Appendix

(Theory and practice)

1. **What is the appendix?**

It is a blind muscular tube with mucosal, submucosal, muscular and serosal layers. Morphologically, it is the undeveloped distal end of the large caecum found in many lower animals.

2. **Where is the site of the base of the appendix**

The position of the base of the appendix is constant, being found at the confluence of the three taeniae coli of the caecum which fuse to form the outer longitudinal muscle coat of the appendix.

3. **What is the name of the mesentery of the appendix? What is its origin?**

The mesentery of the appendix called the mesoappendix arises from the lower surface of the mesentery of the terminal ileum.

4. **Name the artery of the appendix; what is its origin and course?**

The appendicular artery, a branch of the lower division of the ileocolic artery, passes behind the terminal ileum to enter the mesoappendix a short distance from the base of the appendix. It then comes to lie in the free border of the mesoappendix.

5. **Does the appendicular artery is an end artery?**

Yes, the appendicular artery is an ‘end-artery’ and for this reason thrombosis of which results in necrosis of the appendix (syn. gangrenous appendicitis).

6. **Does the appendix has lymphatic channels?**

Four, six or more lymphatic channels traverse the mesoappendix to empty into the ileocaecal lymph nodes.

7. **What cause the variations in the tip of the appendix?**

During childhood, continued growth of the caecum commonly rotates the appendix into a retrocaecal but intraperitoneal position. In approximately a quarter of cases, rotation of the appendix does not occur resulting in a pelvic, subcaecal or paracaecal position.

8. **What are the sites of the tip of the appendix? What are their percentages of occurrence?**
   - Retrocaecal 74%
   - Pelvic 21%
   - Paracaecal 2%
   - Subcaecal 1.5%
   - Preileal 1%
   - Postileal 0.5%

9. **Describe the microscopic anatomy of the appendix**

   - The average length is between 7.5 and 10 cm.
   - The lumen is encroached upon by multiple longitudinal folds of mucous membrane lined by columnar cell intestinal mucosa of colonic type.
   - Crypts are present but are not numerous.
   - In the base of the crypts lie argentaffln cells (Kultschitzsky cells) which may give rise to carcinoid tumours.
   - The appendix is the most frequent site for carcinoid tumours which may present with appendicitis due to occlusion of the appendiceal lumen.
   - The submucosa contains numerous lymphatic aggregations or follicles.
   - The prominence of lymphatic tissue in the appendix of young adults seems important in the aetiology of appendicitis.

10. **What is the classic presentation of acute appendicitis?**
    Periumbilical pain (visceral) that migrates to the right lower quadrant (somatic) in a patient who is anorexic.

    TOP TIP

    - The classical visceral—somatic sequence of pain is present in only about half those patients subsequently proven to have acute appendicitis.

11. **What is the most commonly performed emergency surgery?**
    The most common surgical procedure performed on an emergency basis is an appendectomy
12. **What is the distribution of appendicitis in regard to the age and sex?**
    - It is rare in infants,
    - Becomes increasingly common in childhood and early adult life
    - Reaches a peak incidence in the teens and early 20s.
    - After middle age the risk of developing appendicitis in the future is quite small.

- The incidence of appendicitis is equal amongst males and females before puberty.
- In teenagers and young adults the male: female ratio increases to 3:2 at the age of 25 years, thereafter the greater incidence in males declines

13. Describe the pathophysiology of appendicitis

- Obstruction of the appendiceal lumen is essential for development of appendicitis.
- Obstruction of the appendiceal lumen is followed by continued mucus secretion and inflammatory exudation increase intraluminal pressure, obstructing lymphatic drainage.
- Oedema and mucosal ulceration develop with bacterial translocation to the submucosa.
- Further distension of the appendix may cause venous obstruction and ischaemia of the appendix wall.
- With ischaemia, bacterial invasion occurs through the muscularis propria and submucosa producing acute appendicitis.
- Finally, ischaemic necrosis of the appendix wall produces gangrenous appendicitis, with free bacterial contamination of the peritoneal cavity.
- Alternatively, the greater omentum and loops of small bowel become adherent to the inflamed appendix, walling off the spread of peritoneal contamination (This cause the development of appendicular mass)

Top Tip

-. Appendicitis is obstructive disease (caused by obstruction of the appendicular lumen) just like acute cholecystitis (caused by obstruction of the cystic duct)

14. How appendicitis cause peritonitis?

- Free migration of bacteria through an ischaemic appendicular wall,
- Free migration of bacteria through frank perforation of a gangrenous appendix
- Delayed perforation of an appendix abscess.

15. What are the risk factors for perforation of the appendix

- Extremes of age
- Immunosuppression
- Diabetes mellitus
- Faecolith obstruction
- Pelvic appendix
- Previous abdominal surgery

Top Tip

- Those patient groups are at higher risk of death from perforated appendicitis

16. **Explain the periumbilical pain and the RIF pain in acute appendicitis**
    The periumbilical pain is visceral due to distension of the appendix; while the RIF pain is somatic pain caused by irritation of the parietal peritoneum. The somatic pain is more localised and more severe.
17. **What is the usual time laps between the onset of symptoms and the presentation?**
    The onset of symptoms to time of presentation is usually less than 24 hours for acute appendicitis and averages several hours.

