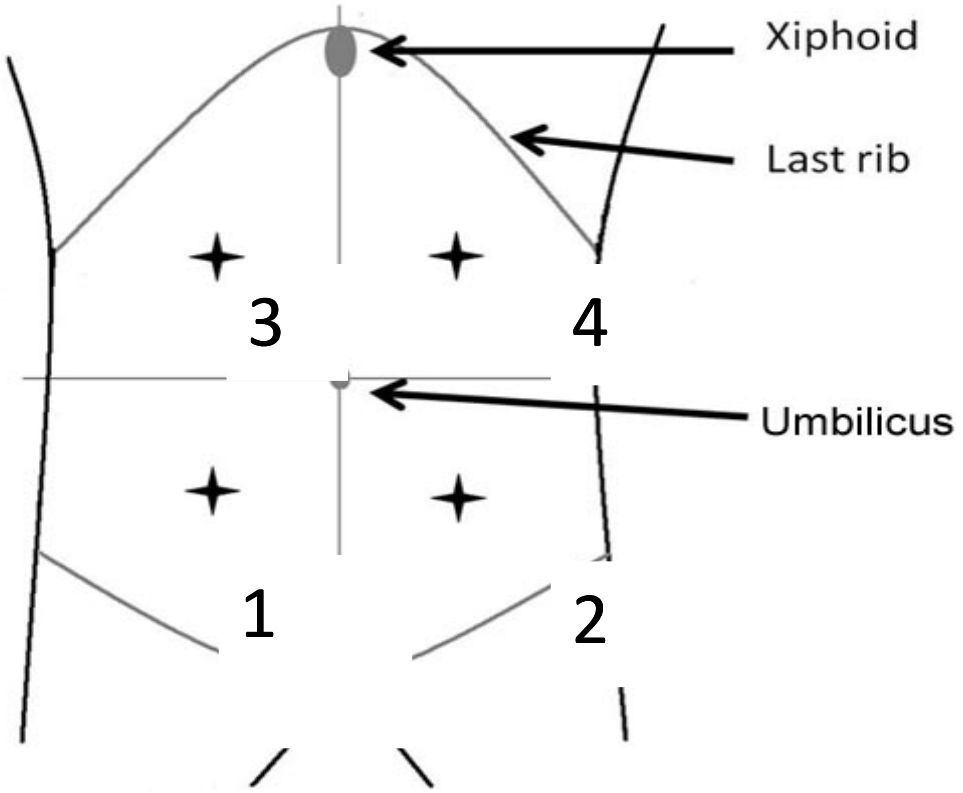
Needle Entry Site

- The two recommended areas of abdominal wall entry for paracentesis are as follows.

- 2 cm below the umbilicus in the midline (through the linea alba)

-5 cm superior and medial to the anterior superior iliac spines on either side(in update 3cm)


Epidermis
Epidermis mark
Peritoneum
2 cm pull down
Insert needle
Release
Copyright © 2010, Cognition Studio, Inc. All rights reserved.


Xiphoid
Last rib
3
4
Umbilicus
1
2

RESULTS

OBSERVATIONS:

Fifty cases of acute abdominal emergencies admitted to the emergency surgical ward of Government Vellore Medical college and Hospital, Adukkamparai were analyzed.

Distribution of the age, sex, occupation, symptoms, clinical signs.The characteristics of the aspirated fluid were analysed.

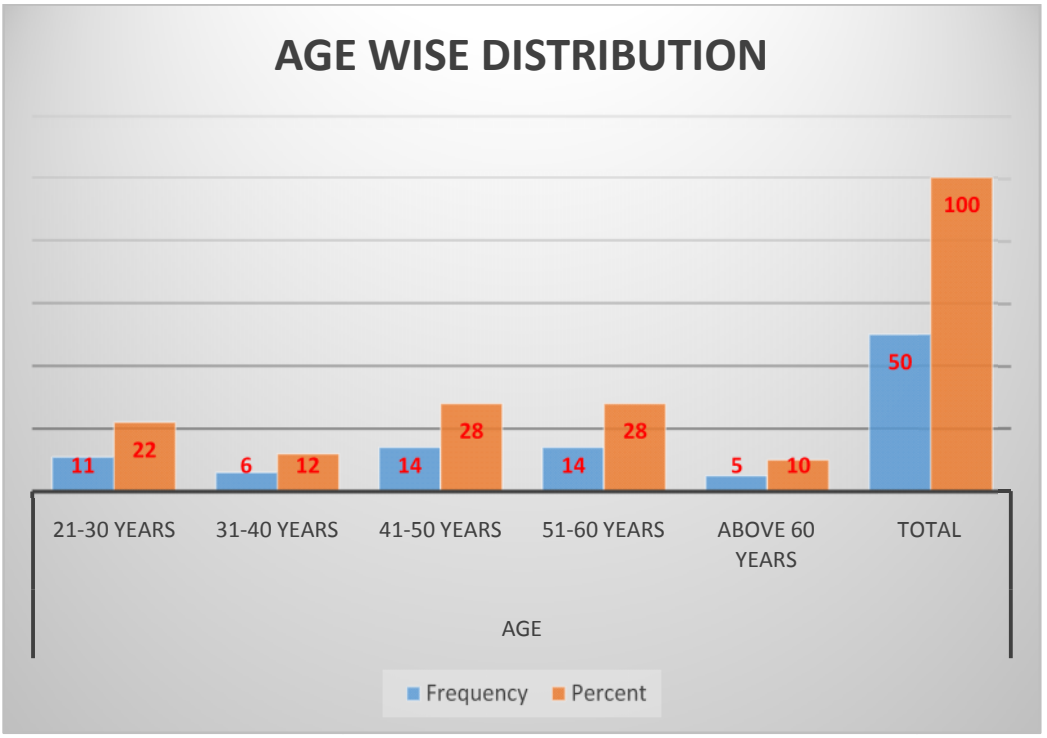
Vitals examined and a complete systemic examination of the patients were done. The patients were put on nasogastric aspiration, Intavenous fluids, iv antibiotics, analgesics and antacids. Patients catheterised depending on the need for output monitoring. Patients presenting with shock were resuscitated. Routine investigations were sent including blood grouping. In suspected perforative peritonitis erect x-ray abdomen was done before the tap.

Once peritoneal tapping with fluid cytology was done and diagnosis made. patients were subjected to other radiological investigations (CT and USG) depending upon their need and our diagnosis confirmed, patients were taken up for surgery and definite surgical procedures done.

Other investigations like USG abdomen, CT abdomen were taken and depending upon clinical circumstances for patients with inconclusive diagnosis after tapping. Patients were subjected to operative / non operative management.

TABLE NO. I :AGE WISE DISTRIBUTION

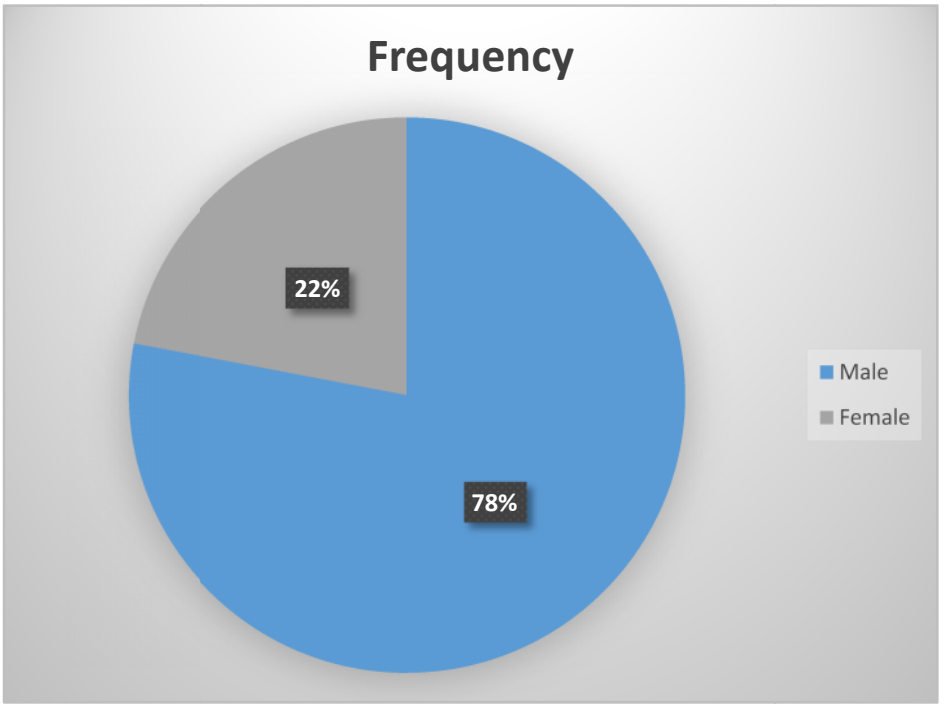
		Frequency	Percent
AGE	21-30 Years	11	22.0
	31-40 Years	6	12.0
	41-50 Years	14	28.0
	51-60 Years	14	28.0
	Above 60 Years	5	10.0
	Total	50	100.0



Among the 50 cases,11 were from age group of 21-30 years.14 were from 41-50 yrs group. 14 were from 51-60 yrs.6 were from 31-40 yrs group. 5 were from age groups above 60 years.

