

Dissertation

**“HIGH DENSITY FREE FLUID IN ACUTE ABDOMEN ON COMPUTED
TOMOGRAPHY: A PREDICTOR OF INTERVENTION”**

Dissertation submitted to

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

CHENNAI

in partial fulfilment of the regulations for the Award of the degree of

M.S. (General Surgery)

Branch – I



THE TAMILNADU Dr. MGR MEDICAL UNIVERSITY

CHENNAI

MAY 2020

CERTIFICATE

This is to certify that, the dissertation entitled “**HIGH DENSITY FREE FLUID IN ACUTE ABDOMEN ON COMPUTED TOMOGRAPHY: A PREDICTOR OF INTERVENTION**”

Is the bonafide work done by **DR.S.SHILPA JAIN**, during his **M.S. (General Surgery)** course **2017-2020**, done under my supervision and is submitted in partial fulfilment of the requirement for the M.S.(BRANCH-I)- General Surgery of The Tamilnadu Dr.MGR Medical University, May 2020 examination.

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DECLARATION

I, certainly declare that this dissertation titled **“HIGH DENSITY FREE FLUID IN ACUTE ABDOMEN ON COMPUTED TOMOGRAPHY: A PREDICTOR OF INTERVENTION”** represents a genuine work of mine. The contributions of any supervisors to the research are consistent with normal supervisory practice, and are acknowledged.

I also affirm that this bonafide work or part of this work was not submitted by me or any others for any award, degree or diploma to any other University board, either in India or abroad. This is submitted to The TamilNadu Dr. M.G.R Medical University, Chennai in partial fulfilment of the rules and regulations for the award of Master of Surgery Degree Branch I (General Surgery).

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(POST GRADUATE)

ACKNOWLEDGEMENT

As I walk down the memory lane I realize with a deep sense of humility that what I have done now would not have materialized, but for certain luminaries, who have enlightened my path to wisdom.

It is my special privilege and great pleasure to record my deep sense of gratitude and indebtedness to my Professor and Guide **Prof. V RAMALAKSHMI M.S.**, but for whose constant guidance, help and encouragement this research work would not have been possible. The unflinching academic, moral and psychological support will remain ever fresh in my memory for years to come. Words cannot simply express my gratitude to her for imparting to me the surgical skills I have acquired.

I place on record my profound gratitude to **Prof. A AFFEE ASMA M.S.** for her support, keen interest and the constant encouragement she has given during the course of this thesis work.

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My sincere thanks to the radiology for granting me permission and helping me to conduct this study.

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I thank the Dean, MMC & RGGGH for permitting me to conduct this study.

I thank my husband for being a constant support throughout without whom this work would not have materialized

With deep reverence, I salute my parents and I thank the Almighty for blessing me with a wonderful family to whom I have dedicated this thesis and leave unsaid what they mean to me.

My heartfelt thanks go to each and every patient who agreed to be a part of this study and also my apologies to them in case of any inconvenience caused.

**INSTITUTIONAL ETHICS COMMITTEE
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CERTIFICATE OF APPROVAL

To
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Dear Dr.S.Shilpa Jain,

The Institutional Ethics Committee has considered your request and approved your study titled **"HIGH DENSITY FREE FLUID IN ACUTE ABDOMEN ON COMPUTED TOMOGRAPHY : A PREDICTOR OF INTERVENTION "** - NO.20122017

The following members of Ethics Committee were present in the meeting hold on **12.12.2017** conducted at Madras Medical College, Chennai 3

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| 13.Tmt.Arnold Saulina, MA.,MSW., | :Social Scientist |
| 14.Thiru K.Ranjith, Ch- 91 | : Lay Person |

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

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

R

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PROFORMA

PATIENT DETAILS:

Name:

Age:

Sex:

IP No. :

ON ADMISSION:

MAIN COMPLAINTS:

MODE OF INJURY (IF ANY):

ASSOCIATED COMPLAINTS :

CLINICAL EXAMINATION:

Pulse :

BP :

RR :

Temp :

Pallor :

CVS :

RS :

CNS :

P/A:

Abdomen X ray :

USG Abdomen :

CT Abdomen :

HOUNSFIELD UNIT :

TREATMENT

Conservative management : YES NO

Operative management :Yes No

Operative procedure:

Intra Op findings :

Post op Period :

FOLLOW UP :

INFORMATION SHEET

**TITLE: ‘HIGH DENSITY FREE FLUID IN ACUTE
ABDOMEN ON COMPUTED TOMOGRAPHY:
A PREDICTOR OF INTERVENTION ’**

Name of Investigator:

Name of Participant:

Purpose of Research: To compare the CT attenuation values of free fluid abdomen in patients those on conservative management Vs. on those who underwent surgical intervention. To find a cut off value above which surgical intervention becomes necessary.

Study Design: Prospective Observational Study

Study Procedures: patients who were admitted as acute abdominal pain and CT showing free fluid abdomen > 30 ml will be subjected to detailed history taking, general and systemic examination, routine and specific blood investigations, and the course of their hospital stay and the data analysed

Possible Risks: No risks to the patient

Possible benefits

To patient : Early diagnosis of the disease permits early treatment which in turn improves survival rates, mortality and morbidity.

To doctor & to other people: If this study gives positive results, it can help in early diagnosis of acute abdomen requiring intervention. Also, helps explain the prognosis and risk of post operative complication.

Confidentiality of the information obtained from you: The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared

Can you decide to stop participating in the study: Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time

How will your decision to not participate in the study affect you: Your decision will not result in any loss of benefits to which you are otherwise entitled.

Signature of Investigator
Participant

Signature of

Date :

Place :

PATIENT CONSENT FORM

Study Detail : **“HIGH DENSITY FREE FLUID IN ACUTE ABDOMEN
ON COMPUTED TOMOGRAPHY: A PREDICTOR OF
INTERVENTION**

Study Centre : Rajiv Gandhi Government General Hospital, Chennai.

Patient's Name :

Patient's Age :

In Patient Number : Patient may check () these boxes

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

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected.

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

I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team.

I hereby consent to participate in this study

I hereby give permission to undergo complete clinical examination and diagnostic tests including hematological, biochemical, radiological tests and to undergo treatment

Signature/thumb impression

Patient's Name and Address:

INTRODUCTION

Acute abdomen means acute attack of abdominal pain that may occur suddenly or gradually over a period of several hours and presents a symptom complex which suggests a disease that possibly threatens life and demands an urgent diagnosis for early intervention. Acute abdominal pain can represent a spectrum of conditions from benign and self-limited disease that can be managed conservatively to surgical emergencies.

Abdominal pain is a common presentation in the outpatient setting and is challenging to diagnose. Abdominal pain is a very common presenting complaint in the surgical emergency department. Although most abdominal pain is benign, as many as 10 percent of patients in the emergency department setting have a surgical cause. Therefore, a thorough and logical approach to the diagnosis of abdominal pain is necessary. It requires a detailed patient history, physical examination, laboratory tests, and imaging studies.

delay may worsen the condition and ultimately be fatal.

The causes of an acute abdomen include appendicitis, perforated peptic ulcer, hollow viscus perforation, acute pancreatitis, ruptured sigmoid diverticulum, ovarian torsion, volvulus, ruptured aortic aneurysm, lacerated spleen or liver, and ischemic bowel. Patients may present in an obvious or subtle manner. Diagnosing a patient with a full-blown acute abdomen is relatively easy but it is difficult to diagnose an incipient abdominal catastrophe in a patient presenting with early, non-specific symptoms.

In the past acute abdomen was indicative of a surgical problem and the patient was taken directly to the operating room. But today we know there are also some medical conditions that can present with acute abdominal pain that requires medical therapy. These conditions include acute pancreatitis, chronic kidney disease , alcoholic liver disease, sickle cell anemia, diabetic ketoacidosis, adrenal crisis, and pyelonephritis. Today, ultrasound / CT scans are widely used to determine the cause of acute abdomen, so that we know beforehand what to expect during surgery. It avoids surgery in patients with medical causes of an acute abdomen.

Abdominopelvic CT is often used for making a diagnosis and determining the etiology of acute abdomen . certain CT scan findings have been shown to be associated with the need for surgical intervention and intrabdominal free fluid (IFF) is known to be one of those CT findings. characteristics of the IFF would improve diagnostic accuracy and its ability in predicting the need for surgical intervention. Thus, our study was intended to evaluate the utility of IFF radiodensity , measured using Hounsfield units would help in determining the need for surgical intervention . We hypothesized that patients who require surgical intervention would have significantly higher IFF radiodensity than those who could be managed nonoperatively. We also studied if hounsfield unit of free fluid would give us information regarding Site of perforation ,Post-operative complications, prolonged hospital stay,morbidity and mortality .

AIMS AND OBJECTIVES

- To compare the computed tomography attenuation values of free fluid abdomen in patients those on conservative management vs intervention done.
- To evaluate the computed tomography (CT) attenuation values of ascites to predict post op infection risk, need for prolonged hospitalization and outcome.

REVIEW OF LITERATURE

A study named - Computed tomography attenuation values of ascites are helpful to predict perforation site was conducted at the Department of Surgery, Keio University School of Medicine, and published in World Journal of Gastroenterology in 2015 February .

In this study A total of 61 consecutive GI perforation patients with detectable ascites on abdominal CT at the time of admission who underwent surgery at Keio University Hospital , a total of 51 patients were included in the analyses. Among this 24 patients with colorectal perforations, the CT attenuation values of ascites was significantly higher than those in patients with perforations at other sites [22.5 Hounsfield units (HU) vs 16.5 HU]. Patients with colorectal perforation were significantly associated with postoperative complications .

The prediction rate of colorectal perforation using attenuation values as an auxiliary diagnosis improved compared to that of CT findings alone (92.2% vs 82.4%).

The study concluded that the CT attenuation values of ascites could facilitate the prediction of perforation sites and postoperative complications in GI perforations, particularly in cases in which the perforation sites are difficult to predict by CT findings alone.

The paper presented at 101st Annual American College of Surgeons Clinical Congress, Chicago, on October 7, 2015 was titled High-Density Free Fluid on Computed Tomography: a Predictor of Surgical Intervention in Patients with Adhesive Small Bowel Obstruction .

A total of 318 patients with acute small bowel obstruction were identified during their study period. Of the total patients , 111 patients were included for analysis. While non-operative management for acute small bowel obstruction was successful in 49 patients, 62 patients required surgical intervention.

Although CT findings suggestive of a closed-loop obstruction were significantly associated with the need for surgical intervention , none of the qualitative CT findings were sufficiently sensitive for the identification of patients requiring surgical intervention. There was a difference in the median HU of intra abdominal free fluid on CT, with a significantly higher value in the operative group compared to the nonoperative group (18.2 vs. 7.0 HU, $p < 0.01$). The majority of the patients in the operative group underwent surgical intervention within 48 h after their admission.

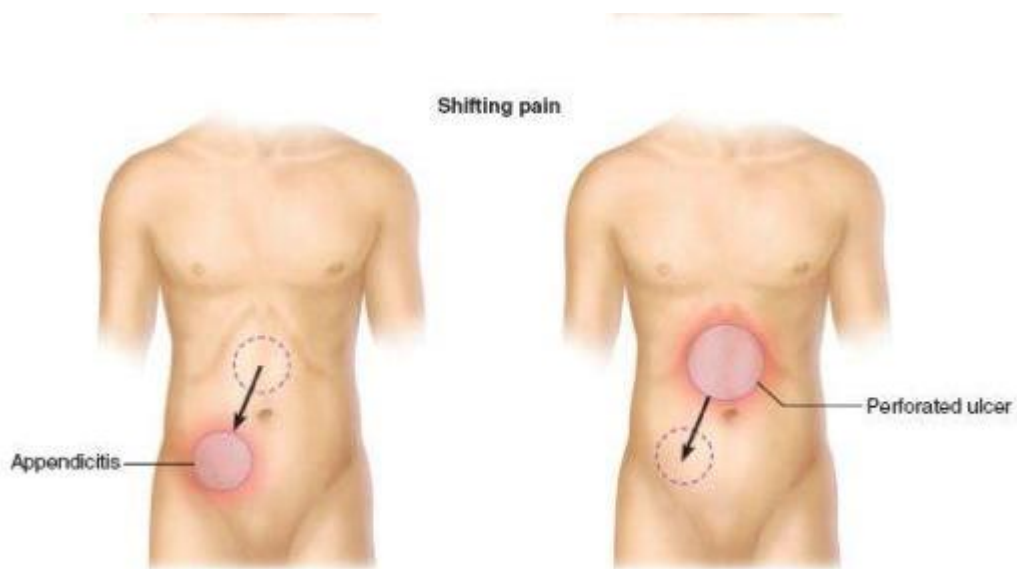
Based on the results of ROC analysis, a cutoff value of 10 HU for IFF radiodensity was determined to be optimal for predicting the need for surgical intervention .The patients with IFF HU >10 were more likely to require surgical intervention than those with a lower density IFF. With the cutoff value of >10 HU, the sensitivity, specificity, PPV, NPV, and accuracy to predict the need for surgical intervention were 83.9, 65.3, 75.4, 76.2, and 75.6 %, respectively in this study.