    Top Tip
    - Two types of appendicitis
    - Those which start by inflammation of the mucosa and the wall ending with luminal obstruction and those which start by Faecolith obstruction of the appendicular lumen progressing to transmural inflammation and ischaemia.
    - The progression of the disease is more rapid in the later than in the former and even the later mostly progress into ischaemia and gangrenous appendicitis.

18. **When the constitutional symptoms is usually appears in patient with acute appendicitis?**
    The constitutional symptoms as fever and tachycardia appear when parietal irritation occurs.
19. **What is the main stay in the diagnosis of acute appendicitis?**
    The main stay in the diagnosis is clinical evaluation. Although laboratory tests and imaging procedures can be helpful, they are of secondary importance.
    Top Tip
    - Any patient presented with RIF pain and tenderness (even tenderness alone) is a case of acute appendicitis until prove otherwise.
20. **Where is McBurney's point?**
    One third the distance between the anterior superior iliac spine and the umbilicus.
21. **What is McBurney's point?**
    The point of maximal tenderness in acute appendicitis.
22. **Who Was McBurney?**
    Charles McBurney (surgeon) (1845–1913), American surgeon who is in collaboration with a surgeon named Fitz, coined the term *appendicitis* in classic papers published in 1886 and 1889.
23. **What are the typical laboratory findings of a patient with appendicitis?**
    - White blood cell (WBC) count: 12,000-14,000
    - Negative urinalysis results (no WBCs)
    - Negative pregnancy test result

24. What are the variations of urinalysis in acute appendicitis?

- **Urinalysis** is abnormal in 25–40% of patients with appendicitis. Pyuria, albuminuria, and hematuria are common.
- Large quantities of bacteria suggest UTI as the cause of abdominal pain.
- If the urinalysis shows more than 20 WBCs per high-power field or more than 30 RBCs per high-power field, it suggests UTI.
- Significant hematuria should prompt consideration of ureteral stones.

25. What are the symptoms of appendicitis?

- Peri-umbilical pain
- Pain shifts to the right iliac fossa
- Anorexia
- Nausea

26. What are the signs of appendicitis?

- Pyrexia
- Pointing sign
- Localised tenderness in the right iliac fossa (on palpation)
- Muscle guarding (on palpation)
- Rebound tenderness (Replaced recently by percussion over the McBurney's point) because rebound tenderness severely painful.
- Rovsing's sign
- Psoas sign
- Obturator sign

27. What is the role of ultrasound in the diagnosis of acute appendicitis?

Ultrasound can be both negatively and positively helpful. It is nice to see a perfectly normal right fallopian tube and ovary (to rule out an ectopic pregnancy and tubo-ovarian abscess [TOA]). It is also reassuring to see an inflamed, edematous appendix.

Top Tip

- The main role of ultrasound in patient suspected as having acute appendicitis is to rule out other causes of RIF pain.

28. How you elicit rebound tenderness?

Press over the McBurney's point and ask the patient to breath in and out then suddenly release your hand. This will induce severe pain in the RIF. For this reason many examination books replace this examination which has the same principle of rebound tenderness but with very little pain; this is by percussing the RIF at the McBurney's point

29. How you perform *Rovsing's sign*

Deep palpation of the left iliac fossa may cause pain in the right iliac fossa. Release of pressure on the left iliac fossa may cause pain on the right. All these manoeuvres cause pain because they move the inflamed appendix as it lies in the right iliac fossa against the overlying peritoneum, which contains many somatic pain fibres.

30. When psoas sign can be elicited? How you elicit it?

- Occasionally an inflamed appendix lies on the psoas muscle and irritate it.
- It is elicited by asking the patient to lie on his (her) left side then extend the leg by pulling it posteriorly; this will induce the pain.

31. When obturator sign can be elicited? How you elicit it?

- If an inflamed appendix is in contact with the obturator internus muscle
- With the patient lying supine, passively flex and internally rotate the leg at the hip joint. This will induce abdominal pain.

32. What findings you may find on inspection of patient has acute appendicitis?

- The right hip may be kept slightly flexed if the appendix is lying against the psoas major muscle.
- Coughing and sudden movements cause pain if peritonitis has developed. For this you may see that the patient lies still in bed

33. What layers does the surgeon encounter on exposing the appendix through a Rockey-Davis incision?

Skin, subcutaneous fat, aponeurosis of the external oblique muscle, internal oblique muscle, transversalis fascia and muscle, and peritoneum.

34. Is it always possible to get tenderness in the RIF in patient with appendicitis?

No, sometimes it is difficult to get obvious tenderness in the RIF for one of the following reasons:

- Obese patient
- Retrocaecal appendix
- Deeply seated pelvic appendix

35. What specific symptoms in patient with acute appendicitis related to the site of the tip of the appendix?

- **Diarrhea** when the tip of the appendix is pelvic irritating the rectum and when preileal or postileal irritating the ileum
- **Dysuria** when the tip of the appendix is pelvic touching and irritating the urinary bladder.