TABLE NO.II: SEX WISE DISTRIBUTION

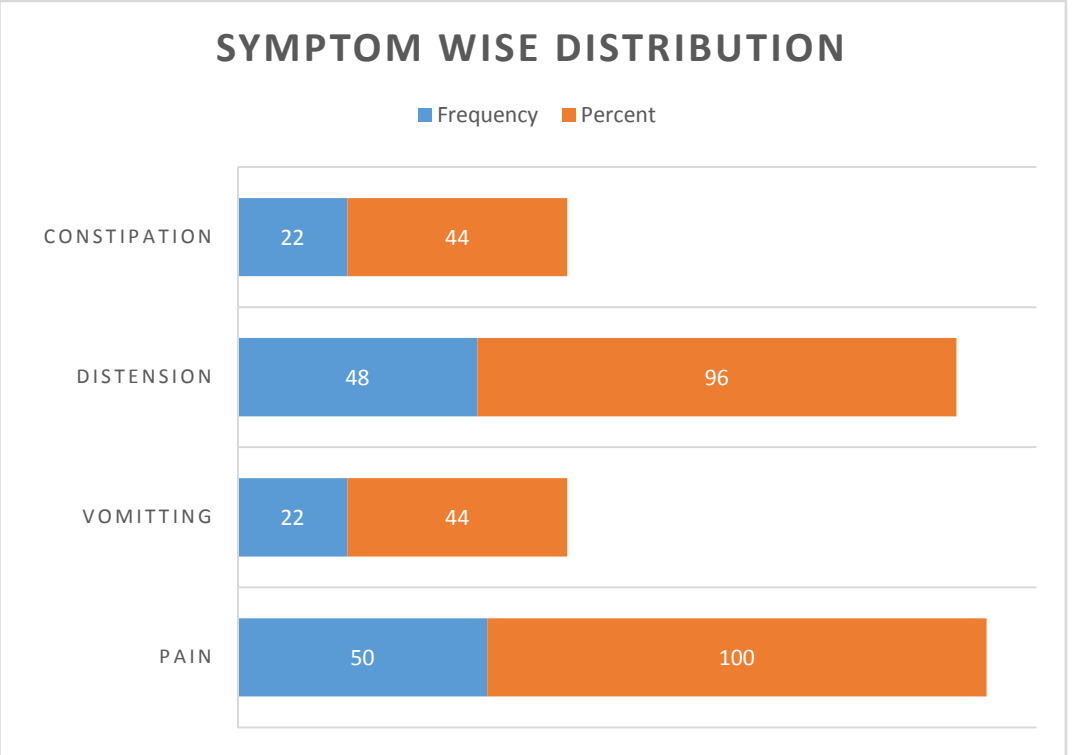
Sex	No of patients	Percentage
Male	39	78.0
Female	11	22.0
Total	50	100.0



Among 50 cases analysed,39 were male and 11 were female. Males are most affected than females in the study.

TABLE NO.III: SYMPTOM WISE DISTRIBUTION

Symptoms	Frequency	Percent
Pain	50	100.0
Vomitting	22	44
Distension	48	96
Constipation	22	44

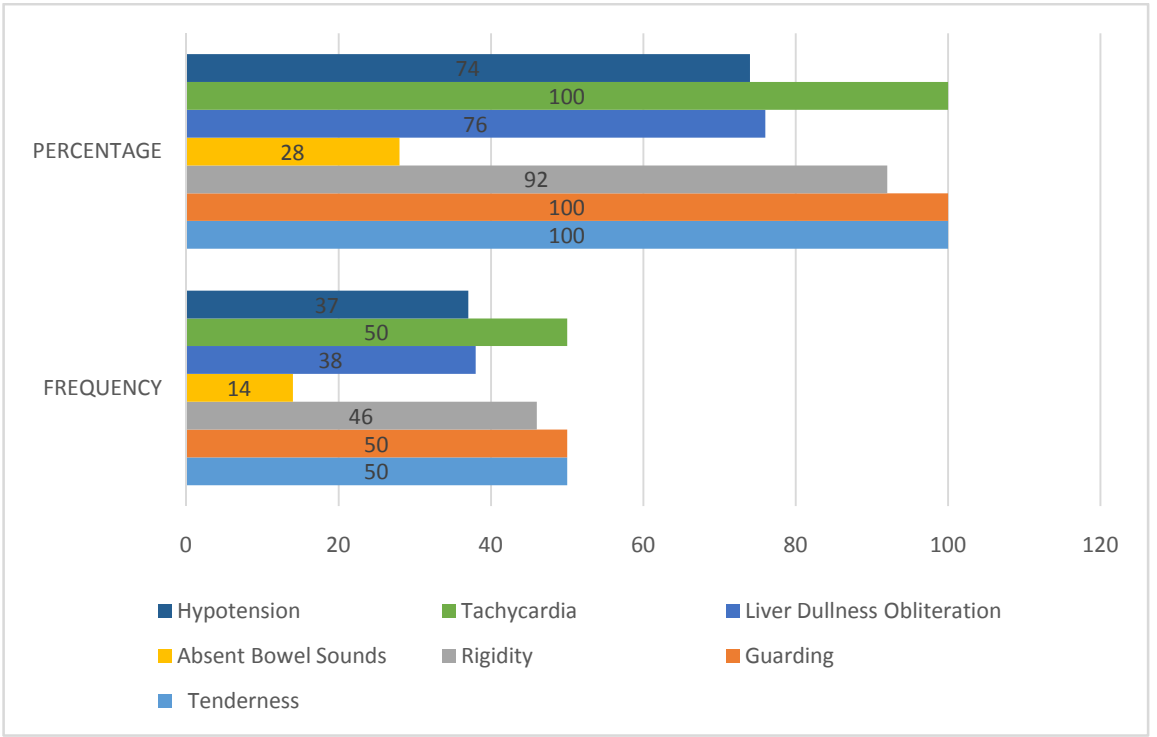


The most common symptom that patient presented with was pain(100%),distension(96%),vomitting(44%) and constipation(44%)

TABLE NO.IV : SIGN WISE DISTRIBUTION

SIGNS	FREQUENCY	PERCENTAGE
Tenderness	50	100
Guarding	50	100
Rigidity	46	92
Absent Bowel Sounds	14	28
Liver Dullness Obliteration	38	76
Tachycardia	50	100
Hypotension	37	74