DIAGNOSIS OF ACUTE ABDOMEN

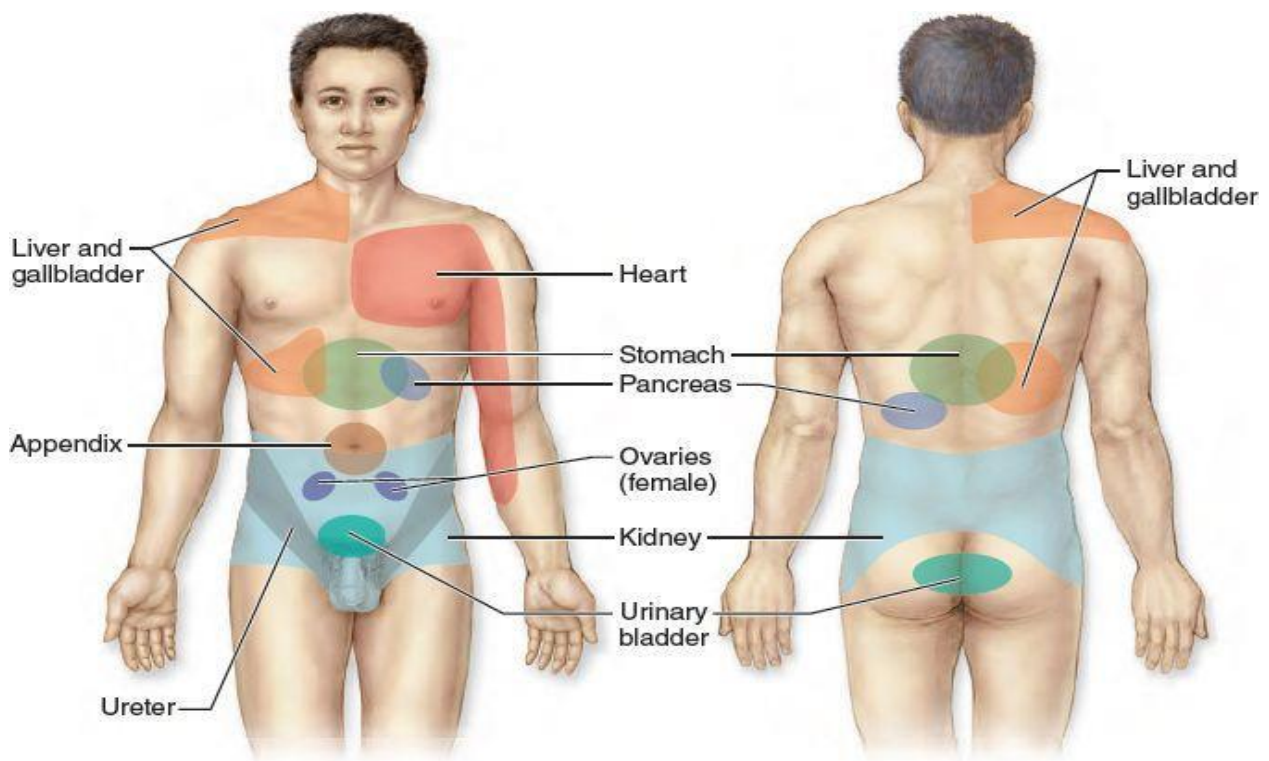
History of symptoms

1. Pain

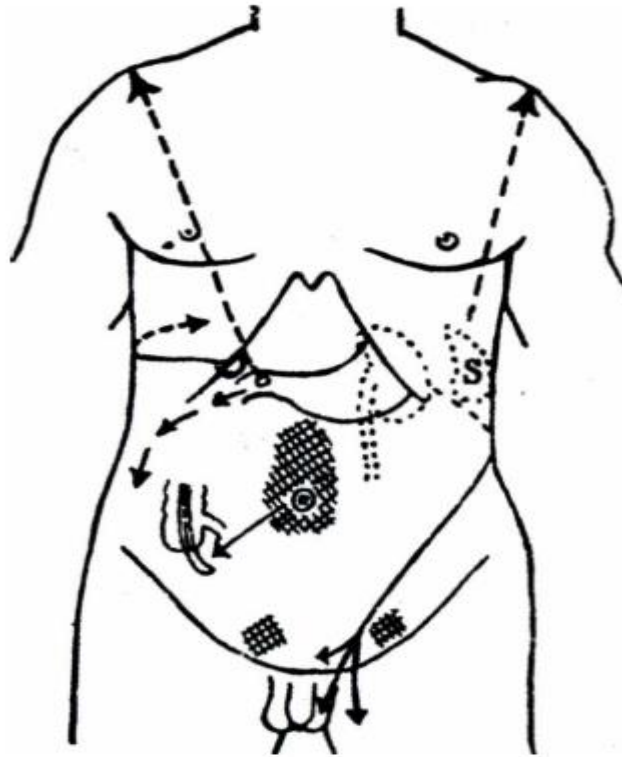
- Time of Onset-The pain in acute appendicitis starts in the early morning, whereas sudden pain due to perforation of a peptic ulcer usually takes place in the afternoon after lunch but the patient is often brought to the hospital at night.
- Mode of Onset - This is sudden in perforation, colic, torsion, volvulus etc. The pain in acute intestinal obstruction may not be severe at the onset but gradually increases in intensity. 'Acute abdomen' is sometimes precipitated by administration of purgatives (e.g. acute appendicitis), by straining (e.g. perforation) or by jolting (ureteric colic).
- How long is the history of present complaint of pain?
- Site of pain.— It usually coincides with the position of the affected organ. The patient is asked to indicate the site of pain with the tip of one finger (Pointing test). If the pain is diffuse the patient will use his whole hand instead of one finger to locate its site.
- Shifting of pain is characteristically seen in acute appendicitis.



- Radiation of pain- In spreading peritonitis the pain is first at the region of the affected organ but it soon spreads all over the abdomen.
- Referred pain- pain is said to be referred when it is felt at some other regions having the same segmental innervation as the site of the lesion. In lesions of the stomach, duodenum and jejunum (T.5 to 8) the pain is felt in the epigastrium; ileum and appendix (T.9 & 10) around the umbilicus, colon (T.11 & 12, LI & 2) in the hypogastrium. The diaphragm is supplied by the phrenic nerve (C.3, 4 & 5). The cutaneous nerves from the same segments supply the skin over the shoulder and the upper part of the front of the chest. Any irritation on the undersurface of the diaphragm either by gastric contents or blood or bile ,may give rise to referred pain to the corresponding shoulder. In suspected cases the foot-end of the bed may be raised to allow the exudates to gravitate down towards the undersurface of the diaphragm which will initiate pain on the corresponding shoulder. In renal colic, pain is referred from loin to groin, testis and inner side of the thigh. Biliary colic pain radiates to the right hypochondrium to inferior angle of the right scapula.



A diagrammatic representation of various types of pain seen in acute abdomen. In perforation of peptic ulcer pain referred to the right shoulder and migrates along the right paracolic gutter towards the right iliac fossa. Pain originating in the gallbladder may radiate to the back just below the inferior angle of the scapula and even to the right shoulder. Splenic (S) pain is referred to the left shoulder (Kehr's sign). In appendicitis umbilical to the right iliac fossa shifting pain.. Renal colic is referred to from the loin to groin, testis and inner side of the thigh.



- Character of pain
 - i. Colicky pain- sharp intermittent griping pain which comes suddenly and disappears suddenly. It indicates obstruction to a hollow organ , either bowel obstruction (intestinal colic) or obstruction of the common bile duct with a stone or worm (biliary colic) or obstruction of the renal pelvis or ureter with a stone (renal or ureteric colic)
 - ii. Constant burning pain in peritonitis
 - iii. Severe agonising pain is characteristic of acute pancreatitis or of torsion
 - iv. Throbbing pain is suggestive of inflammation, e.g. hepatitis or cholecystitis.

- Change in character of the pain

Colicky pain of acute intestinal obstruction may change into constant burning type indicating strangulation.

Diminution of pain is not always a happy situation. In acute appendicitis it may indicate perforation of an obstructive appendix.

In 2nd stage (stage of irritation) of peptic perforation, pain diminishes in intensity although the disease is continuing.

- Effect of pressure on colicky pain gives relief but in inflammatory conditions it aggravates the pain.

- Relation of the pain to jolting, walking, respiration and micturition

In amoebic hepatitis, cholecystitis and appendicitis the pain aggravates during walking and jolting.

Pain during micturition or 'strangury' is frequently met with in ureteric colic, pelvic appendicitis or even pelvic abscess.

In case of pain due to diaphragmatic irritation, deep inspiration will aggravate the pain.

In case of cholecystitis, fatty foods will aggravate the pain.

In peptic ulcer disease, alkalis will make the pain better whereas alcohol, spicy food or drugs like aspirin will aggravate the pain.

In case of hiatus hernia and reflux oesophagitis, stooping forward will make the pain worse.

Vomiting sometimes relieves the pain in peptic ulcer.

In colics vomiting temporarily relieves the pain but reappears immediately.

The pain in acute pancreatitis is relieved to a certain extent by sitting up from the recumbent position.

2. Vomiting

- Character of the act - The vomiting may be projectile . In case of peptic ulcer perforation or general peritonitis the vomiting is quiet regurgitation of mouthfuls.
- Vomitus.— In intestinal obstruction at first the stomach contents, next the bilious duodenal contents and lastly the faeculent intestinal contents are voided. It is also seen in gastrocolic fistula. In biliary colic the vomiting is usually bilious. In case of peptic ulcer the vomitus has gastric contents. In late cases of peritonitis the vomitus becomes dark brown, faeculent being mixed with altered blood. This type of vomitus is also seen in uraemia.
- In Frequency and quantity.— Vomiting is constant, frequent and profuse in acute intestinal obstruction and acute pancreatitis. In peptic ulcer disease vomiting is periodical. Both nausea and vomiting are the characteristic complaints in pre- or post-ileal appendicitis.
- Its relationship with pain
Pain precedes vomiting in acute appendicitis, acute pancreatitis, peptic ulcer, biliary and renal colics.
In high intestinal obstruction, vomiting appears almost simultaneously with pain. In obstruction of the lower end of the ileum vomiting may not occur in the beginning but follows after a few hours and in large bowel obstruction vomiting is absent or is a late presentation .

3. Bowel habit

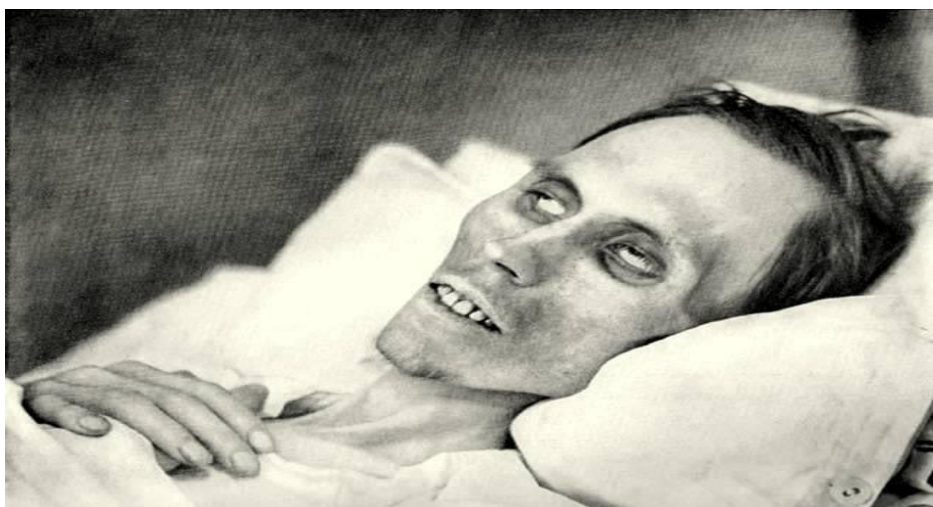
Absolute constipation / obstipation i.e. arrest of both faeces and flatus is usual in intestinal obstruction and peritonitis . In acute appendicitis history of constipation is often present . In pelvic appendicitis or pelvic abscess, irritation of the rectum may lead to 'Tenesmus'. In children features of intestinal obstruction accompanied by passage of mucus and blood per anum is suggestive of acute intussusception. In mesenteric thrombosis, blood and putrid stool may be noticed. Diarrhoea occurs in acute ulcerative colitis, acute enteritis and regional ileitis.

- 4, In women the menstrual history is important. A history of missed period is often present in rupture of ectopic gestation.
- 5 . Smoking and alcoholic habits should always be enquired into.
6. Past history-Previous history of ulcer pain may be present, history of haematemesis and melaena may be present.History of previous surgeries should be enquired into.

PHYSICAL EXAMINATION

- Appearance

In 'acute abdomen' the patient usually presents a peculiar facial expression. In terminal stage of peritonitis, the typical facies called 'Hippocratica' can be observed. An anxious look, bright eyes, pinched face and cold sweat on the surface are the features. Dehydration is also typical and consists of sunken eyes, drawn cheeks and dry tongue. The peculiar lividity or blueness (cyanosis) of the face is a feature which is characteristic, though not often found, in acute haemorrhagic pancreatitis. Extreme pallor and gasping respiration in a woman of child bearing age should arouse suspicion of ruptured tubal gestation



Hippocratica' facies

- Attitude

Patient in colicky pain is either tossing on the bed, doubled up or rolls in agony. In peritonitis, the patient remains quiet because movements will only increase the pain. Only in the last stage of peritonitis and post-operative peritonitis, the patient becomes highly excitable.

- Pulse

In the early stage of many acute abdominal conditions the pulse remain normal in rate, volume and tension. It is said to be a good diagnostic guide in acute appendicitis. In internal haemorrhage pulse is rapid. In peptic perforation the pulse may become normal in the early stage, but with the spread of peritonitis the pulse volume reduces. In acute intestinal obstruction though the pulse remains normal in the beginning , with the advent of dehydration, the volume falls and rate increases with no tendency to return to normal.

- Temperature

In infective conditions the temperature will be raised. This may be quite high in case of acute appendicitis, in acute cholecystitis it is raised to a moderate degree, and in acute pancreatitis or in acute diverticulitis the temperature may not be raised that much. Rise of temperature is never an early sign, it occurs late in the disease

- Tongue - an index of the state of the digestive system. "

A dry tongue indicates dehydration.

A dry and brown tongue signifies toxæmia.

Early stage of appendicitis, it may be dry and thinly coated

- Anaemia- Obvious pallor is seen in haemorrhagic

conditions e.g. ruptured ectopic gestation.

- Cyanosis is noticed in case of haemorrhagic acute pancreatitis.
- Jaundice is often noticed after biliary colic and occasionally in acute pancreatitis.



EXAMINATION OF THE ABDOMEN

- INSPECTION

The patient should lie flat on his back with legs extended and hands by the side. The abdomen from the nipples above down to the saphenous openings must be exposed. Examination should be carried out in good light

- First inspect all the hernial orifices ,if this examination be left for the last it may be missed and actual cause of acute abdomen may thus be missed



- Contour of the abdomen.— Distension of the abdomen in acute intestinal obstruction occurs gradually and may not be evident till sometime has elapsed. In volvulus of the sigmoid colon and caecum distension appears almost immediately . In second stage of peptic perforation slight distension may be evident, but in biliary colic, acute cholecystitis, acute appendicitis and renal colic the contour of the abdomen remains normal.