36. Why the visceral pain of acute appendicitis is perceived in the midline despite the anatomic presence of the appendix in the RIF?

Because during embryonic life, the GIT was straight tube in the midline which is bilaterally innervated.

37. What specific feature related to retrocaecal appendicitis?

- Rigidity is often absent
- On deep pressure tenderness may he lacking (silent appendix),
- The reason being that the caecum, distended with gas, prevents the pressure exerted by the hand from reaching the inflamed structure.

- However, deep tenderness is often present in the loin, and rigidity of the quadratus lumborum may he in evidence.

38. What specific features related to pelvic appendicitis?

- Diarrhea results from an inflamed appendix being in contact with the rectum.
- When the appendix lies entirely within the pelvis there is usually complete absence of abdominal rigidity, and often tenderness over McBurney's point is lacking as well.
- In some instances deep tenderness can he made out just above and to the right of the symphysis pubis.
- In either event, a rectal examination reveals tenderness in the rectovesical pouch or the pouch of Douglas, especially on the right side.
- An inflamed appendix in contact with the bladder may cause frequency of micturition.

39. What specific feature related to postileal appendicitis?

- The inflamed appendix lies behind the terminal ileum.
- It presents the greatest difficulty in diagnosis because the pain may not shift,
- Diarrhoea is a feature and marked retching may occur.
- Tenderness, if any, is ill-defined, although it may he present immediately to the right of the umbilicus.

40. What is the difference between radiated pain, referred pain and shifted (migrated pain)?

- Radiation of pain: extension of pain from original site to another site with persistence of pain at original site e.g. penetration of duodenal ulcer posteriorly causes pain both in epigastrium and back, pancreatitis radiates to back.
- Referred pain: pain is not felt at the site of disease but felt at distant site. e.g. diaphragmatic irritation causes referred pain at the tip of shoulder through same segmental supply . Diaphragm (phrenic c4, c5), shoulder (cutaneous supply c4, c5)
- Shifting/migrating pain: origin of pain is in one site, later pain shifts to another site and pain at original site disappears. Pain when begins in viscera is felt the same somatic segmental area but once parietal peritoneum is inflamed pain is felt at anatomical site e.g. acute appendicitis where original visceral pain at umbilicus which later shifts to right iliac fossa when parietal peritoneum is inflamed (T9, T10 segments supply both umbilicus and appendix.

41. What is Alvarado scoring?

It is a scoring system aid in the diagnosis of acute appendicitis.

42. What are the components of Alvarado scoring system?

Alvarado scoring system consist of the following components:-

Variable	Score
Symptoms	
Migratory RIF pain	1
Anorexia	1
Nausea and vomiting	1
Signs	
Tenderness (RIF)	2
Rebound tenderness	1
Elevated temperature	1
Laboratory	
Leukocytosis	2
Shift to left	1
Total	10

43. What are the possible results of Alvarado scoring?

- A score of 5 or 6 is compatible with a diagnosis of acute appendicitis
- A score of 7 or 8 indicating probable appendicitis
- A score of 9 or 10 indicating a very probable acute appendicitis.

Top Tip

- Localised tenderness at the right iliac fossa is fair enough to put acute appendicitis in mind.

44. What specific features of acute appendicitis related to the age?

- **Infants**
  - ✓ Relatively rare in infants under 36 months of age
  - ✓ The patient is unable to give a history. Because of this, diagnosis is often delayed and thus the incidence of perforation and postoperative morbidity is considerably high
  - ✓ Diffuse peritonitis can develop rapidly due to the underdeveloped greater omentum, which is unable to give much assistance in localising the infection.
- **Children**
  - ✓ Vomiting is usual.
  - ✓ Complete aversion to food.
  - ✓ They do not sleep during the attack
  - ✓ Very often bowel sounds are completely absent in the early stages.

Top Tip

- Acute appendicitis in infants and children is more liable than adults to be complicated by generalised peritonitis because of the poor localization of the disease due to underdeveloped omentum.

- **The elderly**
  - ✓ Gangrene and perforation occur much more frequently in elderly patients.
  - ✓ Elderly patients with lax abdominal walls or obesity may harbour a gangrenous appendix with little evidence of it.
  - ✓ These features coupled with coincident medical conditions produce a much higher mortality for acute appendicitis in the elderly.

Top Tip

- Misdiagnosis of acute appendicitis in elderly occurs for two reasons
  - **A.** Elderly people usually taking NSAIDs which can mask the pain
  - **B.** Lack of guarding at the RIF because of the laxed abdominal muscles in old aged people.