SIGN WISE DISTRIBUTION

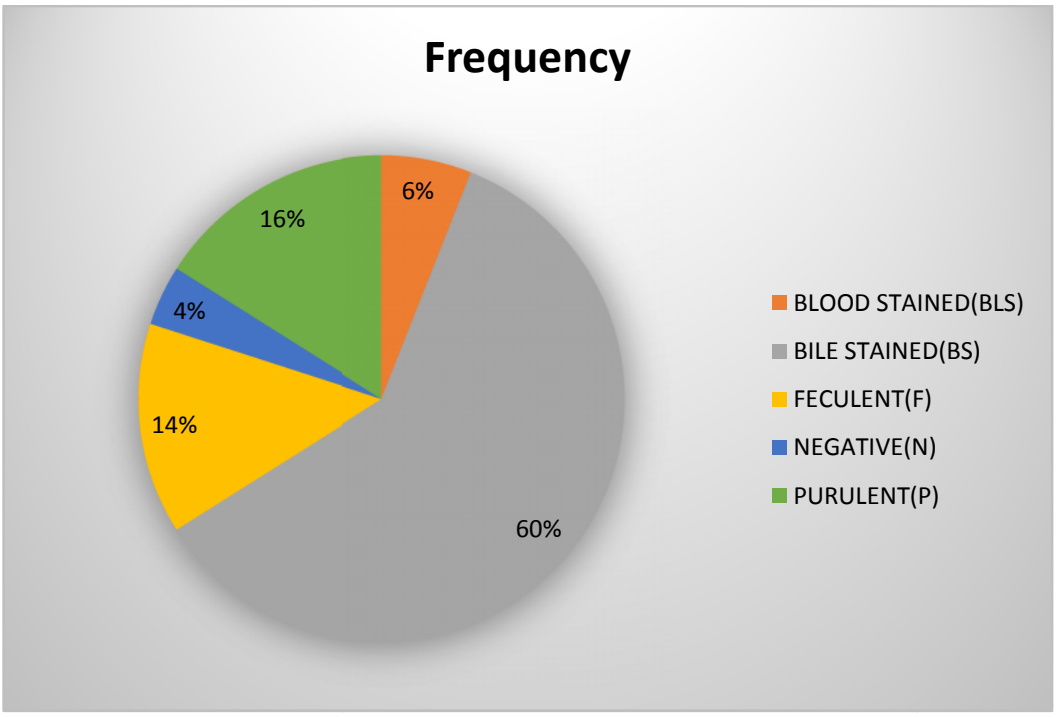


Of the 50 cases studied, tenderness, guarding and tachycardia was found in all cases (100%). Rigidty was noted in 46 (92%) cases. Liver dullness obliteration was noted in 38 (76%) cases. Absent bowel sounds was noted in only 14 (28%) cases.

TABLE NO.V:GROSS NATURE OF TAP DISTRIBUTION

GROSS NATURE OF TAP	Frequency	Percent
BLOOD STAINED(BLS)	3	6.0
BILE STAINED(BS)	30	60.0
FECULENT(F)	7	14.0
NEGATIVE(N)	2	4.0
PURULENT(P)	8	16.0

DISTRIBUTION OF GROSS NATURE OF TAP



The gross nature of the tap was of paramount importance in this study. The physical nature of the aspirate in itself could reveal the underlying pathology in most of the cases.

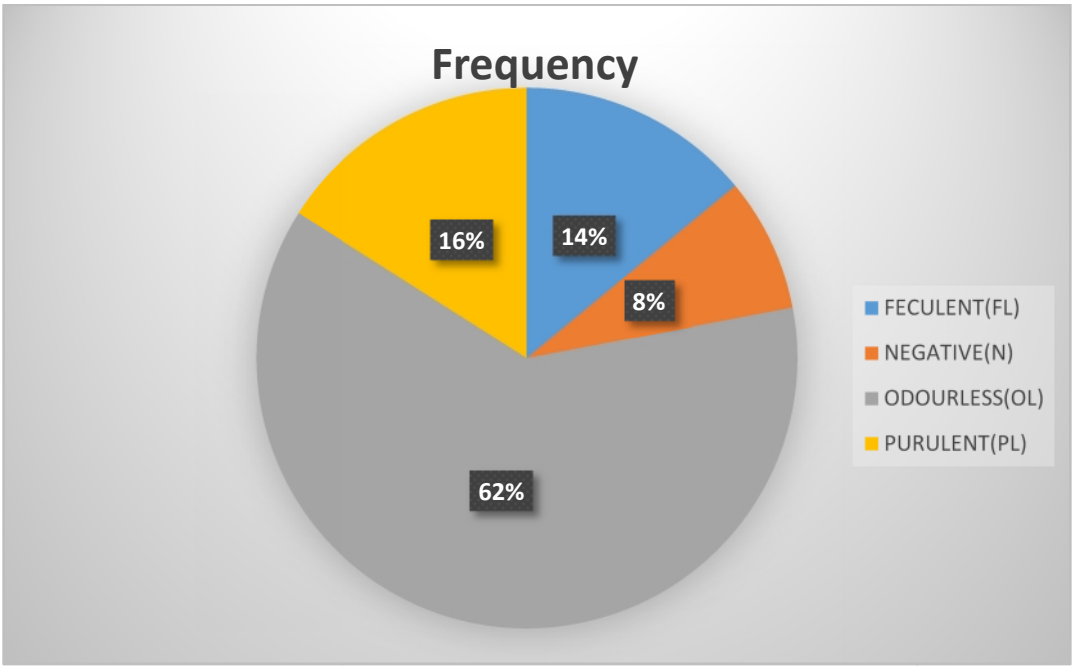
In the current study performed on 50 cases, 46 cases were found to have a positive tap, 4 cases has dry tap. Bilious tap seen in maximum number 30 (60%) of cases. Purulent tap found in 8 (16%) cases. Fecal fluid was aspirated in 7 (14%) cases. Blood-stained fluid noted in 3 (6%) cases. There were just 2 (4%) cases with a negative tap.

TABLE NO. VI: ODOUR OF TAP DISTRIBUTION

Odour of Tap	Frequency	Percent
FECULENT(FL)	7	14.0
NEGATIVE(N)	4	8.0
ODOURLESS(OL)	31	62.0
PURULENT(PL)	8	16.0

Of the 50 cases analyzed,31 of cases(62%) were odourless, 8 cases were purulent(16%) and 7 were feculent(14%).

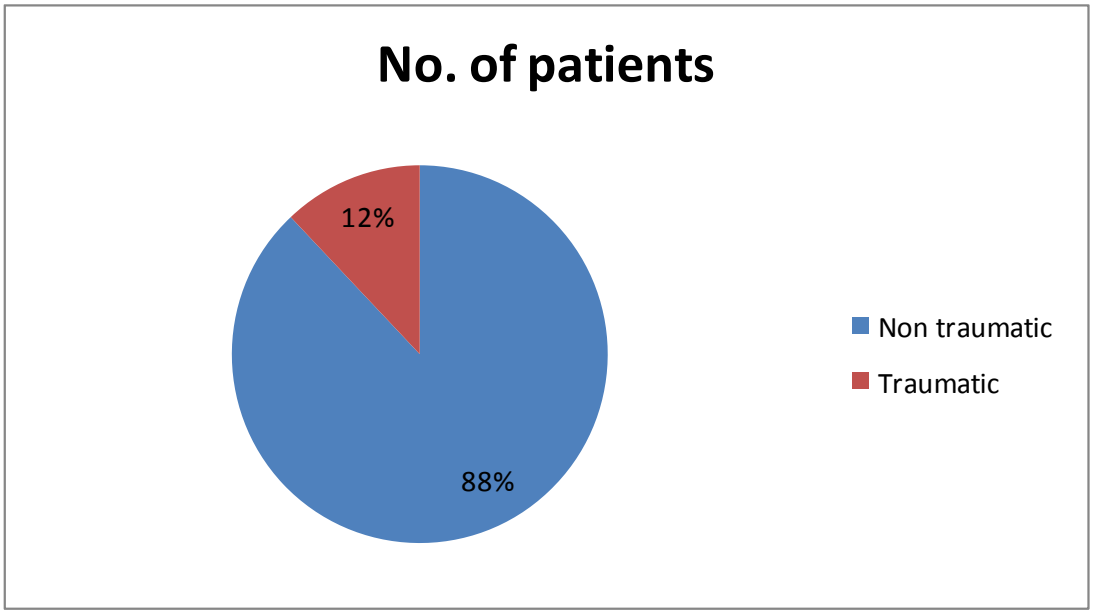
DISTRIBUTION OF THE ODOUR OF TAP



Out of those cases which had a positive tap, 31 (62%) cases had an odourless aspirate. Purulent foul-smelling odour was noted in 8 (16%) cases, feculent odour in 7 (14%) cases,