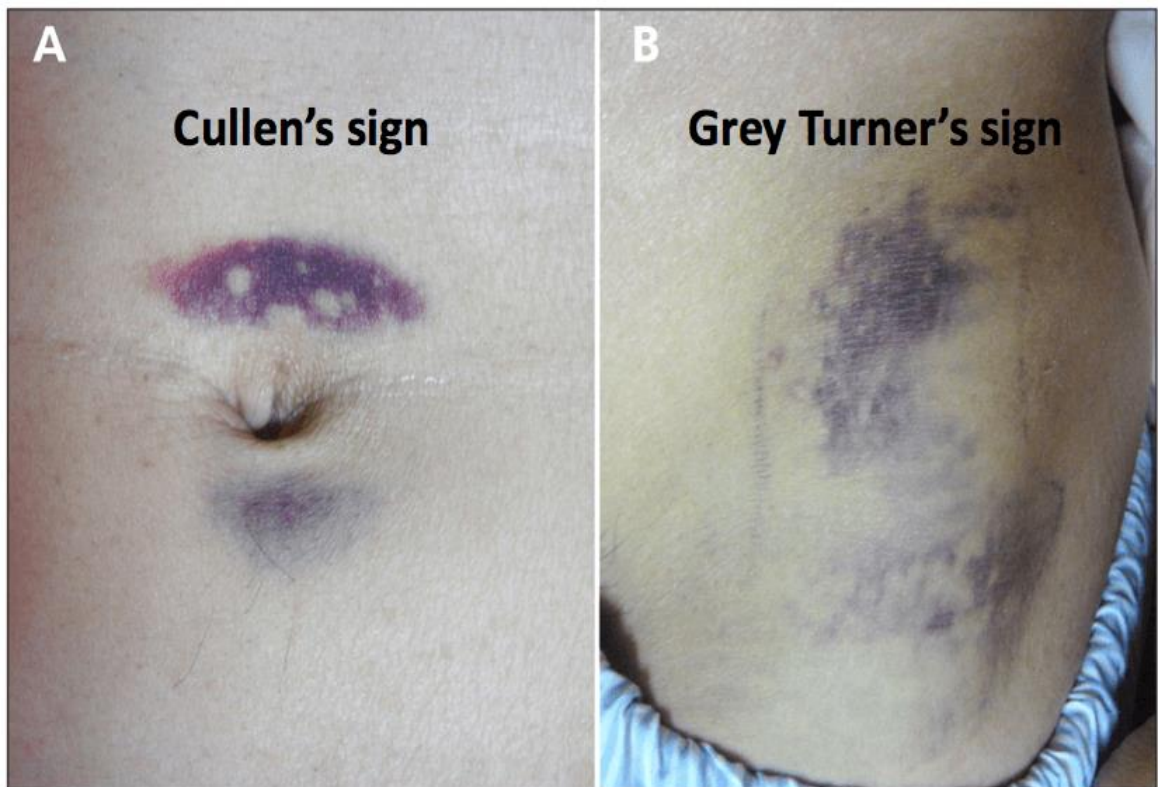
- Respiratory movement- Sluggish or no respiratory movement of the abdominal wall indicates wide spread irritation of the peritoneum as occurs in diffuse peritonitis or haemorrhage into the peritoneal cavity . Localized limitation of respiratory movement occurs in localized irritation of the peritoneum from inflammation of underlying organs
- Peristaltic movements - The characteristic 'ladder pattern' peristalsis may be found in small bowel obstruction.



VISIBLE INTESTINAL PERISTALSIS

- Look for a pulsating swelling - In the case of leaking abdominal aneurysm the patient may come with acute pain in the abdomen.

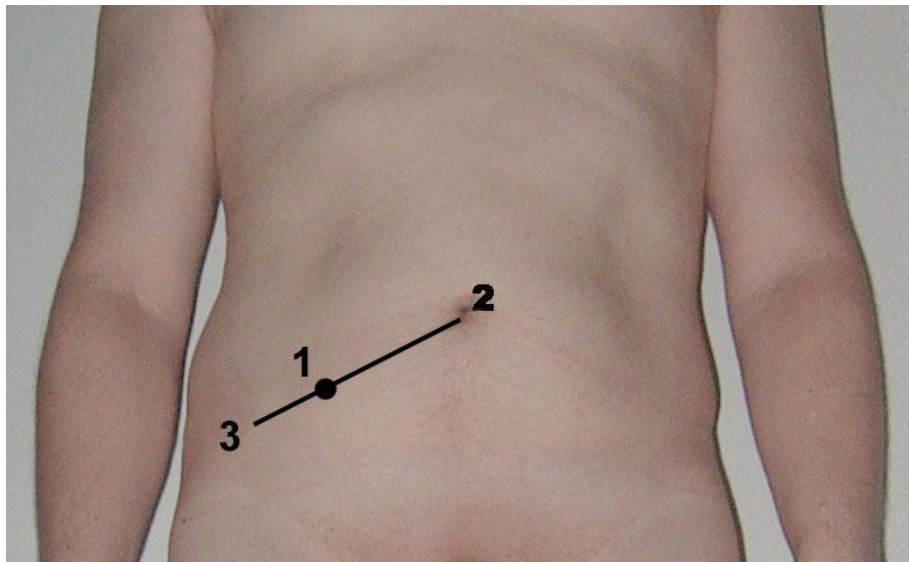
- Skin Discolouration in the left flank (Grey Turner's sign) and bluish hue around the umbilicus (Cullen's sign) are occasionally seen in late cases of acute haemorrhagic pancreatitis with extensive destruction of the pancreas. Hot application to the site of pain to get relief may cause redness and even blisters on the skin at the site of pain.



PALPATION

- The volar surfaces of the fingers employed are for palpation. The forearm should be kept horizontal along the level of the abdomen so that the fingers are placed flat on the abdomen.
- Do not poke .
- Rough palpation will lead to voluntary contraction of the abdominal muscles
- Hands must be kept warm before palpation of the abdomen

- ❖ Hyperaesthesia can be elicited by gently picking up a fold of skin and lifting it off the abdomen or by simply scratching the abdominal wall with finger. Presence of hyperaesthesia in Sherren's triangle (this is formed by lines joining the umbilicus, right anterior superior iliac spine and symphysis pubis) is regarded as a good guide in the diagnosis of gangrenous appendicitis. If hyperaesthesia disappears, it indicates bursting of the gangrenous appendix. An area of hyperaesthesia between the 9th and 11th ribs posteriorly on the right side is known as Boas's sign suggestive of acute cholecystitis.
- ❖ Tenderness is constant over an inflamed organ. In acute cholecystitis, tenderness is present just below the tip of the 9th costal cartilage on the lateral margin of the right rectus. In acute appendicitis, tenderness is present on the McBurney's point.



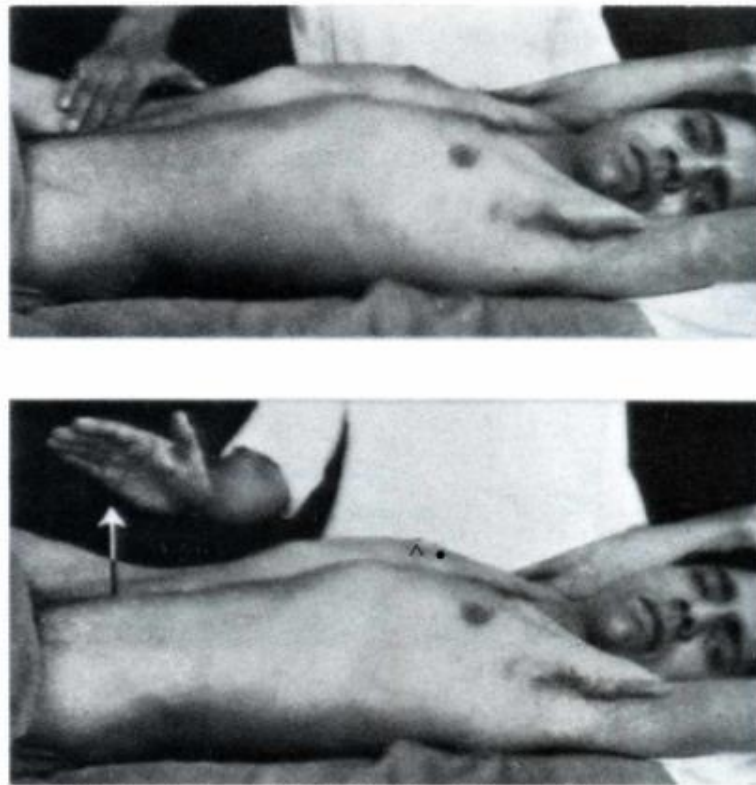
McBurney's point.

Similarly in a case of peptic perforation tenderness may be elicited in the right iliac fossa, the gastric contents gravitate along the right paracolic gutter.

Differentiation from Thoracic disease (pleurisy or basal pneumonia) can be made by the fact that in these conditions the skin may become hyperaesthetic but no definite tenderness can be elicited from deep palpation.

Rovsing's sign is typically present in appendicitis.

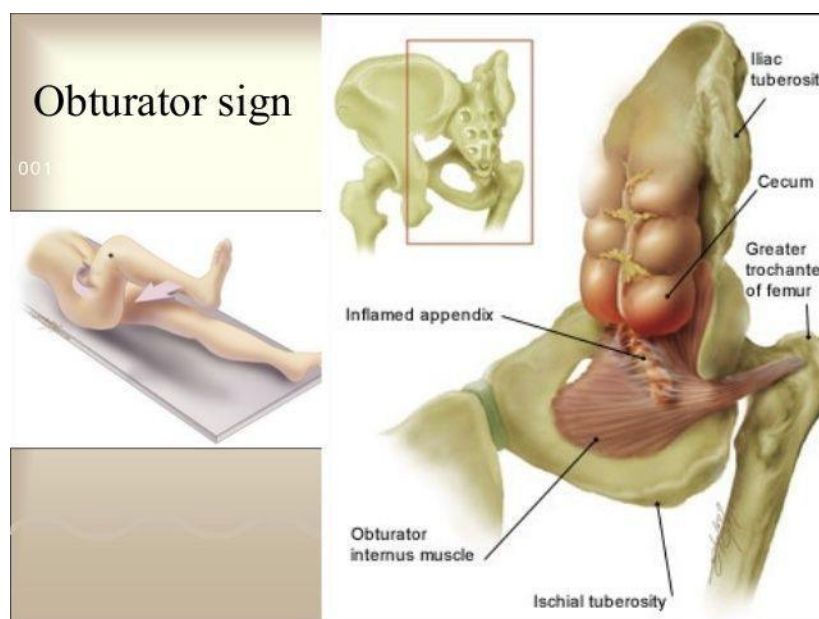
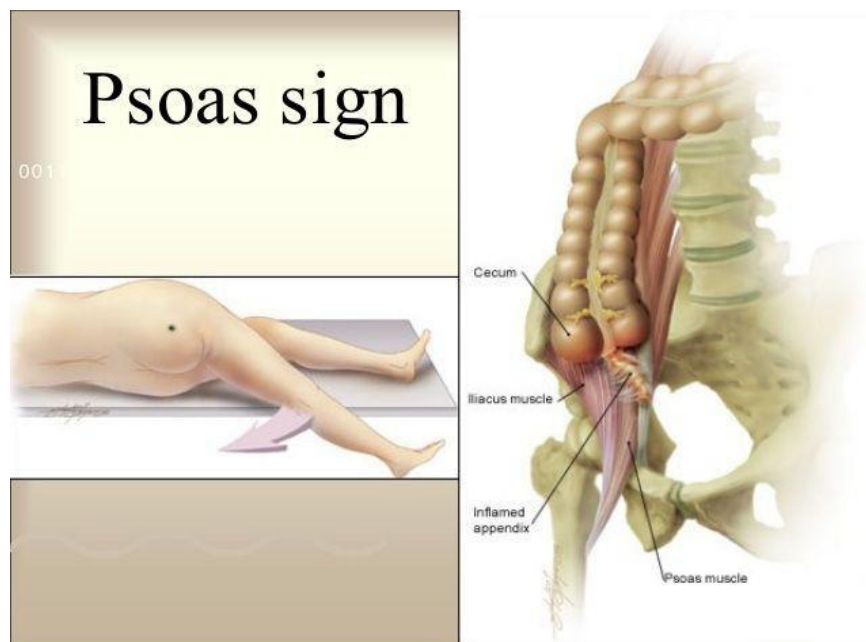
Rebound tenderness or Blumberg's sign or Release sign- a sign of peritonitis due to presence of an inflamed organ underneath it. Presence of this sign in acute intestinal obstruction suggests strangulation of the gut.



Rebound Tenderness being Elicited

Cope's Psoas test in retrocaecal appendix - appendix lies on the Psoas major which causes irritation of Psoas major muscle . When the right hip joint is hyperextended pain is elicited.

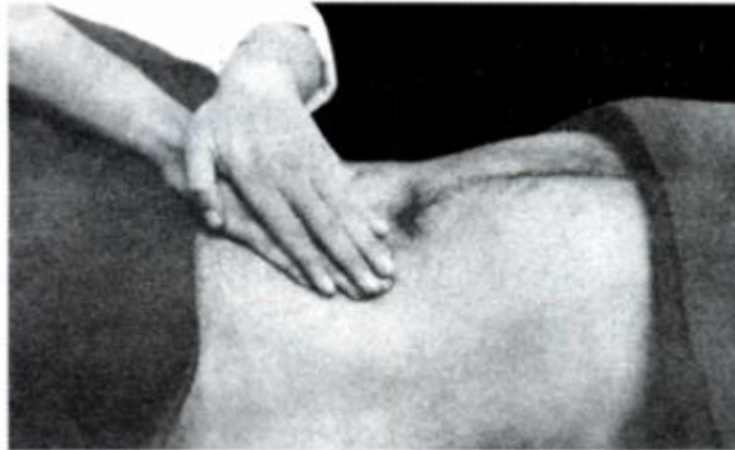
The obturator test - pelvic appendix may lie on the obturator internus muscle. internal rotation of the hip joint will elicit pain. Baldwin's test.— A hand is placed over the flank of the patient, and the patient is asked to raise the right lower limb off the bed keeping the knee extended. The patient will immediately complain of pain in case of retrocaecal appendicitis.



❖ Guarding

Gentle movement of the straight fingers will be able to find out presence or absence of involuntary muscle guard and it should be carried out throughout the abdomen so as to detect localized muscle guarding, if present.

Another method of eliciting involuntary muscle guard is to use both hands during palpation one above the other. The hand in contact with the abdominal wall remains passive and wholly utilized to feel the condition of the abdominal wall musculature while the hand above is used to exert a slight and steady pressure to assist the hand below for better palpation. You may ask the patient to open his mouth and breathe deeply ,Unlike the involuntary muscle guard, the voluntary muscular rigidity will disappear during expiration.



The muscle guard usually corresponds to the area of tenderness. We should not wait for board-like rigidity of the whole abdomen which is a late feature of this condition.

In case of appendicitis the site of muscle guard varies according to the position of the appendix. Muscle guard will be conspicuous by its absence in case of all colics due to absence of irritation of the parietal peritoneum. Similarly acute intestinal obstruction without strangulation will not show any rigidity of the abdomen.

Differentiation of rigidity due to thoracic disease from that due to perforated peptic ulcer is made by asking the patient to take deep breath in and out with open mouth. During expiration the rigidity will be diminished in case of thoracic diseases whereas in case of peptic perforation it persists.

- ❖ Lump.— Appendicular lump may be felt in the right iliac fossa. In intussusception, a sausage-shaped lump may be felt in the epigastrium or left lumbar region associated with empty right iliac fossa (Sign-de-dance).

PERCUSSION

Light Percussion may be employed to elicit local tenderness.