45. What feature specific for acute appendicitis related to pregnancy?

- ✓ Appendicitis is the most common extra uterine acute abdominal condition in pregnancy with a frequency of from one in 1500 to one in 2000 pregnancies.
- ✓ Diagnosis is complicated by delay in presentation; early nonspecific symptoms are often attributed to the pregnancy, and the changing location of the appendix during pregnancy.
- ✓ As pregnancy develops during the second and third trimesters, the caecum and appendix are progressively pushed to the right upper quadrant of the abdomen.
- ✓ This displacement can result in flank or back pain, and may be confused with pyelonephritis, while lower abdominal pain may be confused with torsion of an ovarian cyst.
- ✓ Foetal loss occurs in 3—5 per cent of cases, increasing to 20 per cent if perforation is found at operation.

Top Tip

- The site of tenderness in pregnant female is higher than in the non-pregnant one.

The obese

- ✓ Obesity can obscure and diminish all the local signs of acute appendicitis.
- ✓ It is wiser to consider operating through a midline abdominal incision for two reasons:
  - **1.** Delay in diagnosis
  - **2.** Technical difficulty of operating in the obese make

46. Numerate the differential diagnoses of acute appendicitis in children; how you recognize each?

i. ***Acute gastroenteritis***

- ✓ There is ***intestinal colic together with diarrhoea and vomiting***
- ✓ Localised tenderness does not usually occur.
- ✓ There is often a history of other family members being affected (food poisoning).
- ✓ Post ileal appendicitis may mimic this condition, thus hospital admission and careful observation are warranted. Where serious doubt persists laparoscopy or surgical exploration may be indicated**.**

Top Tip

- Acute gastroenteritis characterised by the following:
  - **A.** Repeated vomiting (vomiting associated with uncomplicated appendicitis is usually once or twice)
  - **B.** Frequent bowel motion
  - **C.** Diffuse more than localised pain and tenderness and mostly central (around the umbilicus)

ii. ***Mesenteric lymphadenitis***

- ✓ ***The pain is colicky in nature*** and the patient may be completely free from pain between attacks, which last for a few minutes.
- ✓ Cervical lymph nodes may be enlarged.
- ✓ Positive shifting tenderness (when the child turns on to his or her left side the tenderness shifted to the left side).
- ✓ If doubt exists exploration is advisable.

Top Tip

- Always consider mesenteric lymphadenitis in a child present with RIF pain and/or tenderness
- The tenderness is never so localized to the RIF in mesenteric lymphadenitis.
- Most of the time the tenderness in mesenteric lymphadenitis present in many sites around the umbilicus.

iii. ***Meckel's diverticulitis***

- ✓ It may be impossible clinically to distinguish from acute appendicitis.
- ✓ The pain is similar, however signs may be central or left-sided.

Top Tip

- It is impossible, but impossible to clinically distinguish acutely inflamed mackle's diverticulum from appendicitis

iv. ***Intussusception***

- ✓ Appendicitis is uncommon before the age of 2 years, whereas the median age for intussusception is 18 months.
- ✓ A mass may be palpable in the right lower quadrant

Top Tip

- Consider intussusception in any child under the age of 2 years (and more specifically under the age of 12 months) who developed sudden screaming.

- Consider intussusception in any child (regardless the age) who suddenly developed acute abdominal pain associated with the passage of red currant jelly stool.

v. Henoch—Schönlein purpura

- ✓ This is often preceded by a sore throat or respiratory infection.
- ✓ There is nearly always an ecchymotic rash, typically affecting the extensor surfaces of the limbs and on the buttocks. The face is usually spared.
- ✓ The platelet count and bleeding time are within normal limits.

Top Tip

- Consider Henoch—Schönlein purpura in any child presented with abdominal pain associated with ecchymotic rash (even so the rash is not typically distributed as mentioned earlier).

vi. Lobar pneumonia and pleurisy

- ✓ Abdominal tenderness is minimal
- ✓ Pyrexia is marked
- ✓ Chest examination may reveal a pleural friction rub or altered breath sounds on auscultation.
- ✓ A chest radiograph is diagnostic.

Top Tip

- Pneumonia is easily diagnosed as it is associated with dyspnoea ,cough and high fever (appendicitis usually associated with low grade fever unless it is complicated by perforation or gangrene)

47. Numerate the differential diagnoses of acute appendicitis in adults: how you recognize each?

i. Terminal ileitis

- ✓ History of abdominal cramping, weight loss and diarrhoea suggests regional ileitis rather than appendicitis.

ii. Ureteric colic

- ✓ The pain is colicky and the patient is writhing rather than silent in bed.
- ✓ The pain usually radiate to the genitalia downward and the kidney upward
- ✓ Urinalysis should always be performed and the presence of red cells should prompt a supine abdominal X-ray.
- ✓ Renal ultrasound or an intravenous urogram is diagnostic.