TABLE NO.VII:CAUSES OF ACUTE ABDOMEN

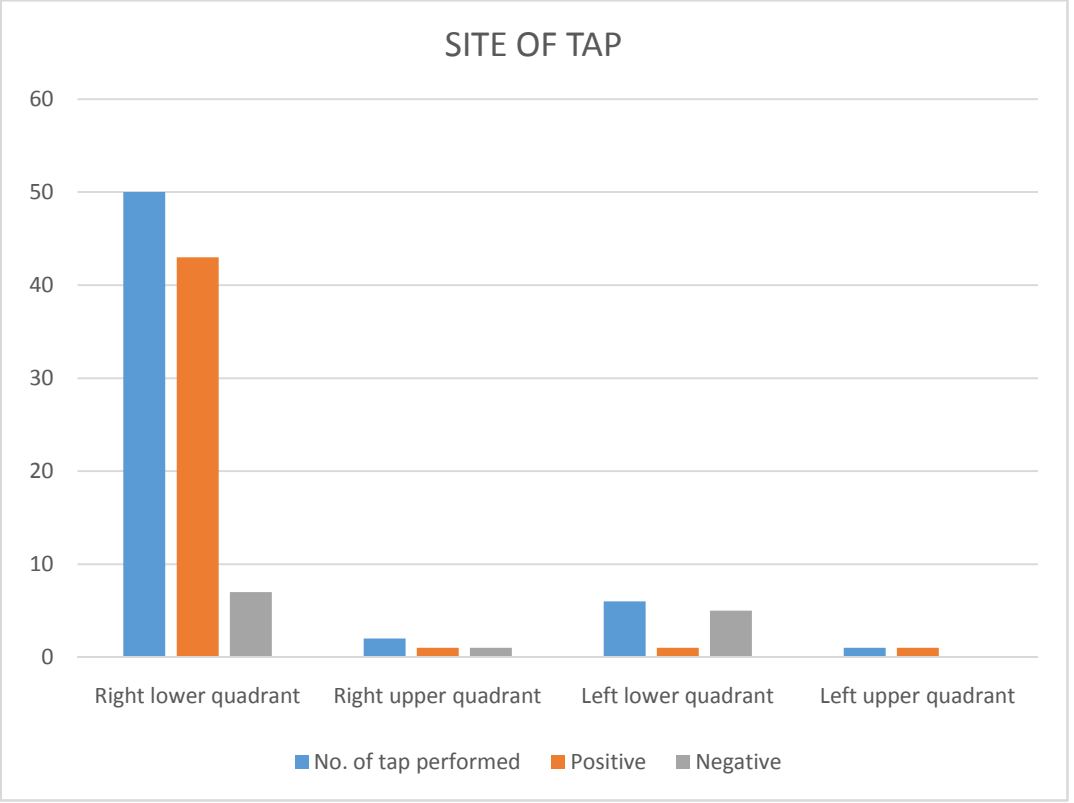
Causes of acute abdomen	No. of patients
Non traumatic	44
Traumatic	6



Among 50 cases studied, 44 were due to non traumatic pathology and 6 were due to trauma

TABLE NO.VIII: Site of the Positive Tap

Site of the tap	No. of tap performed	Positive	Negative
Right lower quadrant	50	43	7
Right upper quadrant	02	01	01
Left lower quadrant	06	01	05
Left upper quadrant	01	01	00



Procedure was done in right lowerquadrant initially in all 50 patients,of which 43 were positive, 1 positive in right upper quadrant, 1 positive in left lower quadrant and 1 positive in left upper quadrany

Table no.IX:.RELATIONSHIP BETWEEN PPERITONEAL CYTOLOGY WITH LAPAROTOMY

Peritoneal fluid cytology	**Laprotomy**	**No. of Cases**
Positive Microscopic findings RBC > 1 lakh cells / cu.mm or / and WBL > 500 cells / cu.mm ; cell count > 1	Laparotomy	46
	No Laparotomy	00
Negative Microscopic findings RBC < 50,000 cells / cu.mm WBL < 100 cells / cu.mm ; cell count < 1	Laparotomy	04
	No Laparotomy	00

CYTOLOGY OF ASPIRATED FLUID

Among the 50 cases, 46 cases only we get a fluid aspiration from the peritoneal Cavity, for the remaining cases were negative or dry tap.On subjecting the fluid for cytology, we able to get a cell count of RBC > 1 lakh cells /cu.mm for 6 cases in traumatic group and 1 case in non-tr Hemo peritoneum confirmed.

For remaining 40 cases, we get a cell count of WBC > 500 cells/cu.mm with cell count ratio > 1; of these only 35 cases underwent laparotomy and obviously pathological fluid was confirmed in laparotomy.

TABLE NO.X: TAP AND LAPARATOMY CORELATION

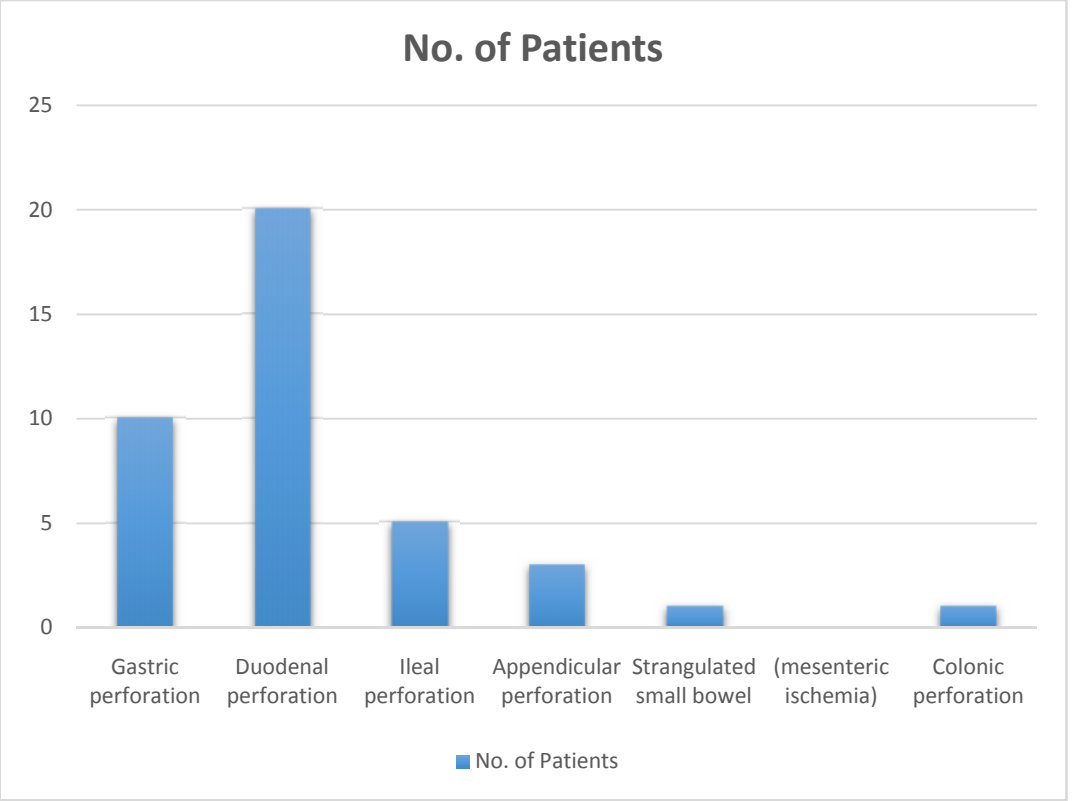
Tap		**No. of Cases**
Positive tap (46 cases)	Laparotomy	46
	No Laparotomy	00
Negative tap (4 cases)	Laparotomy	04
	No laparotomy	00

Of the 50 cases, all were subjected to laparatomy. Peritoneal tap were correlated with laparatomy finding