Right mid-axillary line is percussed from above downwards. The percussion note will be resonant in the upper part of the mid-axillary line. At the upper border of the liver the resonant note is replaced by a dull note. If the liver dullness is replaced by a resonant note it indicates presence of free gas under the diaphragm as occurs in perforation of hollow viscus. absence of this sign does not exclude perforation since this sign will only be present when there is sufficient leakage of air.

Shifting dullness- Presence of free fluid in the peritoneal cavity .There are many acute abdominal conditions of surgical importance in which free fluid can be accumulated in the peritoneal cavity .



Eliciting shifting dullness. The abdomen is percussed from the midline towards the flank. When the percussion becomes dull in the flank, the patient is turned to the opposite side. the flank is again percussed and the note becomes resonant.

Fluid thrill indicates massive amounts of free fluid in the abdomen.

Auscultation

The 'silent abdomen' is a pathognomonic feature of diffuse peritonitis. A 'noisy abdomen' is a feature of acute intestinal obstruction. Normal intestinal sound is heard as clicks and gurgles but in intestinal obstruction distinct metallic tinkles or borborygmi is heard. In case of peritonitis or paralytic ileus when the intestinal sounds are absent peculiar respiratory and cardiac sounds may become audible.

Measurements

Rate of distension assessed through repeated measurements to determine need for intervention .

Rectal examination - No examination of an acute abdominal case is complete without a DRE / digital rectal examination . The right wall may be tender in pelvic type appendicitis, which may not show any tenderness or rigidity of the anterior abdominal wall. The bulging of the anterior wall of the rectum with tenderness is significant of a pelvic abscess. In intussusception, one will find the gloved finger to be smeared with mucus and blood ('red-currant jelly') but there will be no faecal odour. In majority of cases of acute abdomen there is ballooning of the rectum whose significance is yet to be found out.

Vaginal examination.— Purulent discharge and tenderness in both fornices are suggestive of acute salpingitis. In case of ruptured ectopic gestation, the cervix feels softer and cervical motion tenderness is present .

| | | |
|------------------|---|---|
| Aaron sign | Pain or pressure in epigastrium or anterior chest with persistent firm pressure applied to McBurney point | Acute appendicitis |
| Bassler sign | Sharp pain created by compressing appendix between abdominal wall and iliacus | Chronic appendicitis |
| Blumberg sign | Transient abdominal wall rebound tenderness | Peritoneal inflammation |
| Carnett sign | Loss of abdominal tenderness when abdominal wall muscles are contracted | Intra-abdominal source of abdominal pain |
| Chandelier sign | Extreme lower abdominal and pelvic pain with movement of cervix | Pelvic inflammatory disease |
| Charcot sign | Intermittent right upper abdominal pain, jaundice, and fever | Cholelithiasis |
| Claybrook sign | Accentuation of breath and cardiac sounds through abdominal wall | Ruptured abdominal viscus |
| Courvoisier sign | Palpable gallbladder in presence of jaundice | Periapillary tumor |
| Cruveilhier sign | Varicose veins at umbilicus (caput medusae) | Portal hypertension |
| Cullen sign | Periumbilical bruising | Hemoperitoneum |
| Danforth sign | Shoulder pain on inspiration | Hemoperitoneum |
| Fothergill sign | Abdominal wall mass that does not cross midline and remains palpable when rectus is contracted | Rectus muscle hematomas |
| Grey Turner sign | Local areas of discoloration around umbilicus and flanks | Acute hemorrhagic pancreatitis |
| Iliopsoas sign | Elevation and extension of leg against resistance create pain | Appendicitis with retrocecal abscess |
| Kehr sign | Left shoulder pain when supine and pressure placed on left upper abdomen | Hemoperitoneum (especially from splenic origin) |
| Mannkopf sign | Increased pulse when painful abdomen is palpated | Absent if malingering |
| Murphy sign | Pain caused by inspiration while applying pressure to right upper abdomen | Acute cholecystitis |
| Obturator sign | Flexion with external rotation of right thigh while supine creates hypogastric pain | Pelvic abscess or inflammatory mass in pelvis |
| Ransohoff sign | Yellow discoloration of umbilical region | Ruptured common bile duct |
| Rovsing sign | Pain at McBurney point when compressing the left lower abdomen | Acute appendicitis |
| ten Horn sign | Pain caused by gentle traction of right testicle | Acute appendicitis |

GENERAL EXAMINATION

When the abdominal findings are not sufficient to account for the symptoms one is complaining of, we should think of extra-abdominal causes and proceed to examine the following

- Examine the chest and chest wall- Pain is often referred to the abdomen from the thorax in conditions like diaphragmatic pleurisy, basal pneumonia, angina pectoris, myocardial infarction etc. History of fever, hurried respiration with lowered pulse respiration ratio, working of the alae nasi and absence of vesicular breathing all lead to a probable diagnosis of lobar pneumonia. Compressing the lower part of the chest from side to side will cause pain in presence of thoracic diseases but not with typical acute abdomen. When pain radiates from the back along one or more spinal nerves of the lower thoracic segments to the midline anteriorly, one should think of herpes zoster. This often leads to confusion with acute cholecystitis, but skin hyperaesthesia along the course of the affected nerve and absence of rebound tenderness may help in diagnosis.
- Examine the scrotum and spermatic cord for evidence filariasis. This may lead to abdominal pain from retro-peritoneal lymphangitis.
- Examine the spine for Pott's disease. Pain may be referred to the abdomen.
- Examine the nervous system to exclude Tabes Dorsalis. It may lead to gastric crisis consisting of pain in the abdomen and vomiting. A history of

'lightning pain' in the legs, Argyll-Robertson pupil and absence of ankle and knee jerks will settle the diagnosis.

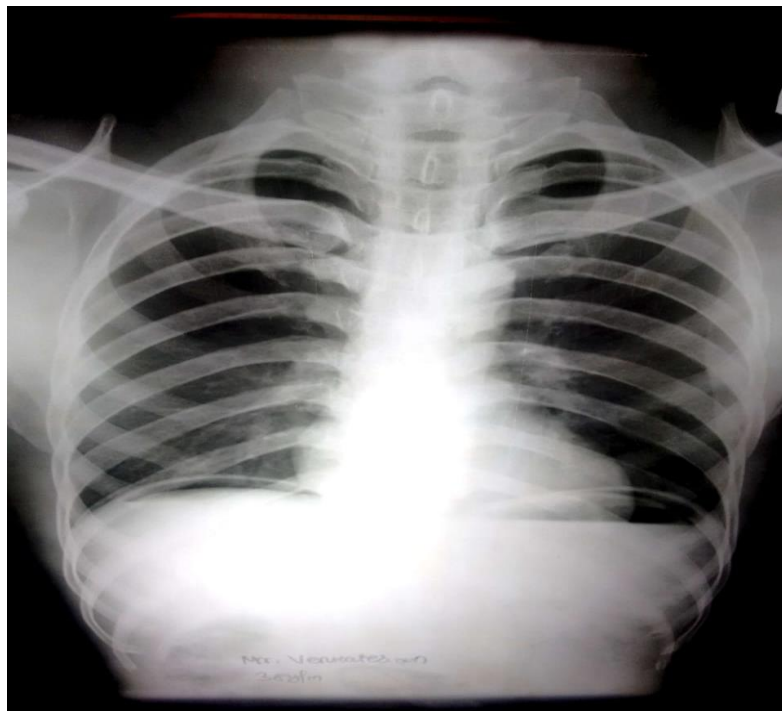
There are a number of medical conditions which may mimic an acute abdomen. These are malaria, porphyria, diabetic crisis, Sickle-cell anaemia, haemophilia .

INVESTIGATIONS

Blood

- (a) Leucocytosis indicates inflammatory condition. Its role in the diagnosis of appendicitis is very important . Besides this, it is almost always present in acute cholecystitis, acute pancreatitis , acute intestinal obstruction when complicated by strangulation
- (b) Sugar and urea estimations of the blood are important. Diabetic ketoacidosis may mimic an acute abdomen. Uraemia may present with persistent vomiting accompanied by increasing distension of the abdomen to make this condition confused with acute intestinal obstruction.
- (c) serum amylase in suspected acute pancreatitis. While the normal value is 80 to 150 Somogyi units, 400 units is considered to suggest presence of acute pancreatitis.
- (d) The serum calcium level is lowered in acute pancreatitis It may take 5 to 8 days after the attack. The fall in the serum calcium level is a good index of the severity of acute pancreatitis.
- (e) The serum bilirubin level is raised in acute pancreatitis cholecystitis , liver abscess .

- (f) The plasma fibrinogen is also raised at the end of first week and should return to normal within the 3rd week. It has considerable prognostic significance.
- (g) Serum deoxyribo-nuclease, leucine amino-peptidase (LAD) and lecithinase A may be raised and considered to be a definite diagnostic index for acute pancreatitis.
- (h) Blood pressure is low in any haemorrhagic condition. In acute pancreatitis, the blood pressure will be lowered due to third space loss.
- (i) Urine.— Routine urine examination should be a must in any case of acute abdomen.
- (j) X-ray Examination - In a straight X-ray multiple fluid levels and gas indicate acute intestinal obstruction.



Straight X-ray showing presence of gas under the diaphragm indicates perforation of the gastro-intestinal tract

In acute pancreatitis gas in the duodenum and first coil of jejunum is sometimes seen. Stewart's sign i.e. gas filled hepatic and splenic flexures, no gas in the transverse colon is suggestive of this condition.

In case of intussusception screening and skiagraphy after a barium enema shows pincer-shaped end of the barium enema. It also helps in spontaneous reduction of the intussusception.

In suspected gallstone ileus the shadow of the stone near the termination of small intestine will clinch the diagnosis.



Bowel obstruction

To differentiate renal colic from appendicular colic, intravenous pyelography is very important.

In acute ulcerative colitis 'toxic megacolon' may be seen.

(k) Barium enema with air contrast may be helpful in detecting early stage of acute ulcerative colitis. Signs include loss of haustral markings and irregularities of the colon wall, which represent small ulceration. As the disease progresses pseudopolyps become prominent. When there are clinical signs of toxic megacolon, barium study is contraindicated.

In Crohn's disease double-contrast barium study may reveal longitudinal and transverse mucosal ulcers as 'spicules'. The irregular network of intersecting ulcers combined with submucosal oedema result in coarse nodularity or 'cobblestone' pattern. There may be filling defects due to hyperplastic lymph follicles. The hallmark of this disease is presence of 'skip lesions'. Barium enema examination of diverticulitis shows segmental spasm with serrations (saw-toothing) of the bowel. Mucosal oedema and narrowing of the lumen may also be evident. barium enema examination is absolutely contraindicated in very acute conditions.

Nothing is more harmful than an enema given in a case of peritonitis. The only suitable subject for administration of enema is one of the acute intestinal obstruction. 'Two enema' test is of greater value. The first enema may show some result by evacuating the lower bowel. It is the result of the

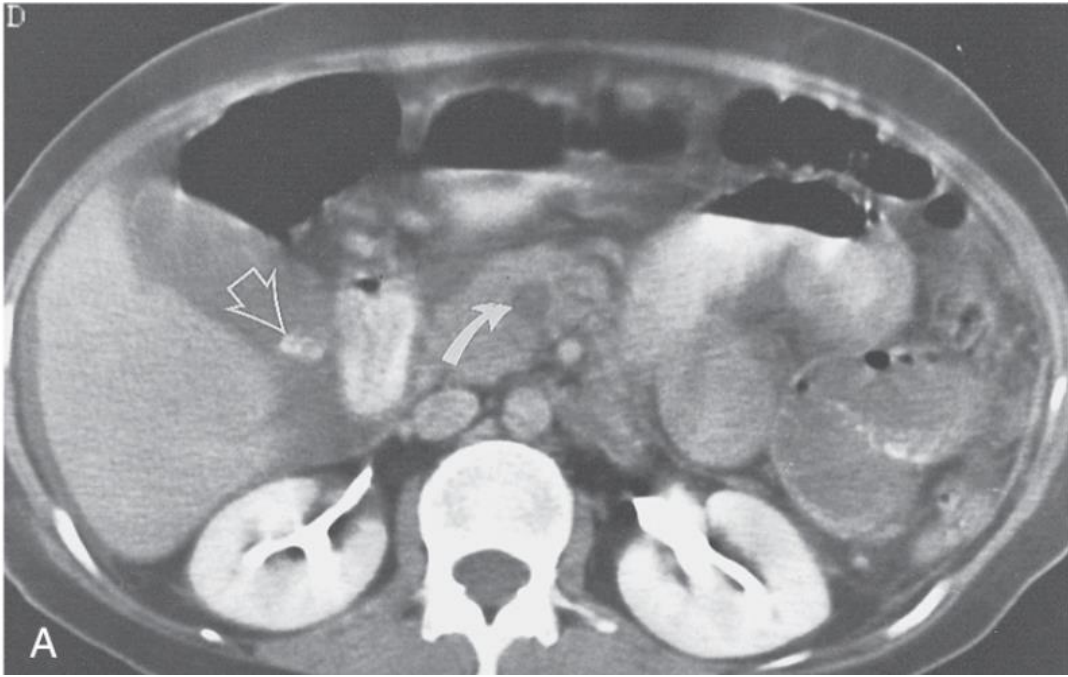
second enema given after an interval of 2 hours that leads to the diagnosis usually.

(l) Endoscopy.— Proctosigmoidoscopy is helpful in acute ulcerative colitis as the rectum is involved in 90% to 95% of the cases .In Crohn's disease (regional ileitis) endoscopy reveals cobblestone appearance with deep linear ulceration. In acute diverticulitis sigmoidoscopy may be painful. The mucosa is inflamed and diverticula may be seen.

(m)Intravenous cholangiography permits visualization of the entire extrahepatic biliary tree. It was used earlier for acute cholecystitis as oral cholecystography is contraindicated, now it is losing ground in this condition.

(n) Ultrasonography.— This non-invasive imaging technique has become the routine investigation in acute abdomen cases .It demonstrates gallbladder calculi, bile duct calculi, dilatation of the gallbladder with stone and sludge, stone in the cystic duct, dilatation of biliary tree, acute pancreatitis, acute appendicitis, perforation, obstruction, free fluid and even a tumour.

(o) Computed Tomography (CT Scan) It provides almost similar informations as ultrasonography. It is useful for those in whom ultrasonography is difficult e.g. in obese patients and in those having excessive bowel gas. It gives additional information regarding the cause of acute abdomen .



CT findings of the low density thrombosed superior mesenteric vein (solid arrow) and incidental gallstones (open arrow) along with free fluid abdomen in a case of mesenteric ischemia

(p) Exploratory laparotomy.— On many occasions of acute abdomen the diagnosis is not established until a laparotomy is undertaken.