Top Tip

- A patient with acute appendicitis never keep writhing because movement induce pain as movement induce more irritation of the parietal peritoneum.

iii. Right-sided acute pyelonephritis

- ✓ This is accompanied and often preceded by increased frequency of micturition.
- ✓ The leading features are tenderness confined to the loin, fever (temperature 39C), and possibly rigors and pyuria.

iv. Perforated peptic ulcer

- ✓ (Duodenal contents pass along the paracolic gutter to the right iliac fossa.)
- ✓ There is usually a history of dyspepsia and a very sudden onset of pain, which starts in the epigastrium and passes down the right paracolic gutter.
- ✓ In appendicitis the pain starts classically in the umbilical region.
- ✓ Rigidity and tenderness in the right iliac fossa are present in both conditions, but in perforated duodenal ulcer the rigidity is usually greater in the right hypochondrium.
- ✓ Radiography may show gas under the diaphragm.

Top Tip

- Guarding and/or rigidity in acute appendicitis shouldn't be above the level of the umbilicus

v. Testicular torsion

- ✓ In testicular torsion the pain is most severe in the testicle which is affected by torsion.

Top Tip

- The pain in the RIF in patient with testicular torsion is only a pain and couldn't be a tenderness (referred pain)

vi. Acute pancreatitis

- ✓ The pain is usually generalized
- ✓ The vital signs are usually abnormal
- ✓ The patient may be hemodynamically unstable at the time of presentation (shock state)
- ✓ If doubt present send the patient for serum or urinary amylase measurement.

vii. Rectus sheath haematoma

- ✓ The acute pain and localised tenderness in the right iliac fossa, often occurs after an episode of strenuous physical exercise.
- ✓ Localised pain without gastrointestinal upset is the rule.
- ✓ The patient may mention a history of injury to the RIF (even minor injury)
- ✓ Suspect rectus sheath haematoma in patient on anticoagulant therapy.

Top Tip

- In rectus sheath haematoma, the pain is induced by actively contracting the abdominal muscles as asking the patient to get up from his (her) supine position.

viii. Acute cholecystitis

Top Tips

- If acute appendicitis is suspected ,the only clinical difference between acute appendicitis and acute cholecystitis is lower versus upper abdominal pain

- If acute appendicitis is strongly suspected, send the patient for abdominal ultrasound to prove or exclude acute cholecystitis.

48. Numerate the differential diagnose of acute appendicitis in adult female; how you recognize each?

i. Salpingitis

- ✓ Typically, the pain is lower than in appendicitis and is bilateral.
- ✓ A history of vaginal discharge, dysmenorrhoea and burning pain on micturition are all helpful differential diagnostic points.
- ✓ When suspected, the opinion of a gynaecologist should be obtained, and high vaginal swab taken for Chlamydia culture. When serious diagnostic uncertainty persists, diagnostic laparoscopy should be undertaken.

Top Tip

- The pain in salpingitis (PID) is usually in the lower abdomen, more severe and more diffuse

ii. **Mittelschmerz**

- ✓ Midcycle rupture of a follicular cyst with bleeding produces lower abdominal and pelvic pain, **typically midcycle**.
- ✓ Systemic upset is rare
- ✓ Pregnancy test is negative and symptoms usually subside within hours.
- ✓ Occasionally, diagnostic laparoscopy is required.

iii. **Torsion/haemorrhage of an ovarian cyst**

- ✓ When suspected, *pelvic ultrasound and a gynaecological opinion should be sought*.
- ✓ If encountered at operation, ovarian cystectomy should be performed, if necessary, in women of child-bearing years.
- ✓ Documented visualisation of the contralateral ovary is an essential medicolegal precaution.

Top Tip

- In rupture ovarian cyst, the pain is somehow diffusely involve the lower abdomen and the patient cannot point specifically to the site of the pain; also the tenderness the examiner got is not fit when he (she) repeat the palpation.

iv. Ectopic gestation

- ✓ Usually there is a history of a missed menstrual period and urinary pregnancy test **<u>may be</u>** positive.
- ✓ Severe pain is felt when the cervix is moved on vaginal examination.
- ✓ Signs of intraperitoneal bleeding usually become apparent
- ✓ The patient should be questioned specifically regarding referred pain in the shoulder.
- ✓ Pelvic ultrasonography should be carried out in all cases where an ectopic pregnancy is a possible diagnosis.

Top Tip

- Consider ruptured ectopic pregnancy in any female in the reproductive age group who is presented with acute abdominal pain, together with tachycardia and hypotension.
- Consider ruptured ectopic pregnancy in any female in the reproductive age group who is presented with acute abdominal pain,

together with shoulder pain.(blood in the peritoneal cavity irritate the under diaphragm);for this reason the patient won't lie supine because this induce or increase the already presented shoulder pain.

49. Numerate the differential diagnoses of acute appendicitis in elderly; how you recognize each?

i. Sigmoid diverticulitis

- ✓ In some patients with a long sigmoid loop, the colon lies to the right of the midline and it may be impossible to differentiate between diverticulitis and appendicitis.
- ✓ A trial of conservative management with intravenous fluids and antibiotics is often appropriate, with a low threshold for exploratory laparotomy in the face of deterioration or lack of clinical response.

ii. Intestinal obstruction

- ✓ The diagnosis of intestinal obstruction is usually clear (pain, colic, abdominal distension and constipation)

iii. Carcinoma of the caecum

- ✓ When obstructed or locally perforated, carcinoma of the caecum may mimic or cause obstructive appendicitis in adults.
- ✓ A history of discomfort, altered bowel habit or unexplained anaemia should raise suspicion.
- ✓ A mass may be palpable and barium enema or colonoscopy is diagnostic.