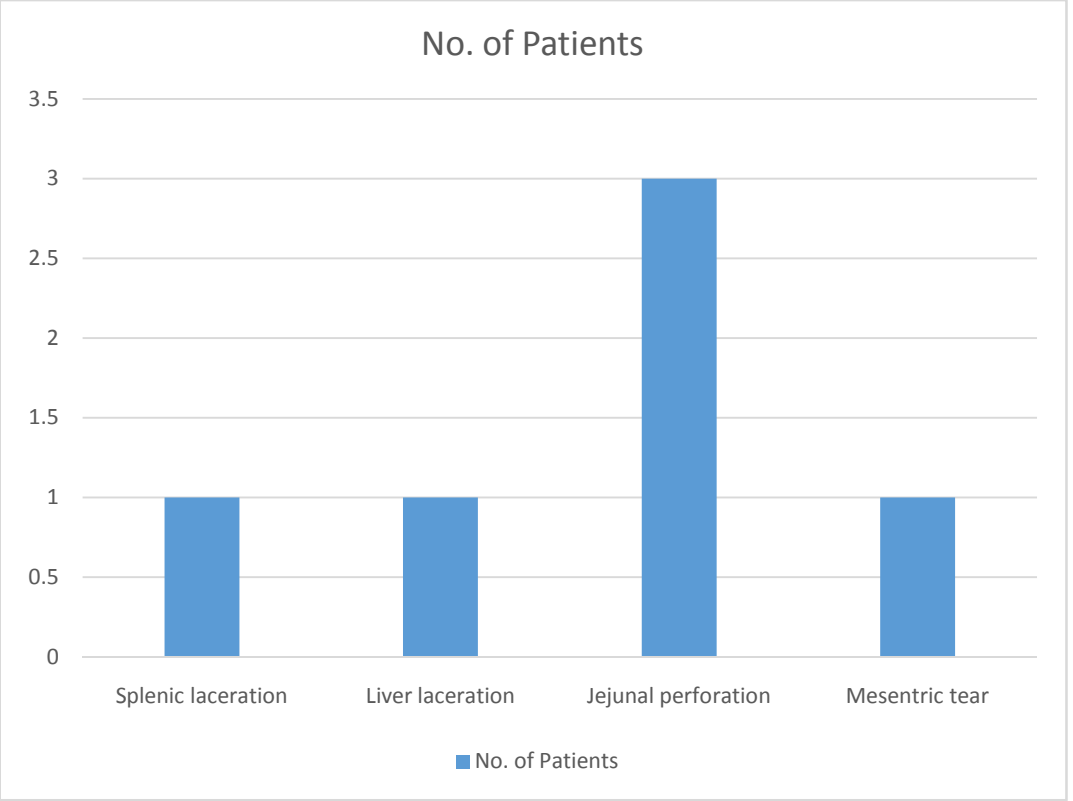
TABLE NO.XI: POSITIVE TAP AND ASSOCIATED PATHOLOGY.

Non Traumatic Group	**No. of Patients**	**Traumatic Group**	**No. of Patients**
Gastric perforation	10	Splenic laceration	01
Duodenal perforation	20	Liver laceration	01
Ileal perforation	05	Jejunal perforation	03
Appendicular perforation	03	Mesentric tear	01
Strangulated small bowel (mesenteric ischemia)	01		
Colonic perforation	01		
Total	**40**	**Total**	**06**

NON TRAUMATIC GROUP



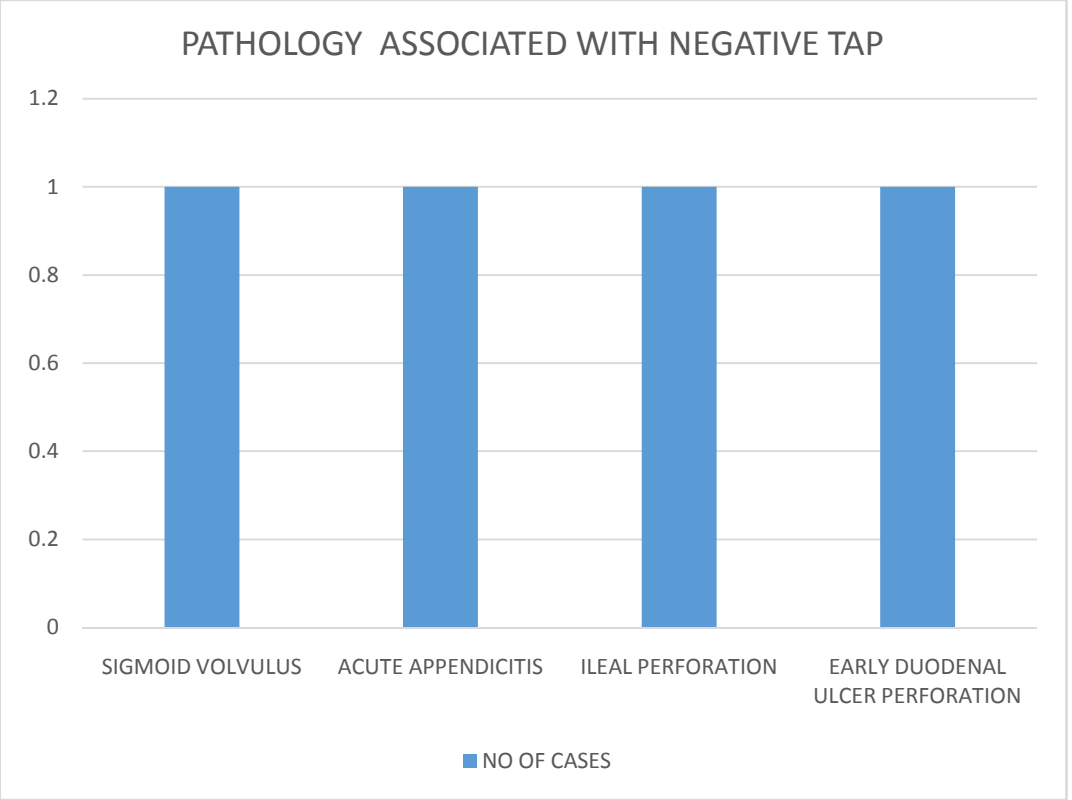
TRAUMATIC GROUP



Among the 50 cases, 40 were non traumatic majority due to duodenal perforation and gastric perforation. Remaining were ileal perforation, appendicular abscess(3), colonic perforation(1) and small bowel gangrene(2).Of the traumatic group 1 liver laceration, 1 splenic laceration, 1 mesenteric tear and 3 jejunal perforation.

TABLE NO. XII : PATHOLOGY ASSOCIATED WITH NEGATIVE TAP

PATHOLOGY	NO OF CASES
SIGMOID VOLVULUS	1
ACUTE APPENDICITIS	1
ILEAL PERFORATION	1
EARLY DUODENAL ULCER PERFORATION	1



In this study,there was 4 negative/dry tap. Among these cases, 1 was sigmoid volvuls,1 acute appendicitis, 1 ileal perforation and early duodenal perforation.

Table XIV : DIAGNOSTIC ACCURACY OF ABDOMINAL PARACENTESIS

	Abdominal Emergencies	No of Cases	Positive Tap		Negative Tap		Diagnostic Accuracy sensitivity	Diagnostic falseness of the test
			True	False	True	False		
Non-Trauma Group								
1 Visceral perforation							93.18%	6.82%
i.	Stomach	10	10	0	0	0		
ii.	Duodenum	20	18	1	0	1		
iii.	Small Bowel	6	5	0	0	1		
iv.	Appendix	3	2	0	1	0		
V	Colon	1	1	0	0	0		
2 Diffuse peritonitis with suspected Intra Abdominal pathology								
i.	Ruptured right tubo ovarian mass	1	1	0	0	0		
ii.	Sigmoid volvulus	1	0	0	1	0		
iii.	Mesentric ischemia	1	1	0	0	0		
iv	Small bowel gangrene	1	1	0	0	0		
	Total	44	39	1	2	2		
3.TRAUMA GROUP								
i	Liver laceration	1	1	0	0	0	100%	0%
ii	Splenic laceration	1	1	0	0	0		
iii	Jejunal perforation	3	3	0	0	0		
iv	Mesenteric tear	1	1	0	0	0		
	Total	6	6	0	0	0		
	TOTAL	50	45	1	2	2	94%	6%

In this study 50 cases were subjected to peritoneal paracentesis, tap was positive in 46 cases and negative/ dry tap in 4 cases.