BOX 45-5 Findings Associated With Surgical Disease in the Setting of Acute Abdominal Pain

Physical Examination and Laboratory Findings

Abdominal compartment pressures >30 mm Hg

Worsening distention after gastric decompression

Involuntary guarding or rebound tenderness

Gastrointestinal hemorrhage requiring >4 units of blood without stabilization

Unexplained systemic sepsis

Signs of hypoperfusion (acidosis, pain out of proportion to examination findings, rising liver function test results)

Radiographic Findings

Massive dilation of intestine

Progressive dilation of stationary loop of intestine (sentinel loop)

Pneumoperitoneum

Extravasation of contrast material from bowel lumen

Vascular occlusion on angiography

Fat stranding or thickened bowel wall with systemic sepsis

Diagnostic Peritoneal Lavage (1000 mL)

>250 white blood cells per milliliter of aspirate

>300,000 red blood cells per milliliter of aspirate

Bilirubin level higher than plasma level (bile leak) within aspirate

Presence of particulate matter (stool)

Creatinine level higher than plasma level in aspirate (urine leak)

CAUSES OF ACUTE ABDOMEN

1. INTRA-ABDOMINAL CAUSES :

a. Inflammation

- Acute appendicitis
- Acute cholecystitis
- Acute salpingitis
- Acute diverticulitis
- Acute regional ileitis
- Acute pneumococcal peritonitis
- Acute non-specific mesenteric lymphadenitis
- Amoebic liver abscess.

b. Perforation

- Peptic ulcer
- Duodenal ulcer
- Typhoid ulcer
- Diverticular disease
- Ulcerative colitis
- Malignancy
- Paralytic ileus

c. Acute intestinal obstruction

Mechanical

- In the lumen — gallstone, round worms, faecolith
- In the wall — tubercular stricture, intussusception, growths etc.

- Outside the wall — additional bands, volvulus, external and internal herniae etc.
- Toxic — Paralytic ileus.
- Neurogenic — Hirschprung's disease.
- Vascular — Occlusion of mesenteric vessels by embolism or thrombosis.

d. Haemorrhage

- Rupture of ectopic gestation
- Ruptured Lutein cyst
- Spontaneous rupture of malarial spleen
- Rupture or leaking aortic aneurysm
- Aortic dissecting aneurysm

e. Tortion of pedicle

- Twisted ovarian cyst
- Spleen

f. Colics

- Biliary
- Ureteric
- Appendicular
- Intestinal

2. EXTRA-ABDOMINAL CAUSES

a. Parietal conditions

- superficial cellulitis of the abdominal wall
- gas gangrene of the abdominal wall

- abscess of the abdominal wall
- rupture of rectus abdominis muscle and/or tearing of inferior epigastric artery.

b. Thoracic conditions

- Diaphragmatic pleurisy
- Lobar pneumonia
- Spontaneous pneumothorax
- Pericarditis
- Angina pectoris
- Coronary thrombosis

c. Retro-peritoneal conditions

- lymphangitis and lymphadenitis
- Uremia
- Pyelitis
- Dietl's crisis
- Leaking aneurysm of the aorta
- Dissecting aneurysm of the aorta

d. Retroperitoneal Diseases of the spine, spinal cord and intercostal nerves

- Pott's disease
- Acute osteomyelitis of lower dorsal or lumbar vertebrae
- Gastric crisis in Tabes Dorsalis

- Herpes zoster of lower intercostal nerves
- Intercostal neuralgia.

e. General Diseases

- Sickle cell anaemia
- Haemophilia
- Purpura
- Small pox
- Malaria
- Typhoid fever
- Porphyria
- Diabetic crisis

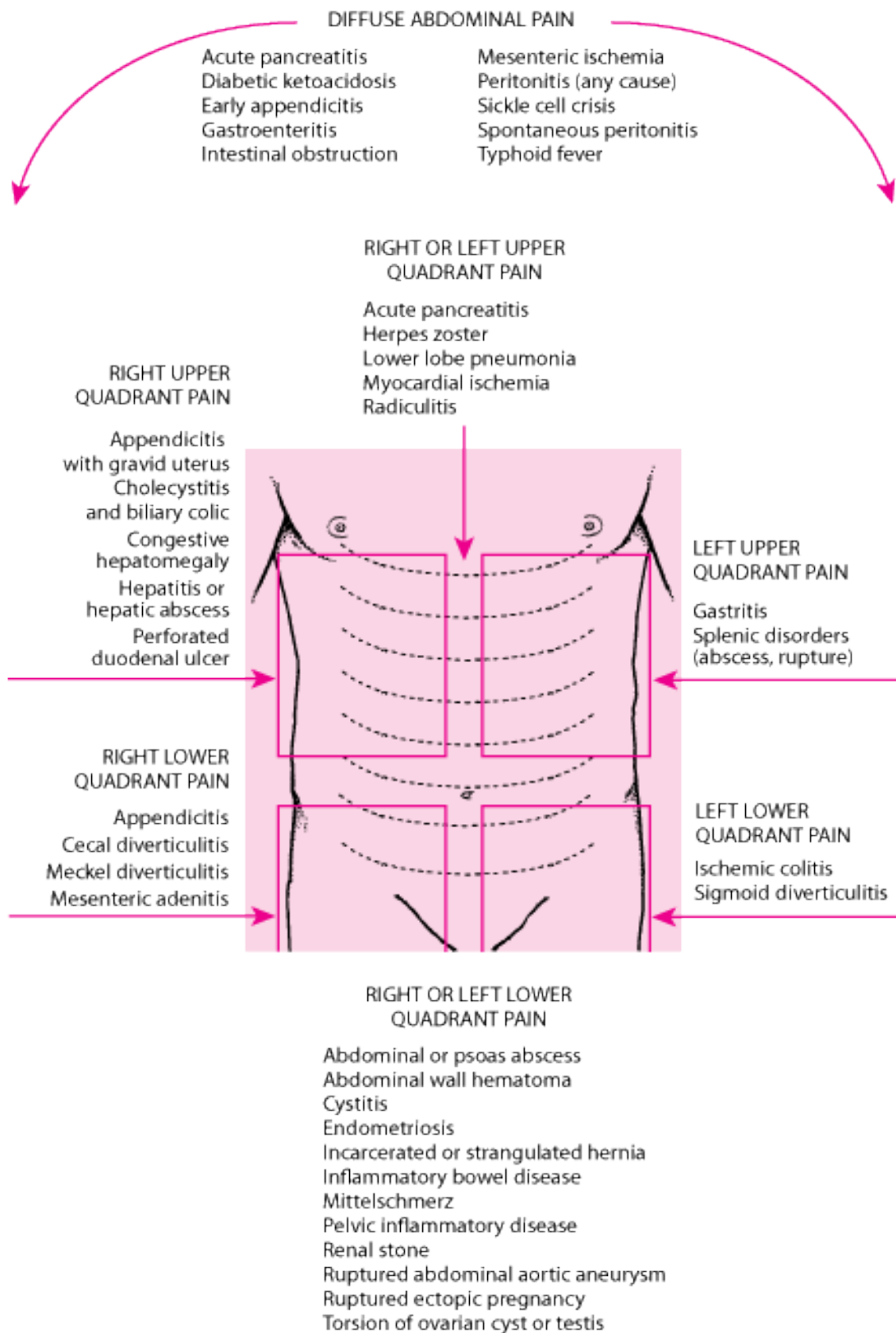
In children the following conditions are common :

- a) Acute appendicitis
- b) Intussusception
- c) Intestinal obstruction by round worms, congenital band or by bands including Meckel's diverticula
- d) Acute nonspecific mesenteric lymphadenitis
- e) Meckel's diverticulitis
- f) Primary peritonitis

In females the following conditions are common :

- (a) Ruptured ectopic gestation
- (b) Ruptured lutein cyst

- (c) Twisted ovarian cyst
- (d) Acute salpingitis
- (e) Tubo-ovarian abscess
- (f) Torsion or degeneration of a uterine fibroid.



HOUNSFIELD UNIT

The Hounsfield scale named after the British physicist Godfrey N. Hounsfield is a quantitative scale for describing radiodensity on computed tomography . Hounsfield units are obtained from a linear transformation of the measured attenuation coefficients . This transformation is based on the arbitrarily-assigned densities of air and pure water.

- radiodensity of distilled water at standard temperature and pressure = 0 HU
- radiodensity of air at STP = -1000 HU

STP: standard temperature is 0 °C and pressure is 105 pascals

This results in a scale from -1000 HU for air to +~2000 HU for very dense bone (cochlea).

The Hounsfield density of tissues reflects their attenuation of x-ray and is proportional to their physical density. The software of all CT scanners has the ability to measure the density of a region of interest (ROI) electronically overlaid on the image. Each elemental region of the CT image (pixel) is expressed in terms of Hounsfield units (HU) corresponding to the x-ray attenuation (or tissue density).CT numbers are displayed as gray-scale pixels on the viewing monitor. White represents pixels with higher CT numbers (bone). Varying shades of gray are assigned to intermediate CT numbers .No equivalent to Hounsfield units exists in any other form of structural imaging.

Attenuation value is related to the specific gravity of a tissue. The specific gravity of a fluid is proportional to its protein content. Therefore, the density of the ascitic fluid increases with increasing protein content and exudates. Ascitic fluid is traditionally classified as being transudative or exudative based on its protein concentration. The attenuation value of transudative ascites (total protein <2.5 g/dL, specific gravity <1.015) is less than 10 HU

HOUNSFIELD UNIT CHART

| Substance | HU |
|-------------|--|
| Air | -1000 |
| Lung | -700 |
| Soft Tissue | -300 to -100 |
| Fat | -84 |
| Water | 0 |
| CSF | 15 |
| Blood | +30 to +45 |
| Muscle | +40 |
| Bone | +700(cancellous bone)to +3000 (dense bone) |

Intra abdominal free fluid

Ascites is the abnormal accumulation of fluid in the peritoneal cavity. it may be an exudate or transudate. Exudative ascites can be secondary to malignancy, infection, or inflammation, whereas transudative ascites due to portal hypertension (e.g., liver cirrhosis, acute liver failure) and/or hypoalbuminemia (e.g., nephrotic syndrome),chronic heart failure. There is a continuous exchange of substances between the peritoneal space and vascular bed. In patients with cirrhosis, secondary

to portal hypertension, capillary pressure and permeability increase and ascites is transudative .

In cases of exudate ascites, vascular perfusion is increased because of the inflammatory process, tumoral invasion, or traumatic destructive changes. Capillary bed injury or fragility of newly formed capillary beds in malignancy leads to leakage, resulting in ascitic fluid that is denser than that associated with benign ascites .

Clinical features include progressive abdominal distension, shifting dullness, and a fluid thrill . Ascites may be associated with abdominal pain in rare cases. An adequate clinical assessment should be followed by imaging to identify even very small quantities of ascitic fluid in the peritoneal cavity.

If the onset of ascites is spontaneous or the origin is unclear, an abdominal paracentesis and ascitic fluid assessment may be performed . Management involves treating the underlying condition in addition to sodium restriction and diuretic therapy.

| FEATURE | TRANSUDATE | EXUDATE |
|------------------------------|---|--|
| Definition | Filterate of blood plasma without changes in endothelial permeability. Due to physiomechanical factors. | Oedema of inflamed tissue associated with increased vascular permeability, damage to serous membranes. |
| Character | Non-inflammatory oedema | Inflammatory oedema |
| Grossly | Typically clear, pale yellow fluid | Usually cloudy, yellow or bloody |
| Protein content | Low, no tendency to coagulate as mainly albumin, no fibrinogen. | High, readily coagulates due to high content of fibrinogen. |
| Glucose content | Same as plasma | Low |
| Specific gravity | Low | High |
| pH | >7.23 | <7.23 |
| LDH | Low | High |
| Effusion LDH/Serum LDH ratio | <0.6 | >0.6 |
| Cells | Few cells, mainly mesothelial cells and cellular debris | Many cells, inflammatory as well as parenchymal. |

Radiographic features of free fluid abdomen

Ultrasound

Ultrasound is variably sensitive depending on the size of the patient and the operator. In thin patients, relatively small volume of fluid can be found. Clear fluid without internal echoes (anechoic) is likely to be reactive. Low-volume free fluid in the pouch of Douglas is often seen in female patients of child-bearing age and is often physiological with no clinical significance. Echogenic fluid has small suspended particles that look like flecks of white and swirl with agitation or breathing . An echogenic fluid often means that the fluid is cellular, such as a suppurative, hemorrhagic or neoplastic effusion, or is proteinaceous.

CT

Fluid on CT is relatively hypodense (dark) on CT. It can be compared to fluid in the gallbladder or stomach. Dense fluid may suggest hemoperitoneum. Fluid may be within the peritoneal space or paracolic gutters, or may be interposed between bowel loops or around solid organs, e.g. the liver, spleen etc

HOLLOW VISCUS PERFORATION



Hollow Viscus Perforation

Hollow viscus perforation is one of the important cause of abdominal pain in adults.

Duodenal ulcer perforation is the most common .

Duodenal ulcer perforation is common in the first part of duodenum and most common in males in the age group 20 to 40. The high incidence of duodenal ulcer perforation is due to alcoholism, smoking , incomplete treatment of H. pylori and NSAID abuse .