50. What is the diagnostic work in patient suspected of having acute appendicitis; what investigations the patient may need?

- ✓ The diagnosis of acute appendicitis is essentially clinical.
- ✓ A full blood count and urinalysis should be performed in all cases.
- ✓ In women of reproductive years, it is wise to obtain a urinary pregnancy test before proceeding to exploration.
- ✓ Pelvic ultrasound is of value in excluding tubal or ovarian disease if suspected.
- ✓ Abdominal ultrasound examination is a useful diagnostic tool, particularly in children, with a diagnostic accuracy of appendicitis in excess of 90 per cent (appendicular compression sign where the appendix is compressible if not inflamed i.e. the lumen can be obliterated when not inflamed)
- ✓ In dehydrated or elderly patients or where comorbid conditions present, serum urea and electrolytes should be checked.
- ✓ If a diagnosis of intestinal obstruction, intussusception or ureteric colic is being entertained, a supine abdominal X-ray should be performed.

In brief:-

Preoperative investigations in appendicitis
Routine
■ Full blood count
■ Urinalysis
Selective
■ Pregnancy test
■ Urea and electrolytes
■ Supine abdominal radiograph
■ Ultrasound of the abdomen/pelvis
■ Contrast-enhanced CT scan of the abdomen

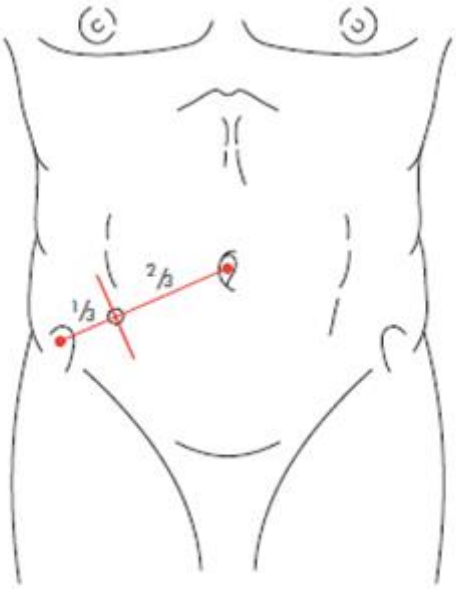
51. Name the incisions used for appendicectomy; describe each

i. gridiron incision
ii. Rockey-Davis incision
iii. Lanz incision
iv. Right paramedian incision
v. *a lower midline abdominal incision*
vi. *Rutherford Morrison's incision*

Gridiron incision

The gridiron incision is made at right angles to a line joining the anterior superior iliac spine to the umbilicus, its centre being along the line at McBurney's point

- ✓ The skin is opened as mentioned soon.
- ✓ The external oblique is incised in the line of its fibres along the length of the incision.
- ✓ The fibres of the internal oblique and transversus abdominis are split, and with suitable retraction the peritoneum is opened.
- ✓ If better access is required, it is possible to *convert the grid-iron to a Rutherford Morrison incision by cutting the internal oblique and transversus muscles in the line of the incision.*