In non-traumatic group, there were 44 cases, of these 40 cases had a positive tap.

In other 39 cases, we had positive tap both macroscopically and microscopically which was confirmed by emergency laparotomy. In remaining 5 cases, we had 2 false negative results. In these cases no fluid was aspirated inspite of presence of fluid in the peritoneal cavity.

The diagnostic accuracy (sensitivity) in non traumatic group was found to be 93.18% with high percentage of true positive result was found in gastroduoodenal perforations.

In traumatic group, paracentesis was positive in 46 cases. All of them underwent laparotomy with positive pathology except one case. Most common intra abdominal organ injury in this study was liver laceration.

The diagnostic accuracy of paracentesis in traumatic group was found to be 100%.

Our study yield, high accuracy in non traumatic visceral perforations and in traumatic acute abdomen.

The overall diagnostic accuracy of abdominal paracentesis in both non traumatic and traumatic group was 94%.

DISCUSSION

The usefulness of paracentesis in various traumatic and non-traumatic acute abdominal conditions has been emphasised by several authors. The safety and ease with which procedure can be performed and reliability of the test has been well documented in the literature. Abdominal tap was done in 50 patients in the present study, but bowel puncture was never encountered. This was probably because patients with intestinal obstruction and multiple abdominal scars were excluded from this study.

The procedure hardly takes 5 minutes and is easy to perform. The overall requirements of this procedure was a disposable syringe with wide bore needle. In this study, we used 18 or 20 gauge or blood transfusion needle with 10cc disposable syringe. No attempt was made to compare the relative accuracy of this test with other diagnostic radiology.

In the present series, acute abdominal disease was more common in the male sex. 39 out of 50 cases were male accounting for 78.00% and 11 were females accounting for 22.00%. Blunt trauma abdomen was dominant in the male group. This is probably because of active involvement of males in day to day life and high incidence of trauma under the influence of alcohol.

Positive tap reported in the literature ranges from 52-100%. In the present series we got the positive tap in 46 out of 50 cases with an accuracy of 93.75%. This positive rate is in close confirmation with the observation made by other workers.

- Rao S.P.S (1977) performed a study on 100 cases and their positive tap rate was 81.00%.35
- Trivedi D. R. et al. (1971), in their series of 70 cases had positive taps in 57 cases amounting to 81.00%.14
- Khan M. (1975) in their series of 56 cases had 46 positive tap amounting to 82.14%.27
- Baker W. N. (1967) in an unselected series of 101 patients, found positive results in 83%.12
- Lamke L. O. (1978) did a study on 114 patients with a positive rate of 90%.28
- Sloop R.G.(1978) reported 94% positive rates in his study of 65 cases.29
- McPartlin J. F. (1971) in his study on 100 cases had positive rate of 67%.10
- Giacobine J. W. (1960) performed diagnostic paracentesis in 130 patients with a positive rate of 82%.4
- Prout W. C. (1961) had 72% positive rate in his study.13

Most of the cases in this current series were in non-traumatic acute abdomen. 40 out of 44 cases were in this group, accounting for 90.9%. Peritoneal paracentesis was positive in 46 cases with true positive in 45 cases, accounting for 97.8%. Approximately similar reports have been published in the literature.

- Baker W. N. (1967) reported accuracy of diagnostic tap in 80% of cases with perforated duodenal ulcer or gastric ulcer.12
- Similar reports have been reported by Singh J.31 (1973) and Thate R2 (1974) et al.

- T. Narasinga Rao (1993) obtained 100% positive results in gastrointestinal perforation.30
- Mahantha (1990) showed 76.47% positive tap in non-traumatic acute abdomen.15

Although the clinical and radiological picture in majority of visceral perforation is characteristic, there are some instances, where, the diagnosis is uncertain and in such circumstances abdominal paracentesis proves very helpful.

We encountered four such instances in our clinical study. In one case we were in diagnostic dilemma between perforative peritonitis and acute pancreatitis. This was because of both patients presented with shock and per abdomen examination revealed tenderness, guarding and rigidity. Erect x-ray abdomen showed only ground glass appearance. Diagnostic aspiration of peritoneal fluid revealed bilious. Diagnosis of perforative peritonitis was made and laparotomy done which revealed gall bladder perforation. Peritoneal paracentesis proved to be valuable in these circumstances, as opening, the patient with acute pancreatitis would have been disastrous.

- In other two cases of suspected peritonitis, where radiological findings inconclusive. But diagnostic aspiration revealed bilious. Patient taken up for laparotomy and found to be a ileal perforations.

Similar reports were published in the literature.

• Singh J. (1973) encountered three postoperative cases, where peritoneal paracentesis was very useful in arriving at the diagnosis.31

• Baker W. N. W. (1967) in his article published two postoperative cases where abdominal paracentesis undoubtedly helped the surgeon.12

In our series we encountered 44 cases of non-traumatic acute abdomen. 39 out of 44 cases were due to visceral perforation. Out of 39 visceral perforations 37 cases were positive for abdominal tap, resulting in 93.18% accuracy. Thus, the present study revealed that the utility of abdominal paracentesis is considerably effective in visceral perforations. This finding is consistent with the observations of other workers.

In traumatic group 6 out of 6 cases were found to be positive for tap there by accounting 100% diagnostic accuracy.

The overall diagnostic accuracy in both groups is 94% hence diagnostic peritoneal paracentesis is useful as a diagnostic tool in acute abdomen and arriving at the need for laparatomy equivocal cases in a setup where radiological scan is unavailable 24 hrs or radiologist not available round the clock or difficulty in shifting the patients who are in severe shock.

CONCLUSION

In conclusion this study establishes the simplicity, safety and accuracy of peritoneal tapping as a diagnostic aid in acute abdomen. It is particularly useful in centres where, radiological facilities do not exist, or where radiologists don’t available at all time and in serious cases of acute abdomen who cannot be shifted for radiography.. It is concluded that diagnostic abdominal tap is extremely reasonable diagnostic aid and can lead to improve surgical care of the patient with atypical acute abdominal pain.

BIBLIOGRAPHY

1. Peritoneal Fluid Analysis • LITFL • CCC Investigations [Internet]. Life in the Fast Lane • LITFL • Medical Blog. 2019 [cited 2019 Nov 5]. Available from: https://litfl.com/peritoneal-fluid-analysis/
2. Chalmers AD, Slack JM. Development of the gut in Xenopus laevis. Dev Dyn Off Publ Am Assoc Anat. 1998 Aug;212(4):509–21.
3. Dang C, Aguilera P, Dang A, Salem L. Acute abdominal pain. Four classifications can guide assessment and management. Geriatrics. 2002 Mar;57(3):30–2, 35–6, 41–2.
4. Varacallo M, Al-Dhahir MA. Anatomy, Anterolateral Abdominal Wall Muscles. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 [cited 2019 Nov 5]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK470334/
5. Anterior abdominal wall [Internet]. Kenhub. [cited 2019 Nov 5]. Available from: https://www.kenhub.com/en/library/anatomy/anterior-abdominal-wall
6. Regions of the abdomen [Internet]. Kenhub. [cited 2019 Nov 5]. Available from: https://www.kenhub.com/en/library/anatomy/regions-of-the-abdomen
7. Peritoneum | anatomy | Britannica.com [Internet]. [cited 2019 Nov 5]. Available from: https://www.britannica.com/science/peritoneum
8. The role of the diaphragm in lymphatic absorption from the peritoneal cavity. [Internet]. [cited 2019 Nov 5]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1167005/

9. Patterson JW, Dominique E. Acute Abdomen. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 [cited 2019 Nov 5]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK459328/
10. The Acute Abdomen - Causes - Management [Internet]. TeachMeSurgery. [cited 2019 Nov 5]. Available from: https://teachmesurgery.com/general/presentations/acute-abdomen/
11. EXTRA-ABDOMINAL CONDITIONS SIMULATING ACUTE ABDOMINAL DISEASES | JAMA | JAMA Network [Internet]. [cited 2019 Nov 5]. Available from: https://jamanetwork.com /journals/jama/article-abstract/236176
12. O'Rourke MC, Burns B. Blunt Abdominal Trauma. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 [cited 2019 Nov 5]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK431087/
13. Splenic trauma: WSES classification and guidelines for adult and pediatric patients | World Journal of Emergency Surgery | Full Text [Internet]. [cited 2019 Nov 5]. Available from: https://wjes.biomedcentral.com/articles/10.1186/s13017-017-0151-4
14. Taghavi S, Askari R. Liver Trauma. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 [cited 2019 Nov 5]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK513236/
15. Mukhopadhyay M. Intestinal Injury from Blunt Abdominal Trauma: A Study of 47 Cases. Oman Med J. 2009 Oct;24(4):256–9.