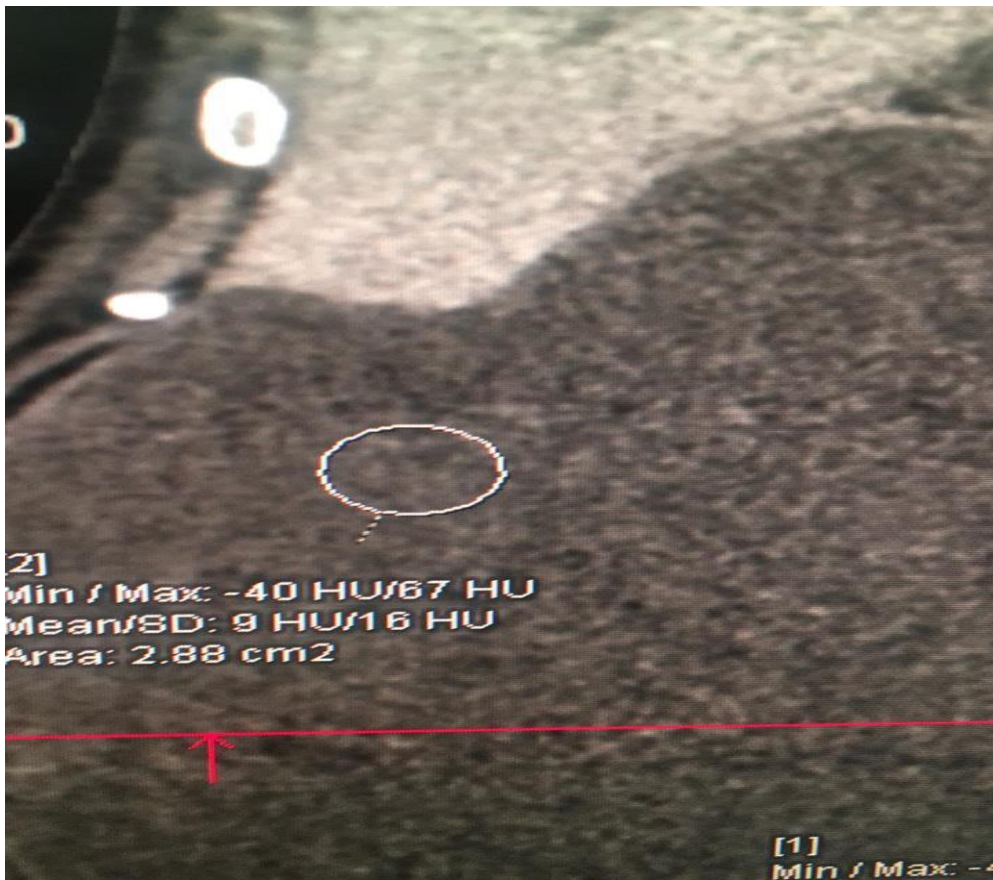
The other causes of GI hollow viscus perforations are acid peptic disease, enteric fever, amoebic colitis, appendicular perforation, trauma, diverticulitis, malignancy, tuberculosis, iatrogenic injuries. Majority of traumatic perforations are caused by road traffic accidents. .Enteric fever perforations are common in second week of the disease . Tubercular perforations involving the ileocaecal junction are treated by right hemicolectomy. In appendicular perforation emergency appendicectomy with peritoneal lavage is sufficient. Nowadays iatrogenic perforations are common due to minimally invasive or endoscopic procedures. Early diagnosis and emergency explorative laparotomy improves outcome. Early diagnosis and adequate treatment can prevent complications.

MESENTERIC ISCHEMIA



Embolus is the most common cause of acute mesenteric ischemia and is responsible for over 50% of cases. The embolic source is usually in the heart with 95% of patients with acute mesenteric ischemia have a documented history of cardiac disease. Mesenteric venous thrombosis is classified as primary if no etiologic factor is identifiable or as secondary if an etiologic factor, such as heritable or acquired coagulation disorders, is identified. Regardless of the pathophysiologic mechanism, acute mesenteric ischemia can lead to intestinal mucosal sloughing within 3 hours of onset and full-thickness intestinal infarction by 6 hours. Severe abdominal pain, out of proportion to the degree of tenderness on examination, is the hallmark of acute mesenteric ischemia, regardless of the pathophysiologic mechanism. The pain is typically perceived to be colicky and most severe in the midabdomen. Associated symptoms can include nausea, vomiting, and diarrhoea. Physical findings are characteristically absent early in the course of ischemia. With the onset of bowel infarction, abdominal distension, peritonitis, and passage of bloody stools occur.

PANCREATIC ASCITES



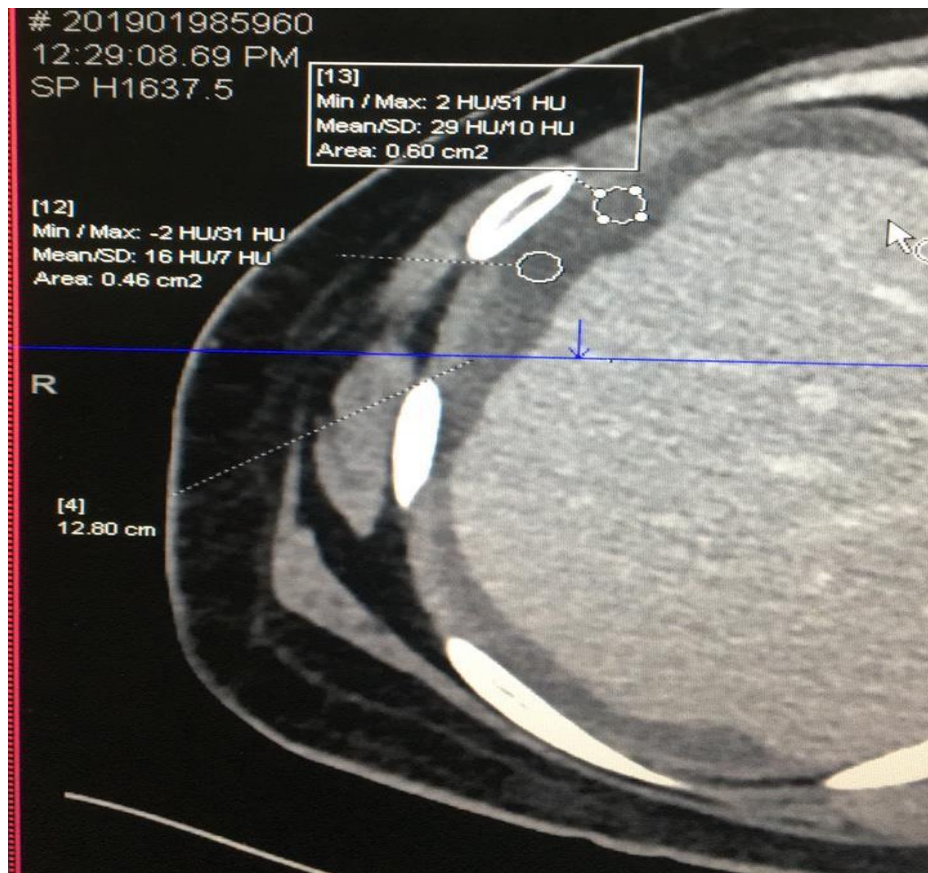
It is a rare complication in patients with chronic alcoholism and pancreatitis presenting with ascites. It occurs due to pancreatic pseudocyst leakage or due to ductal disruption. Medical treatment includes holding enteral feedings, TPN, paracentesis and administration of octreotide. Interventional therapies includes endoscopic transpapillary pancreatic duct stenting or surgeries which includes cystogastrostomy, cystoenterostomy or partial pancreatic resection.

SIGMOID DIVERTICULAR PERFORATION

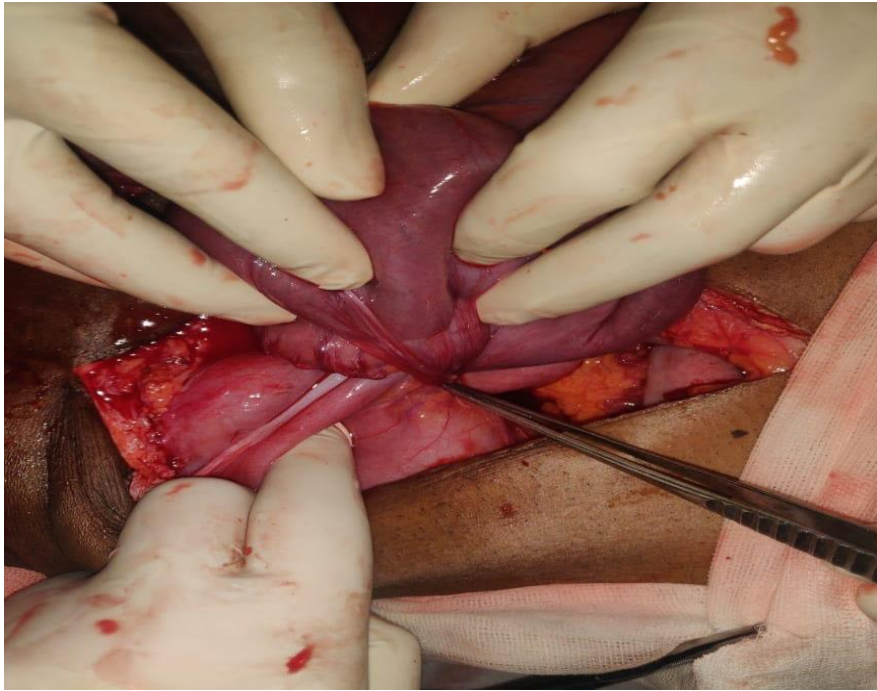


Diverticulitis refers to infection associated with a diverticulum . Occur in 10% to 25% of people with diverticulosis. The disease ranges from mild, uncomplicated diverticulitis that can be treated in the outpatient setting, to free perforation and diffuse peritonitis that requires emergency laparotomy.

Malignant Ascites



Ascites is the abnormal fluid accumulation within the peritoneal cavity. Approximately 10% of cases are due to malignancy, the condition is associated with a poor prognosis other than in the context of ovarian cancer. The average median survival once malignant ascites is diagnosed is approximately 1 to 4 months (varying according to primary cancer). It is a poor contributor to the quality of life for those patients in the terminal phase of their illness.



Bands Usually only one band is culpable.

It may be:

- congenital, e.g. obliterated vitellointestinal duct;
- a string band following previous bacterial peritonitis;
- a portion of greater omentum, usually adherent to the parietes.

Adhesive obstruction



adhesions and bands are the most common cause of intestinal obstruction. The lifetime risk of requiring an admission to hospital for adhesional small bowel obstruction subsequent to abdominal surgery is around 4% and that requiring a laparotomy around 2%. Adhesions start to form within hours of abdominal surgery. In the early postoperative period, the onset of such a mechanical obstruction may be difficult to differentiate from paralytic ileus. Any source of peritoneal irritation results in local fibrin production, which produces adhesions between opposed surfaces. Early fibrinous adhesions may disappear when the cause is removed or they may become vascularised and be replaced by mature fibrous tissue.

Gangrenous Cholecystitis



When the gallbladder remains obstructed and secondary bacterial infection supervenes, an acute gangrenous cholecystitis develops, and an abscess or empyema forms within the gallbladder. Rarely, perforation of ischemic areas occurs. The perforation is usually contained in the subhepatic space by the omentum and adjacent organs.

POST OPERATIVE COMPLICATIONS

While different classification systems exist to describe the severity of postoperative complications, there is no standardized method for reporting the severity of complications.

There are three common approaches for the classification of postoperative complications of surgery:

- 1 Linked to time after surgery: ● immediate (within 6 h of procedure); ● early (6–72 h); ● late (>72 h).
- 2 Generic and surgery specific
- . 3 Clavian-Dindo classification

| Grade | |
|-------|--|
| 1 | Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Acceptable therapeutic regimens are: drugs as antiemetics, antipyretics, analgetics, diuretics and electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside. |
| 2 | Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions, antibiotics and total parenteral nutrition are also included. |
| 3 | Requiring surgical, endoscopic or radiological intervention |
| 3a | Intervention under regional/local anesthesia |
| 3b | Intervention under general anesthesia |
| 4 | Life-threatening complication requiring intensive care/intensive care unit management |
| 4a | Single organ dysfunction |
| 4b | Multi-organ dysfunction |
| 5 | Patient demise |

Post-operative length of stay, need for reoperation, readmission rates and decline in disposition are all markers of patient outcomes, however they may be less useful for grading complications. Complications can occur for a various number of reasons. A surgeon can perform a technically sound operation in a severely compromised patient by the disease process and have a complication. A surgeon who is sloppy or careless or hurries through an operation can make technical errors that account for the operative complications. Finally, the patient can be healthy nutritionally, have an operation performed meticulously, and yet experience a complication because of the nature of the disease.

The occurrence of postoperative complication indicates an important change in the recovery of a patient. The possibility of occurrence of a postoperative complication known before hand can help the surgeon to better counsel patients preoperatively regarding risks, morbidity and mortality.

| Table 1 | | |
|--|---------------------------------------|---------------|
| Classic "Ws" of postoperative fever | | |
| W | Cause | Timing |
| Wind | Atelectasis | POD 1-2 |
| Water | Urinary tract infection | POD 2-3 |
| Wound | Wound infection | POD 3-7 |
| Walking | Deep vein thrombosis/thrombophlebitis | POD 5-7 |
| Wonder drug | Drug fever | POD >7 |

Abbreviation: POD, postoperative day.

Data from Cline D, Stead LG. Abdominal emergencies. New York: McGraw Hill; 2007.

SURGICAL WOUND COMPLICATIONS

Seroma

A seroma is a collection of liquefied fat, serum, and lymphatic fluid under the incision. The fluid is clear, yellow, and viscous and is found in the subcutaneous layer of the skin. Seromas represent the most benign complication after an operative procedure

Hematoma

Hematoma is an abnormal collection of blood, usually in the subcutaneous layer of a recent incision or in a potential space in the abdominal cavity. Hematomas are more worrisome than seromas because of the potential for secondary infection. Hematoma formation is related to inadequate hemostasis, depletion of clotting factors, or the presence of coagulopathy. Medications associated with coagulopathy are antiplatelet drugs, such as acetylsalicylic acid (aspirin), clopidogrel, ticlopidine, eptifibatide, and abciximab, and anticoagulants, such as unfractionated heparin (UFH), low molecular-weight heparin (LMWH; e.g., enoxaparin, dalteparin sodium, tinzaparin), and vitamin K antagonist (VKA; e.g., warfarin sodium).

Acute Wound Failure (Dehiscence)

Acute wound failure (wound dehiscence or a burst abdomen) refers to postoperative separation of the abdominal musculoaponeurotic layers. Wound dehiscence is among the most dreaded complications and is of great concern because of the risk of evisceration, the need for some form of intervention and the possibility of repeat dehiscence, surgical wound infection, and incisional

hernia formation. Acute wound failure occurs in approximately 1% to 3% of patients who undergo an abdominal operation. Dehiscence most often develops 7 to 10 days postoperatively but may occur anytime after surgery (range, 1 to >20 days). Acute wound failure is often related to technical errors in placing sutures . Local wound complications of hematoma and infection can also predispose to localized dehiscence. A deep wound infection is one of the most common causes of localized wound separation.

BOX 12-1 Factors Associated With Wound Dehiscence

- Technical error in fascial closure
- Emergency surgery
- Intra-abdominal infection
- Advanced age
- Wound infection, hematoma, and seroma
- Elevated intra-abdominal pressure
- Obesity
- Long-term corticosteroid use
- Previous wound dehiscence
- Malnutrition
- Radiation therapy and chemotherapy
- Systemic disease (uremia, diabetes mellitus)

Surgical Site Infection (Wound Infection)

Surgical site infections (SSIs) are a significant problem post operatively . Despite major improvements in antibiotics, anaesthesia, superior instruments, earlier diagnosis of surgical problems, and improved techniques for postoperative vigilance, wound infections continue to occur. Although some may view the problem as merely cosmetic, it causes significant patient

suffering, morbidity, and mortality and is a financial burden to the health care system. SSIs also represent a risk factor for the development of incisional hernia.