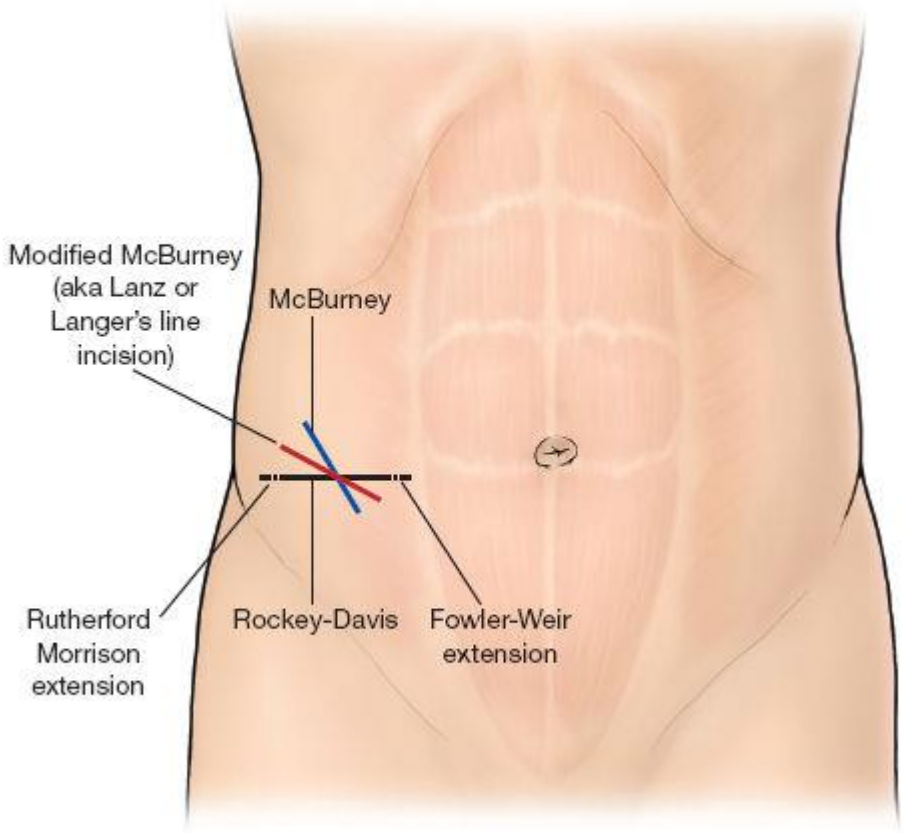
Gridiron incision

52. What layers does the surgeon encounter on exposing the appendix through a Rockey-Davis incision؟

- Skin,
- subcutaneous fat,
- Aponeurosis of the external oblique muscle,
- internal oblique muscle,
- transversalis fascia and muscle, and
- Peritoneum.

Rockey-Davis incision

Its place either transversely at McBurney's point or at the place of the lanz incision (see below).

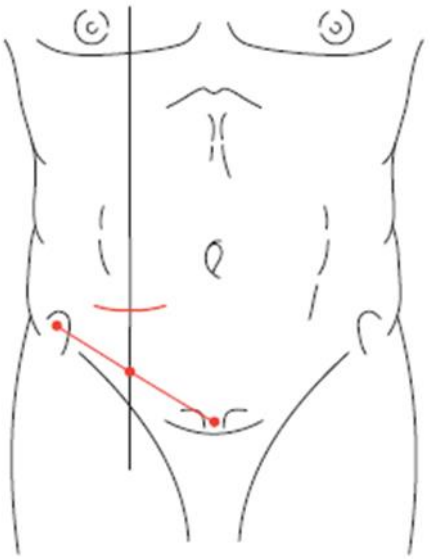


53. Who was Rockey-Davis?

Rockey-Davis was a pair of surgeons-A.E. Rockey and G.G. Davis-who developed RLQ transverse, muscle-splitting incisions that extend into the rectus sheath.

Lanz incision

- ✓ A transverse skin crease **incision**
- ✓ The exposure is better and extension, when needed, is easier.
- ✓ More cosmetic because it run with the skin crease
- ✓ The incision, made approximately 2 cm below the umbilicus centred on the midclavicular midinguinal line.
- ✓ The external oblique aponeurosis, internal oblique and transversus muscles are split in the direction of the fibres and the peritoneum is opened.
- ✓ When necessary the incision may be extended medially, with retraction or suitable division of the rectus abdominis muscle.



Lanz incision

Lower midline abdominal incision

- ✓ Used when the diagnosis is in doubt, particularly in the presence of intestinal obstruction,

Right paramedian incision

- ✓ Not used now a days (in most hosptals)
- ✓ Lower midline incision ifs preferred for the following causes:
  - **A.** Is difficult to extend
  - **B.** More difficult to close
  - **C.** Provides less good access to the pelvis and peritoneal cavity.

Rutherford Morrison incision

- ✓ It is a gridiron incision extended by cutting the internal oblique and transversus muscles in the line of the incision i.e. converting the muscle splitting incision into muscle cutting incision.
- ✓ It is done when more access needed to achieve the appendectomy as in complicated appendicitis, short caecal mesentery and in obese patient.

54. What problems could be encountered during appendicectomy?

A. A normal appendix is found — remove the appendix even so the appendix is normal to eliminate acute appendicitis from the differential diagnosis of future RIF pain.

B. The appendix cannot be found — the caecum should he mobilised and the taenia coli should be traced to their confluence on the caecum before the diagnosis of 'absent appendix' is made.

C. An appendicular tumour is found — small tumours (under 2.0 cm in diameter) can he removed by appendicectomy; larger tumours should he treated by a right hemicolectomy.

D. An appendix abscess is found and the appendix cannot he removed easily — this should be treated by local peritoneal toilet, drainage of any abscess and intravenous antibiotics.

E. Appendicitis complicating Crohn's disease :

- **A.** If the caecal wall is healthy at the base of the appendix, appendicectomy can he performed without increasing the risk of an enterocutaneous fistula.
- **B.** If the appendix is involved with the Crohn's disease. In this situation a conservative approach may be warranted, and a trial of intravenous corticosteroids and systemic antibiotics used to resolve the acute inflammatory process.