16. Pancreatic trauma: A concise review [Internet]. [cited 2019 Nov 5]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870553/
17. Duodenal perforation following blunt abdominal trauma [Internet]. [cited 2019 Nov 5]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3214512/

REFERENCE

1. Townsend CM. Sabiston Textbook of Surgery: The biological basis of modern surgical practice 16th Ed. Singapore: Harcourt Asia PTE Ltd., W. B. Saunders Co.; 2001.

2. Thate RL, Jain CS, Nayak N, Dias AD. Diagnostic peritoneal tap of the acute abdomen. Indian J. Surg. 1974; 36: 26-9.

3. Neuhof H, Cohen I. Abdominal puncture in the diagnosis of acute intra peritoneal diseases. Annals of Surgery. 1926; 83:454-62.

4. Giacobine JN, Siler VE. Evaluation of abdominal paracentesis. Surgery Gynec and Obst. 1960; 110: 676-86.

5. Moretz WH, Erickson WG. Peritoneal tap as an aid in the diagnosis of acute abdominal diseases. American Surgeon. 1954; 20: 363-77.

6. Glass WW, Gould SE. The acute abdomen: Aspiration 1st Ed. Baltimore: Williams and Wilkins Company; 1966.

7. Byrne RV. Diagnostic abdominal tap. Surgery Gynecology and Obstetrics. 1956; 103: 362.

8. Stephens FO. The use of peritoneal tap as an aid to diagnosis of intra abdominal lesions. Journal of Royal College of Surgeons, Edinburgh, 1969; 14: 230-4.

9. Gjessing J, Oskarsson BM, Tomlin PJ, Brock-Utne J. Diagnostic abdominal paracentesis. British Medical Journal. 1972; 1: 617-9.

10. McPartlin JF, McCarthy W. An appraisal of diagnostic paracentesis of the abdomen. British Journal of Surgery. 1971; 58(7): 498-501.

11. Strickler JW, Erwin PD, Rice CO. Diagnostic paracentesis. Archives of Surgery. 1958; 77: 859-62.

12. Baker WNW. Mackie DB. Newcombe JF. Diagnostic paracentesis in acute abdomen. British Medical Journal. 1967; 3: 146-9.

13. Prout WC. An Evaluation of Diagnostic paracentesis in acute abdomen. British Journal of Surgery. 1968; 55: 853.

14. Trivedi DR, Shenoy CK, Waghmare AR, Bapat RD, Chaukar AP, Deshmukh SS et al. Diagnostic use of paracentesis periotoneal in the management of acute abdomen. Indian Journal of Surgery. 1971; 33: 3957.

15. Mahanta H, Das MK, Datta Choudhary SB. An experience with diagnostic paracentesis in 100 cases of acute abdomen. Journal of Indian Medical Association, 1990; 88(5): 125-9.

16. Drapanas T, McDonald J. Peritoneal tap in abdominal trauma. Surgery. 1965; 50: 743.

17. Steinberg B. Peritoneal exudate guide diagnosis and prognosis of peritoneal conditions. J.A.M.A.1941; 116: 572.

18. Morris PJ, Wood WC. Oxford textbook of surgery: Acute abdomen. 2nd Ed. New York: Alison Langton; 2000.

19. Greenfield LJ, Mulholland MW, Oldham KT, Zejenock GB, Lillemo KD. Surgery scientific principles and practice: Acute abdomen and Appendix. 13th Ed. Philadelphia: Lippincott Williams and Wilkins; 2001.

20. Bannister LH. Gray's Anatomy: Alimentary System. 38th Ed. New York: ELBS; 1995.

21. Maddaus MA, Ahrenholz D, Simmons RL. The biology of peritonitis and implication for treatment: Surgical Clinics of North America. 1988; 68(2): 431-43.

22. Howard RJ. Current practice of gastrointestinal and abdominal surgery: Acute abdomen. New York: Churchill Livingstone; 1994.

23. Morris PJ, Wood WC. Oxford textbook of surgery: The Peritoneum and Peritonitis. 2nd Ed. New York: Alison Langton; 2000.

24. Ellis BW. Hamilton Bailey's Emergency Surgery: Abdominal Trauma. 79th Ed. Bombay; K. M. Verghese Company: 1995.

25. Hai AA. ASI Texbook of Surgery: Abdominal trauma. 1st Ed. New Delhi: Tata McGraw Hill Publishing Company; 2003.

26. Williams RD, Zollinger RH. Diagnostic and prognostic factors in abdominal trauma. American Journal of Surgery. 1959; 97: 575.

27. Khan M, Malik MS, Garyali RK, Dhar PM. Paracentesis peritoneii as a diagnostic aid in acute abdominal emergencies. Indian Journal of surgery. ; 37: 29-35.

28. Lamke LO, Varenhorst E. Abdominal paracentesis for early diagnosis of closed abdominal injury. Acta. Chir. Scand. 1978; 144(1): 21-5.

29. Sloop RD. The dominant role of paracentesis technics in the early diagnosis of blunt abdominal trauma. American Journal of Surgery. 1978; 136(1): 145-50.

30. Narasinga RT, Naik BB. Results of diagnostic peritoneal tap in acute abdomen. Indian Journal of Surgery. 1993; 55(7): 338-40.

31. Singh J, Bharadwaj DN, Singh B. Paracentesis in the management of Acute Abdomen. Journal of Indian Medical Association. 1973; 61(4): 176-9.

32. Bhatnagar VB, Asopa HS. Diagnostic abdominal paracentesis. Journal of Indian Medical Association, 1971; 57: 167.

33. Kosloske M, Goldthorn JF. Paracentesis as an aid to the diagnosis of intestinal gangrene. Experience in 50 infants and children. Archives of Surgery. 1982; 117(5): 571-5.

34. Mansoor T, Zubari S, Masiullah. Evaluation of peritoneal lavage and abdominal paracentesis in cases of blunt abdominal trauma. Journal of Indian Medical Association. 2000; 98(4):174-5.

35. Rao SPS, Parekh BR, Raina VK, Kapoor JP. Evalaution of Diagnostic abdominal paracentesis in acute surgical conditions of the abdomen.