Wounds are generally categorized as follows:

1. Superficial, which includes the skin and subcutaneous tissue
2. Deep, which includes the fascia and muscle
3. Organ space, which includes the internal organs of the body if the operation includes that area

| TABLE 12-3 Classification of Surgical Wounds | | |
|---|---|---------------------------|
| CATEGORY | CRITERIA | INFECTION RATE (%) |
| Clean | No hollow viscus entered Primary wound closure No inflammation No breaks in aseptic technique Elective procedure | 1-3 |
| Clean-contaminated | Hollow viscus entered but controlled No inflammation Primary wound closure Minor break in aseptic technique Mechanical drain used Bowel preparation preoperatively | 5-8 |
| Contaminated | Uncontrolled spillage from viscus Inflammation apparent Open, traumatic wound | 20-25 |
| Dirty | Major break in aseptic technique Untreated, uncontrolled spillage from viscus Pus in operative wound Open suppurative wound Severe inflammation | 30-40 |

TABLE 12-2 Risk Factors for Postoperative Wound Infection

| PATIENT FACTORS | ENVIRONMENTAL FACTORS | TREATMENT FACTORS |
|-----------------------------------|---------------------------------------|--------------------------------|
| Ascites | Contaminated medications | Drains |
| Chronic inflammation | Inadequate disinfection/sterilization | Emergency procedure |
| Undernutrition | Inadequate skin antisepsis | Inadequate antibiotic coverage |
| Obesity | Inadequate ventilation | Preoperative hospitalization |
| Diabetes | Presence of foreign body | Prolonged operation |
| Extremes of age | | |
| Hypercholesterolemia | | |
| Hypoxemia | | |
| Peripheral vascular disease | | |
| Postoperative anemia | | |
| Previous site of irradiation | | |
| Recent operation | | |
| Remote infection | | |
| Skin carriage of staphylococci | | |
| Skin disease in area of infection | | |
| Immunosuppression | | |

RESPIRATORY COMPLICATIONS

Almost all patients who undergo an abdominal incision have a significant alteration in their breathing pattern. Vital capacity may be reduced to 50% of normal for the first 2 days after surgery. The use of narcotics substantially inhibits the respiratory drive, and anesthetics may take some time to wear off. Most patients who have respiratory problems postoperatively have mild to moderate problems that can be managed with aggressive pulmonary toilet.

However, in some patients, severe postoperative respiratory failure develops that may require intubation and may be life-threatening.

The most common postoperative respiratory complication is atelectasis. As a result of the anaesthetic, abdominal incision, and postoperative narcotics, the alveoli in the periphery collapse, and a pulmonary shunt may occur. If appropriate attention is not directed to aggressive pulmonary toilet with the initial symptoms, the alveoli remain collapsed, and a buildup of secretions occurs and becomes secondarily infected with bacteria, resulting in pneumonia. The risk appears to be particularly high in patients who are heavy smokers, are obese, and have copious pulmonary secretions.

Pneumonia is the most common nosocomial infection occurring in hospitalized patients. Aspiration of oropharyngeal secretions is a significant contributing factor. Extended intubation results in ventilator-associated pneumonia—pneumonia occurring 48 hours after but within 72 hours of the initiation of ventilation.

Other complications include

- Complications of thermal regulation
- Aspiration Pneumonitis and Aspiration Pneumonia
- Pulmonary Edema, Acute Lung Injury, and Adult Respiratory Distress Syndrome
- Pulmonary Embolism and Venous Thromboembolism
- Postoperative Hypertension

- Perioperative Ischemia and Infarction
- Cardiogenic Shock
- Postoperative Cardiac Arrhythmias
- Postoperative Heart Failure
- Urinary Retention
- Acute Renal Failure
- Endocrine gland dysfunction
- Ileus and Early Postoperative Bowel Obstruction
- Acute Abdominal Compartment Syndrome
- Postoperative Gastrointestinal Bleeding
- Anastomotic leaks

AIM & OBJECTIVE:

- To compare the computed tomography attenuation values of free fluid abdomen in patients those on conservative management vs intervention done.
- To evaluate the computed tomography (CT) attenuation values of ascites to predict post op infection risk, need for prolonged hospitalization and outcome.

STUDY CENTRE:Institute Of General Surgery, Madras Medical College, Chennai

DURATION OF STUDY: January 2018 To September 2019.

STUDY DESIGN: Prospective Study

METHODOLOGY: Patients Who Fit The Inclusion Criterion Will Be Studied and The Various Factors Analysed

SUBJECT SELECTION: Patients Admitted With Acute Abdominal Pain And CT Abdomen done

SAMPLE SIZE: 100

INCLUSION CRITERIA:

1. Patient admitted for pain abdomen for whom computed tomography was done
2. Patients of age groups 13 years and above
3. Patients with free fluid in CT abdomen and pelvis above 30 ml.

EXCLUSION CRITERIA:

1. Cases with known medical cause of ascites
2. Age less than 13 years
3. Cases operated on the abdomen less than 6 weeks back.

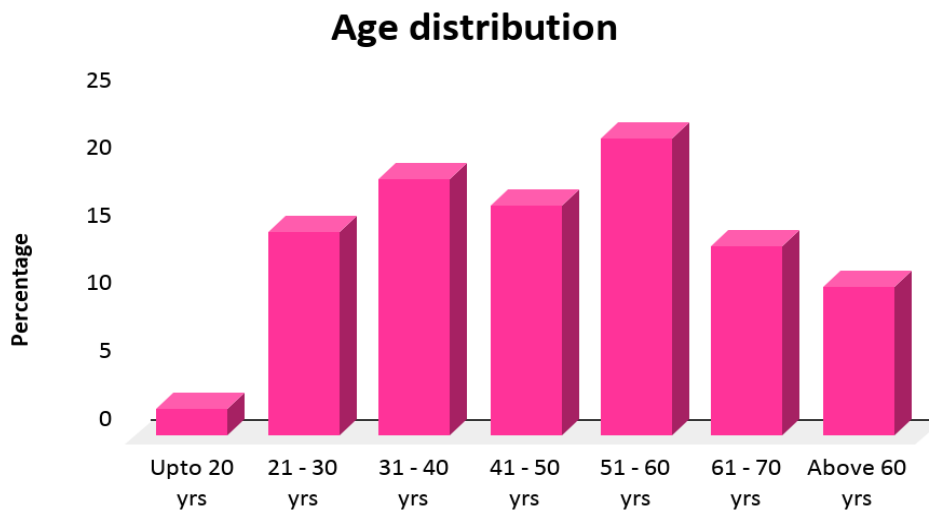
RESULTS

The collected data were analysed with IBM.SPSS statistics software 23.0 version .To describe about the data descriptive statistics frequency analysis , percentage analysis were used for categorical variables and the mean and SD were used for continuous variables. The receiver operating curve was used to find the efficacy of the score to predict the conservative with sensitivity and specificity, NPV,PPV and accuracy . In the above statistical tool the probability value .05 is considered as significant level.

| Descriptive Statistics | | | | | |
|------------------------|-----|---------|---------|------|-----|
| | N | Minimum | Maximum | Mean | S.D |
| Age | 100 | 18 | 88 | 49 | 16 |

AGE WISE DISTRIBUTION

| AGE | FREQUENCY | PERCENT |
|---------------|-----------|---------|
| UPTO 20 YEARS | 2 | 2.0 |
| 21-30 YEARS | 15 | 15.0 |
| 31-40 YEARS | 19 | 19.0 |
| 41-50 YEARS | 17 | 17.0 |
| 51-60 YEARS | 22 | 22.0 |
| 61-70 YEARS | 14 | 14.0 |
| ABOVE 70 | 11 | 11.0 |
| TOTAL | 100 | 100.0 |

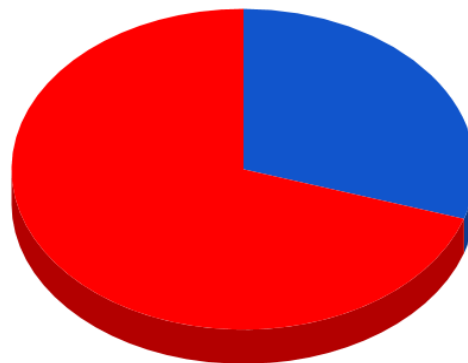


Majority of the patients belong to the age group between 51 - 60 years

GENDER WISE DISTRIBUTION

| SEX | FREQUENCY | PERCENT |
|--------|-----------|---------|
| MALE | 70 | 70.0 |
| FEMALE | 30 | 30.0 |
| TOTAL | 100 | 100.0 |

Gender distribution



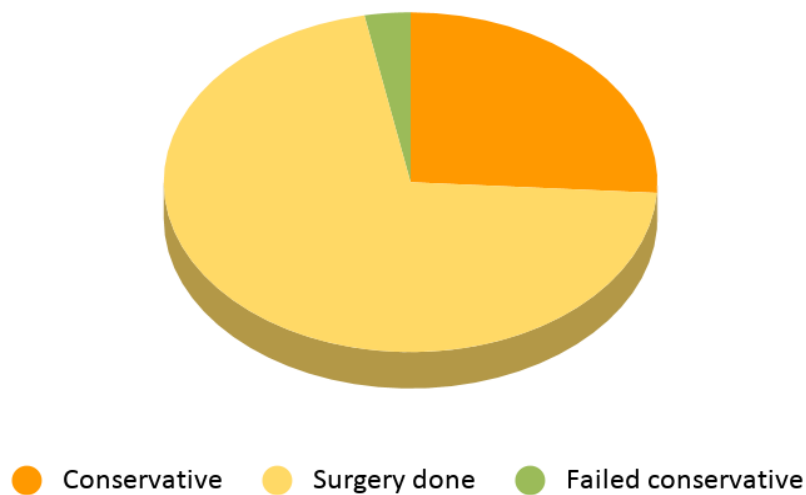
● Female ● Male

70 % of the patients are men in this study

MANAGEMENT

| MANAGEMENT | FREQUENCY | PERCENT |
|---------------------|-----------|---------|
| CONSERVATIVE | 26 | 26.0 |
| SURGICAL | 71 | 71.0 |
| FAILED CONSERVATIVE | 3 | 3.0 |
| TOTAL | 100 | 100.0 |

Management



71 % of the patients underwent surgical intervention based on clinical suspicion and radiological findings .

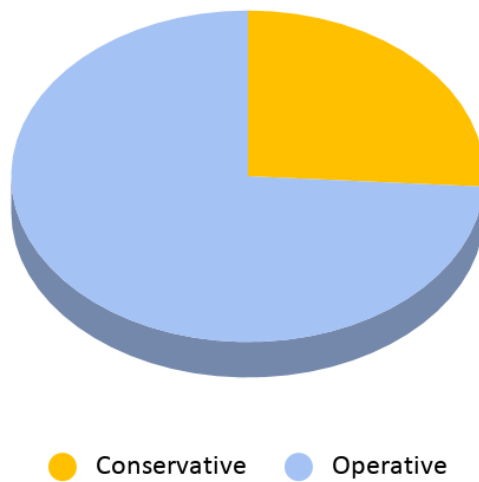
3 patients were kept on conservative management due to paucity of signs on clinical grounds .

Within 48 hours all the 3 patients were taken up for surgery and all had a positive finding intraop.

MANAGEMENT DATA OVERALL

| MANAGEMENT | FREQUENCY | PERCENT |
|-------------|-----------|---------|
| COSERVATIVE | 26 | 26.0 |
| SURGICAL | 74 | 74.0 |
| TOTAL | 100 | 100.0 |

Management



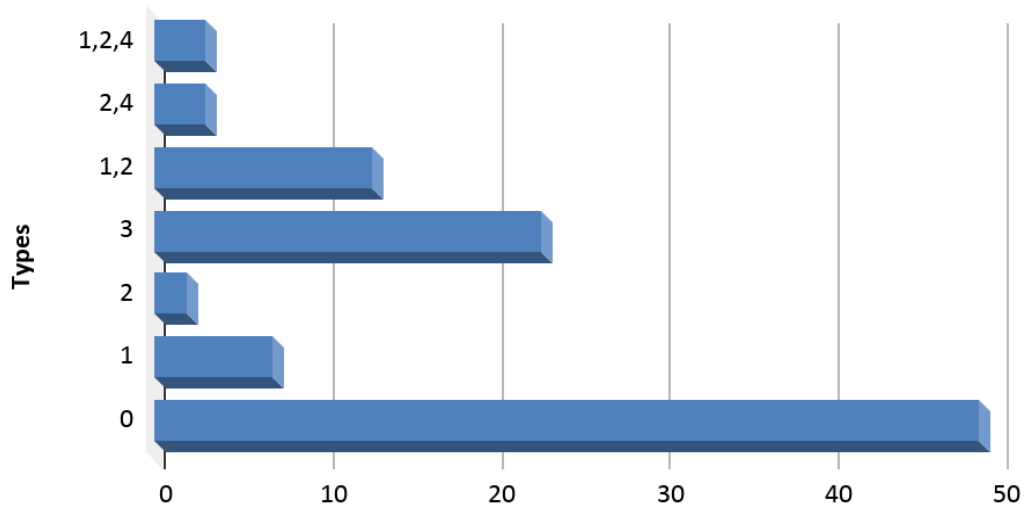
74 % of the patients underwent operative management

Outcome of patients

| |
|-------------------|
| 0 uneventful |
| 1 wound infection |
| 2 prolonged stay |
| 3 death |
| 4 pneumonia |

| Outcome | | | |
|----------------|-------|---------------|---------|
| | | Frequenc y | Percent |
| | 0 | 49 | 49.0 |
| | 1 | 7 | 7.0 |
| | 2 | 2 | 2.0 |
| | 3 | 23 | 23.0 |
| | 1,2 | 13 | 13.0 |
| | 2,4 | 3 | 3.0 |
| | 1,2,4 | 3 | 3.0 |
| | Total | 100 | 100.0 |

Outcome



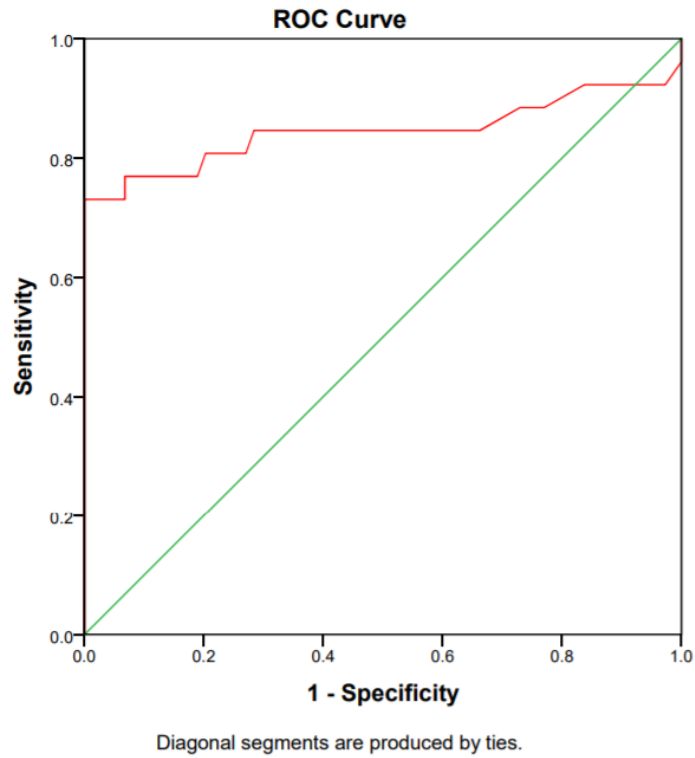
Among the patients who had post-operative infections ,respiratory comolications and prolonged hospital stay the hounsfield unit of free fluid was found to be higher as compared to the patients with an uneventful post op outcome .