Top Tip

- Crohn's disease can initially present as appendicitis

55. What are the lines of management lines of patient diagnosed as having appendicular mass?

- ✓ The management is conservative and is called the Ochsner Sherren regimen
- ✓ Admit the patient to the hospital
- ✓ Keep the patient nil by mouth
- ✓ Insert nasogastric tube only if repeated vomiting
- ✓ Give intravenous fluid and correct any electrolyte disturbance
- ✓ Give antibiotics against gram negative ,gram positive and anaerobes as (Penicillin, Aminoglycoside and Metronidazole)or (Cephalosporin and Metronidazole)
- ✓ Give analgesia
- ✓ Make a 6-12 hourly chart for the vital signs ,abdominal pain ,vomiting and tenderness
- ✓ Mark the appendicular mass with skin marker every day

56. What are the criteria for stopping the Ochsner Sherren regimen

- ✓ Rising pulse rate
- ✓ Increasing or spreading abdominal pain
- ✓ Increasing size of the mass

57. If the patient not responding to the Ochsner Sherren regimen, what complication he (she) mostly developed?

The patient mostly developed appendicular abscess and here the surgery is unavoidable.

58. Numerate the post-appendicectomy complications

- **A.** Wound infection
- **B.** Ileus
- **C.** Respiratory(Adequate postoperative analgesia and physiotherapy, when appropriate, reduce the incidence)
- **D.** Venous thrombosis and embolism
- **E.** Portal pyaemia (Pylephlebitis) (very serious complication of gangrenous appendicitis associated with high fever, rigors and jaundice. It is due to septicaemia in the portal venous system and may leads to the development of intrahepatic abscesses (often multiple). Treatment is with systemic antibiotics and percutaneous drainage of hepatic abscesses as appropriate.
- **F.** Faecal fistula
  - **i.** May follow if the encircling stitch has been put in too deeply or
  - **ii.** if the caecal wall was involved by oedema or inflammation.
  - **iii.** Occasionally, a fistula may result following appendicectomy in Crohn's disease.
- **G.** Adhesive intestinal obstruction

H. Right inguinal hernia (following a grid-iron incision for appendicitis due to injury to the iliohypogastric nerve)

59. What you know about carcinoid tumour of the appendix *(argentaffinoma*)?

- ✓ Carcinoid tumours arise in argentaffln tissue (Kultschitzsky cells of the crypts of Lieberkuhn) and are most commonly found in the vermiform appendix (60%).
- ✓ Carcinoid tumour is found once in every 300—400 appendices subjected to histological examination and is 10 times more common than any other neoplasm of the appendix.
- ✓ The tumour can occur in any part of the appendix, but it frequently does so in the distal third.
- ✓ The neoplasm feels moderately hard, and on sectioning the appendix it can be seen as a yellow tumour between the intact mucosa and the peritoneum.
- ✓ Unlike carcinoid tumours arising in other parts of the intestinal tract, carcinoid tumour of the appendix rarely gives rise to metastases.
- ✓ Appendicectomy has been shown to be sufficient treatment if it is less than 2 cm size.
- ✓ Right hemicolectomy is indicated if:
  - **a)** The caecal wall is involved,
  - **b)** The tumour is 2 cm or more in size,
  - **c)** Involved lymph nodes are found, otherwise right

Top Tips

- 60% of carcinoid tumors occur in the appendix;
- 0.03% of appendectomies reveal incidental carcinoid;
- When found, the bowel should be assessed because of 30% chance of synchronous lesion.

60. What you know about Primary adenocarcinoma of the appendix?

- ✓ Is extremely rare.
- ✓ It is usually of the colonic type and should be treated by right hemicolectomy (as a second-stage procedure if the condition is not recognised at the first operation).

61. Suppose you are the doctor in duty in the emergency room and you received a patient who you diagnosed him (her) as having acute appendicitis, what is your plan for management?

- **a.** Keep the patient the causality till seen by the surgeon
- **b.** Call the surgeon about the case
- **c.** Keep the patient nil by mouth
- **d.** Give him (her) intravenous fluid
- **e.** Prescribe parenteral antibiotics active against gram negative, gram positive and anaerobic microorganisms
- **f.** Give the patient analgesia if you are sure about the diagnosis

g. Do the necessary investigations preparing the patient for general anesthesia as (CBC, blood group and Rh and prepare blood when needed (the patient may be already anaemic), RBS, urea, creatinine, virology, ECG and/or CXR (when indicated),serum electrolytes if the patient has history of renal impairment or presented with repeated vomiting, and finally pregnancy test for married females to prove or exclude pregnancy (this is for medicolegal because general anaesthesia has its own risk on the conception)

Top Tips

- Your duty in the causality when receiving a patient with acute appendicitis is to prepare him (her) for surgery
- The treatment of appendicitis is appendicectomy.

62. Who is Rutherford Morison?

James Rutherford Morison (10 October 1853, County Durham, England– 9 January 1939, Newcastle upon Tyne, England) was a British surgeon

63. Does surgery for appendicitis involve a risk of mortality?

No surgical procedure is devoid of risk.

	Mortality rate
Nonperforated appendix	< 0.1%
Perforated appendix	≤ 5.0%

64. Is laparoscopic appendectomy replacing the traditional approach?

The normal appendix can be removed easily and safely via the laparoscope, but the inflamed or perforated appendix is tougher. Laparoscopic appendectomy probably should be reserved for the normal appendix.

65. What is a "white worm"?

A normal appendix.

For ever is only the beginning!

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