ANNEXURE I

PROFORMA OF CLINICAL EXAMINATION OF

INDIVIDUAL PATIENT

Serial No.	
Name of the Patient :	
Age :	
Sex :	
Address :	
Occupation :	
Socioeconomic status :	
IP No.	
DOA :	
Clinical Diagnosis :	
Clinical Details	

Abdominal pain □Traumatic or Non traumatic □Site □Mode of onset □Shifting of pain □Radiation of pain Referred pain □Character of pain □Aggravating or relieving factors	
Abdominal Distention	
Vomiting	
Bowel habits (Constipation / Diarrhoea)	
Person history	
Past history	
Drug history	
General physical examination □Vitals □Appearance □Attitude	

P/A Abdomen □Inspection □Palpation □Percussion □Auscultation	
RS Examination	
CVS Examination	
General Examination	
Investigations CBC RFT LFT □Urine routine □X-ray abdomen - Erect - Lateral decubitus □USG abdomen	
CT Scan abdomen	

Peritoneal tap □Clear □Turbid □Bile □Hemorrhagic □Purulent □Others	
Peritoneal Cytology	
Preoperative diagnosis by peritoneal tap	
Type of operation □Findings during operation	
Type of Anaesthesia	
Post-operative diagnosis	
Summary :	

ANNEXURE II – KEY TO MASTER CHART

Y	-	yes
N	-	No
M	-	Male
F	-	Female
AP	-	Appendicular perforation
BTA	-	Blunt trauma abdomen
DP	-	Diffuse peritonitis
LP	-	Localized peritonitis
PAN	-	Pancreatitis
PP	-	Perforative peritonitis
B	-	Bilious
BL SF	-	Blood stained fluid
BSF	-	Bile stained fluid
CL	-	Clear fluid
PL	-	Purulent fluid
H	-	Haemorrhagic
FL	-	Feculent
SS	-	Sero sanguinous
P	-	Positive
N	-	Negative
T	-	Turbid fluid
OL	-	Odourless
U	-	Uriniferous

FF	FREE FLUID
PAF	PERIAPPENDICULAR FLUID
FS	FAT STRANDING
AUD	AIR UNDER DIAPHRAGM
LI	LOCALIZED ILEUS
HP	HEMOPERITONEUM
MAF	MULTIPLE AIR FLUID LEVELS
GP	GASTRIC PERFORATION
DUP	DUODENAL PERFORATION
IP	ILEAL PERFORATION
JP	JEJUNAL PERFORATION
CP	COLONIC PERFORATION
EL	EMERGENCY LAPARATOMY
PL	PERITONEAL LAVAGE
RA R	ESECTION ANASTAMOSIS
MGOPL	MODIFIED GRAHAMS LIVE OMENTAL PATCH CLOSURE
PC	PRIMARY CLOSURE
SV	SIGMOID VOLVULUS
MT	MESENTERIC TEAR
MTR	MESENTERIC TEAR REPAIR

MASTER CHART

S No.	IP No.	Age	Sex	Pain	Vomiting	Distension	Constipation	Tenderness	Guarding	Rigidity	Absent Bowel Sounds	Liver Dullness Obliteration	Tachycardia(>100/mt)	Hypotension (Sys<90mmHg)	Gross Nature of Tap	Odour of Tap	Microscopic findings of tap	X Ray Abd Erect	USG Abdomen	CT Abdomen	Intra Op findings	Procedures
1.	68888	70	F	Y	Y	Y	N	Y	Y	N	N	N	Y	N	N	N	N	COFFEE BEAN	NA	FF SV	SV	RA
2.	58360	30	M	Y	Y	N	N	Y	Y	N	N	N	Y	N	N	N	P	NAD	AA	PAF & FS	AAP	EA
3.	59080	59	M	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
4.	59113	25	M	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N	F	FL	P	AUD	NA	FF	IP	RA
5.	61350	52	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	N	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
6.	62093	28	M	Y	Y	Y	N	Y	Y	N	N	N	Y	N	P	PL	P	LI	NA	PAF & FS	AA	EA
7.	62391	22	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
8.	62476	42	M	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	BLS	BL	P	MAF	NA	MAF FF	HP GSB	PL RA
9.	62101	55	M	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	GP CP	PC MGLOP
10.	63987	55	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
11.	64691	40	M	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	F	FL	P	NAD	NA	FF	IP	PL PC

S No.	IP No.	Age	Sex	Pain	Vomiting	Distension	Constipation	Tenderness	Guarding	Rigidity	Absent Bowel Sounds	Liver Dullness Obliteration	Tachycardia(>100/mt)	Hypotension (Sys<90mmHg)	Gross Nature of Tap	Odour of Tap	Microscopic findings of tap	X Ray Abd Erect	USG Abdomen	CT Abdomen	Intra Op findings	Procedures
12.	68541	45	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	JP	PL PC
13.	67076	28	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
14.	67926	50	M	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	N	N	P	NAD	NA	FF	IP	RA
15.	68462	38	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	N	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
16.	68425	45	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	y	BS	OL	P	AUD	NA	AUD FF	GP	EL PC MGLOP
17.	67568	30	M	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N	BS	OL	P	AUD	NA	AUD FF	GP	EL PC MGLOP
18.	67702	35	M	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	GP	EL PC MGLOP
19.	66710	56	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
20.	70959	60	F	Y	N	Y	N	Y	Y	Y	N	N	Y	Y	F	FL	P	NAD	NA	FF	IP	RA
21.	74532	60	F	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	GP	EL PC MGLOP
22.	75269	48	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
23.	75866	60	F	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	P	PL	P	AUD	NA	AUD FF	PP	EL PL
24.	76533	50	M	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP

S No.	IP No.	Age	Sex	Pain	Vomiting	Distension	Constipation	Tenderness	Guarding	Rigidity	Absent Bowel Sounds	Liver Dullness Obliteration	Tachycardia(>100/ mt)	Hypotension (Sys<90mmHg)	Gross Nature of Tap	Odour of Tap	Microscopic findings of tap	X Ray Abd Erect	USG Abdomen	CT Abdomen	Intra Op findings	Procedures
25.	78801	50	M	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
26.	76502	47	F	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	F	FL	P	NAD	NA	HP	LL	PHP
27.	76513	40	F	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
28.	84447	60	M	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	P	PL	P	AUD	NA	AUD FF	DUP	EL MGLOP
29.	85428	56	F	Y	N	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	P	AUD	NA	AUD	DUP	EL MGLOP
30.	86643	85	M	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	P	PL	P	AUD	NA	AUD	GP	EL MGLOP
31.	86658	28	F	Y	Y	N	Y	Y	Y	N	N	N	Y	N	P	PL	p	LI	PAF FS	PAF & FS	AA	EL DR PL
32.	87645	45	M	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	BLS	BL	P	NAD	NA	HP	MT	MTR
33.	87320	22	M	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
34.	87452	50	M	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD	DUP	EL MGLOP
35.	89494	52	M	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	BLS	BL	P	MAF	NA	MAF FF	SBG AMI	EL RA
36.	87543	35	F	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	BS	OL	P	AUD	NA	AUD FF	GP	EL PC MGLOP
37.	88763	50	F	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	GP	EL PC MGLOP

S No.	IP No.	Age	Sex	Pain	Vomiting	Distension	Constipation	Tenderness	Guarding	Rigidity	Absent Bowel Sounds	Liver Dullness Obliteration	Tachycardia (>100/mt)	Hypotension (Sys<90mmHg)	Gross Nature of Tap	Odour of Tap	Microscopic findings of tap	X Ray Abd Erect	USG Abdomen	CT Abdomen	Intra Op findings	Procedures
38.	89567	60	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	BLS	BL	P	AUD	NA	HP	SPI	SPLENECTOMY
39.	592	26	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	GP	EL MGLOP
40.	612	29	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	GP	EL MGLOP
41.	765	45	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
42.	3149	63	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	F	FL	P	AUD	NA	AUD	IP	EL PL PC
43.	3357	83	M	Y	N	Y	Y	Y	Y	Y	N	Y	Y	N	BS	OL	P	AUD	NA	AUD	DUP	EL MGLOP
44.	3587	24	M	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	BS	OL	P	AUD	NA	AUD	DUP	EL MGLOP
45.	4072	45	F	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	P	PL	P	LI	NA	RIF FS FF	R TOM PP	EL PL
46.	4416	36	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	F	FL	P	LI	NA	FF	IP	EL PL PC
47.	4589	70	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	BS	OL	P	AUD	NA	AUD	JP	EL PL PC
48.	4756	55	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	GP	EL PC MGLOP

S No.	IP No.	Age	Sex	Pain	Vomiting	Distension	Constipation	Tenderness	Guarding	Rigidity	Absent Bowel Sounds	Liver Dullness Obliteration	Tachycardia (>100/mt)	Hypotension (Sys<90mmHg)	Gross Nature of Tap	Odour of Tap	Microscopic findings of tap	X Ray Abd Erect	USG Abdomen	CT Abdomen	Intra Op findings	Procedures
49.	4897	55	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	BS	OL	P	AUD	NA	AUD FF	DUP	EL MGLOP
50.	17642	43	M	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	BS	OL	P	AUD	NA	AUD	DUP	EL MGLOP