2 out of the 3 patients kept on conservative management succumbed to the disease post operatively. All three patients had a HU of above 18 in the CT scan.

RECEIVER OPERATING CURVE

| | |
|---|---------------------------|
| ROC Curve | |
| | |
| Case Processing Summary | |
| Management | Valid N (listwise) |
| Positive | 26 |
| Negative | 74 |
| Smaller values of the test result variable(s) indicate stronger evidence for a positive actual state. | |
| a. The positive actual state is Conservative. | |

| | | | |
|---|-----------|---------|------|
| | | | |
| Area Under the Curve | | | |
| Area | P-value | 95% C.I | |
| | | LB | UB |
| .845 | 0.0005 ** | .723 | .968 |
| ** Highly significant at P < 0.01 level | | | |



Cut off for HU units to decide management

| Hu with Management | | | | |
|---------------------------|-------------|------------------|---------------|-------|
| | | Management | | Total |
| | | Conservat ive | Operati ve | |
| Hu | ≤ 16.1 | 21 | 15 | 36 |
| | > 16.1 | 5 | 59 | 64 |
| Total | | 26 | 74 | 100 |

| | |
|-------------|-------|
| Cut off | 16.1 |
| Sensitivity | 80.77 |
| Specificity | 79.73 |
| PPV | 58.33 |
| NPV | 92.19 |
| Accuracy | 80.25 |

In this study , statistically Hounsfield unit of 16.1 is the cut off value . A HU of less than 16.1 would favour us to keep a case on conservative management while a HU of 16.1 and above would favour an operative management. Exception to this was , cases with malignant ascites . Though they had a higher Hounsfield unit, clinically there was no evidence to suggest an operative management in them .

DISCUSSION

This is a prospective observational study in which patients who presented to the Department of General surgery at Rajiv Gandhi Government General Hospital , with complaints of pain abdomen and a CT scan showing evidence of free fluid abdomen were included. Patients with EXCLUSION CRITERIA were excluded from the study.

1. Cases with known medical cause of ascites
2. Age less than 13 years
3. Cases operated on the abdomen less than 6 weeks back.

Based on the history , clinical findings and radiological findings the patient were categorized into conservative management and operative management . The mean of the Hounsfield unit of the free fluid in the abdomen was noted and tabulated.

- Majority of the patients belonged to the age group of 51-60. Minimum age of 18 and maximum age of 88 were present.
- 70 % of the patients were males in this study.
- 71 % of the patients were taken up for surgery based on clinical and radiological findings .

- 29 % of the patients were kept on conservative management initially . 3 % of these patients were taken up for emergency laparotomy and all 3 patients had a positive finding.
- All three patients had a HU of above 18 in the CT taken at the time of admission.
- In cases of perforation the HU of the free fluid was higher for perforations of large bowel compared to small bowel perforation.
- In the post operative period patients who had wound site infection and prolonged hospital stay had a relatively higher HU value on CT.
- A cut off value of 16.1 was obtained for the HU in this study ie cases with above 16.1 HU had likely possibility of requiring an operative intervention.
- Among the cases kept on conservative management a HU of above 16.1 was seen in 5 patients and all the 5 cases were of malignant ascites which clinically had no signs suggestive of intervention.
- The cases which underwent operative management and had a HU of less than 16.1 had clinically significant findings to be taken up for laparotomy.
- The sensitivity of this study was 80.77

- The specificity of the study was 79.73
- The positive predictive value was 58.33
- The negative predictive value was 92.19
- The accuracy was 80.25
- The p value of this study was 0.0005 which was highly significant.
- Limitations to this study-

The need for surgical intervention was determined by the attending surgeon's discretion which is relatively a subjective way of categorization.

Volume cutoffs of free fluid was subjectively determined by radiologists.

All the patients with a low volume of IFF ie less then 30 ml , were excluded from the study,

CONCLUSION

Acute abdominal pain can represent a spectrum of conditions from benign and self-limited disease that can be managed conservatively to surgical emergencies. Patients may present clinically in an obvious or subtle manner. Diagnosing a patient with a full-blown acute abdomen is relatively easy but it is difficult to diagnose an incipient abdominal catastrophe in a patient presenting with early, non-specific symptoms.

Based on the results of ROC analysis, a cutoff value of 16.1 HU for intra abdominal free fluid was determined to be optimal for predicting the need for surgical intervention. The patients with IFF HU >16.1 were more likely to require surgical intervention than those with a lower density IFF. With the cutoff value of >16.1 HU, the sensitivity, specificity, PPV, NPV, and accuracy to predict the need for surgical intervention were 80.77, 79.73, 58.33, 92.19 and 80.25% respectively in this study.

HU helps in predicting the site of perforation. Higher HU values were seen in distal perforations. It also helps us to keep in mind the possibility of increased post operative complications.

In patients presenting with acute abdomen history of presenting illness, clinical findings and radiological findings along with the additional data regarding the radiodensity of IFF analyzed on CT, would be practical and useful in identifying the need for early surgical intervention.

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HIGH DENSITY FREE FLUID IN ACUTE ABDOMEN ON COMPUTED TOMOGRAPHY : A PREDICTOR OF INTERVENTION

| sl no | Age | Sex | Hu | Diagnosis | Management | Outcome | outcome | 0 uneventful |
|-------|-----|-----|----|-----------------------------------|------------|---------|------------|-----------------------|
| 1 | 32 | M | 18 | gastric perforation | 2 | 0 | | 1 wound infection |
| 2 | 44 | M | 7 | pancreatic ascites | 1 | 0 | | 2 prolonged stay |
| 3 | 28 | M | 22 | ileal perforation | 2 | 1,2,4 | | 3 death |
| 4 | 75 | M | 19 | gangrenous gall bladder | 3 | 3 | | 4 pneumonia |
| 5 | 33 | F | 22 | ruptured ectopic | 2 | 0 | | |
| 6 | 46 | M | 9 | ckd | 1 | 0 | | |
| 7 | 76 | F | 21 | smv | 3 | 1,2 | management | 1 conservative |
| 8 | 61 | M | 14 | ileal perforation | 2 | 0 | | 2 surgery done |
| 9 | 22 | F | 18 | ruotured ectopic | 2 | 0 | | 3 failed conservative |
| 10 | 18 | F | 14 | obstruction with ileal gangrene | 2 | 0 | | |
| 11 | 58 | M | 8 | pancreatic ascites | 1 | 0 | | |
| 12 | 56 | M | 21 | caecal perforation | 2 | 1,2 | | |
| 13 | 44 | M | 8 | dclid | 1 | 0 | | |
| 14 | 51 | M | 17 | gastric perforation | 2 | 1,2 | | |
| 15 | 29 | F | 19 | ileal perforation | 2 | 0 | | |
| 16 | 38 | F | 24 | haemorrhagic ovarian cyst rupture | 2 | 0 | | |
| 17 | 70 | F | 18 | sma | 2 | 3 | | |
| 18 | 63 | M | 15 | gastric perforation | 2 | 0 | | |
| 19 | 28 | M | 18 | jejunal perforation | 2 | 0 | | |
| 20 | 47 | M | 24 | ruptured liver abscess | 2 | 3 | | |
| 21 | 25 | M | 19 | ileal perforation | 2 | 1 | | |
| 22 | 30 | M | 18 | knotting with ileal gangrene | 2 | 2,4 | | |
| 23 | 88 | M | 17 | gastric perforation | 2 | 0 | | |
| 24 | 74 | M | 7 | ckd | 1 | 0 | | |

| | | | | | | | | |
|----|----|---|----|--------------------------------|---|-------|--|--|
| 25 | 56 | M | 22 | smv | 2 | 1,2 | | |
| 26 | 55 | F | 20 | smv | 3 | 1,2,4 | | |
| 27 | 72 | F | 19 | gangrenous gall bladder | 2 | 2,4 | | |
| 28 | 39 | F | 9 | ckd | 1 | 0 | | |
| 29 | 27 | M | 14 | diverticulitis | 1 | 0 | | |
| 30 | 31 | M | 21 | stercoral perforation | 2 | 1,2 | | |
| 31 | 27 | F | 13 | acute necrotizing pancreatitis | 1 | 0 | | |
| 32 | 30 | M | 17 | du perforation | 2 | 0 | | |
| 33 | 40 | M | 17 | ruptured hydtid cyst | 2 | 3 | | |
| 34 | 52 | F | 23 | ruptured aortic aneurysum | 2 | 3 | | |
| 35 | 55 | M | 16 | gastric perforation | 2 | 1 | | |
| 36 | 66 | M | 19 | du perforation | 2 | 2 | | |
| 37 | 73 | M | 15 | gastric perforation | 2 | 0 | | |
| 38 | 38 | M | 6 | dclid | 1 | 0 | | |
| 39 | 28 | M | 23 | du perforation | 2 | 3 | | |
| 40 | 61 | F | 22 | ovarian malignancy ascites | 1 | 3 | | |
| 41 | 60 | M | 20 | ileal perforation | 2 | 1,2 | | |
| 42 | 64 | M | 19 | descending colon perforation | 2 | 3 | | |
| 43 | 54 | M | 13 | gastric perforation | 2 | 0 | | |
| 44 | 39 | M | 9 | ckd | 1 | 0 | | |
| 45 | 47 | M | 29 | malignant ascites | 1 | 0 | | |
| 46 | 52 | M | 9 | pancreatic ascites | 1 | 0 | | |
| 47 | 29 | M | 8 | pancreatic ascites | 1 | 0 | | |
| 48 | 40 | F | 19 | du perforation | 2 | 3 | | |
| 49 | 57 | M | 23 | sigmoid perforation | 2 | 1,2 | | |
| 50 | 59 | M | 21 | smv | 2 | 3 | | |

| | | | | | | | | |
|----|----|---|----|----------------------------------|---|-------|--|--|
| 51 | 62 | M | 17 | gastric perforation | 2 | 1 | | |
| 52 | 21 | M | 16 | ileal perforation | 2 | 1 | | |
| 53 | 33 | F | 24 | ruptured ectopic | 2 | 1 | | |
| 54 | 71 | M | 17 | ruptured pseudo cyst of pancreas | 2 | 2,4 | | |
| 55 | 44 | M | 23 | ruptured splenic abscess | 2 | 3 | | |
| 56 | 57 | M | 21 | sma | 2 | 3 | | |
| 57 | 20 | M | 21 | caecal perforation | 2 | 1,2 | | |
| 58 | 59 | F | 16 | malignant ascites | 1 | 0 | | |
| 59 | 47 | F | 11 | malignant ascites | 1 | 0 | | |
| 60 | 38 | F | 15 | du perforation | 2 | 1,2 | | |
| 61 | 36 | M | 11 | dclid | 1 | 0 | | |
| 62 | 62 | M | 21 | sma | 2 | 3 | | |
| 63 | 54 | M | 15 | gastric perforation | 2 | 0 | | |
| 64 | 68 | M | 7 | ckd | 1 | 0 | | |
| 65 | 41 | M | 22 | du perforation | 2 | 3 | | |
| 66 | 48 | M | 21 | ileal perforation | 2 | 1,2 | | |
| 67 | 45 | F | 17 | jejunal perforation | 2 | 0 | | |
| 68 | 35 | F | 23 | sigmoid perforation | 2 | 1,2,4 | | |
| 69 | 38 | F | 13 | sbp | 2 | 1 | | |
| 70 | 26 | F | 14 | tb | 2 | 0 | | |
| 71 | 49 | M | 21 | sigmoid perforation | 2 | 3 | | |
| 72 | 53 | M | 21 | sma | 2 | 3 | | |
| 73 | 60 | F | 24 | malignant ascites | 1 | 0 | | |
| 74 | 68 | F | 16 | ileal perforation | 2 | 1,2 | | |
| 75 | 52 | M | 17 | gastric perforation | 2 | 0 | | |
| 76 | 40 | M | 13 | gastric perforation | 2 | 0 | | |

| | | | | | | | | |
|-----|----|---|----|-------------------------------|---|-----|--|--|
| 77 | 30 | M | 22 | gangrenous gall bladder | 2 | 1 | | |
| 78 | 53 | M | 6 | dclid | 1 | 0 | | |
| 79 | 79 | F | 23 | descending colon perforation | 2 | 3 | | |
| 80 | 28 | M | 14 | gastric perforation | 2 | 0 | | |
| 81 | 62 | F | 18 | du perforation | 2 | 0 | | |
| 82 | 48 | F | 17 | malignant ascites | 1 | 0 | | |
| 83 | 37 | F | 13 | tb | 1 | 0 | | |
| 84 | 46 | M | 20 | ileal gangrene | 2 | 3 | | |
| 85 | 54 | M | 22 | malignant jejunal perforation | 2 | 3 | | |
| 86 | 55 | M | 11 | pancreatic ascites | 1 | 0 | | |
| 87 | 73 | M | 21 | malignant ascites | 1 | 0 | | |
| 88 | 62 | M | 13 | gastric perforation | 2 | 0 | | |
| 89 | 50 | M | 22 | sigmoid perforation | 2 | 3 | | |
| 90 | 55 | M | 17 | du perforation | 2 | 0 | | |
| 91 | 45 | F | 18 | ileal gangene | 2 | 2 | | |
| 92 | 72 | F | 19 | du perforation | 2 | 3 | | |
| 93 | 70 | M | 22 | gastric perforation | 2 | 3 | | |
| 94 | 62 | M | 11 | chrons | 1 | 0 | | |
| 95 | 35 | M | 7 | dclid | 1 | 0 | | |
| 96 | 39 | M | 18 | du perforation | 2 | 1,2 | | |
| 97 | 41 | M | 15 | gastric perforation | 2 | 0 | | |
| 98 | 49 | M | 13 | gastric perforation | 2 | 0 | | |
| 99 | 73 | M | 21 | descending colon perforation | 2 | 3 | | |
| 100 | 40 | M | 18 | ileal perforation | 2 | 1,2 | | |