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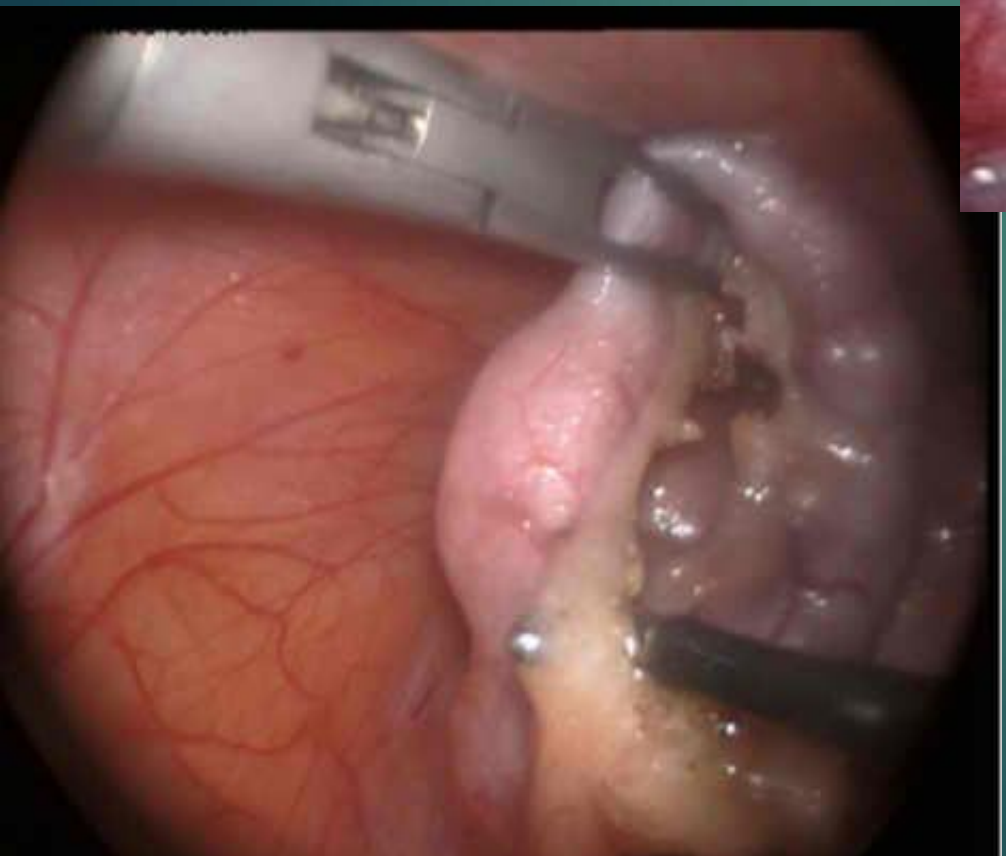
IMRCS



Abdominal Pain

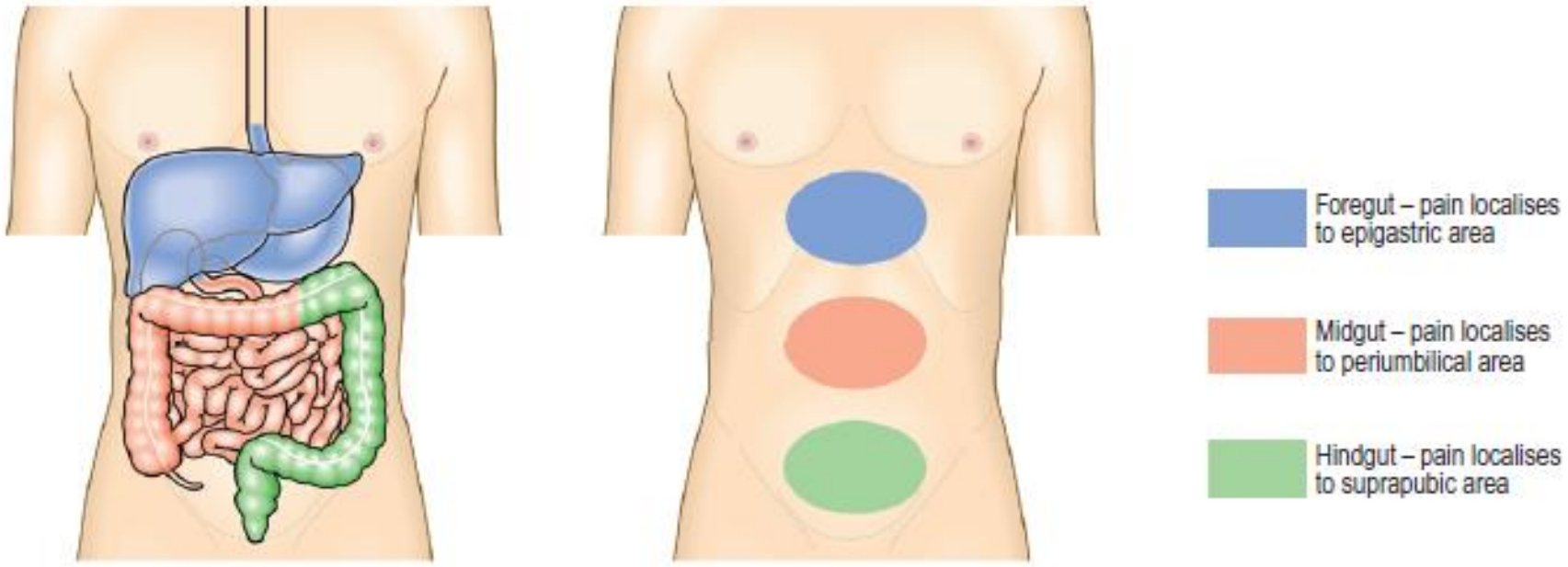


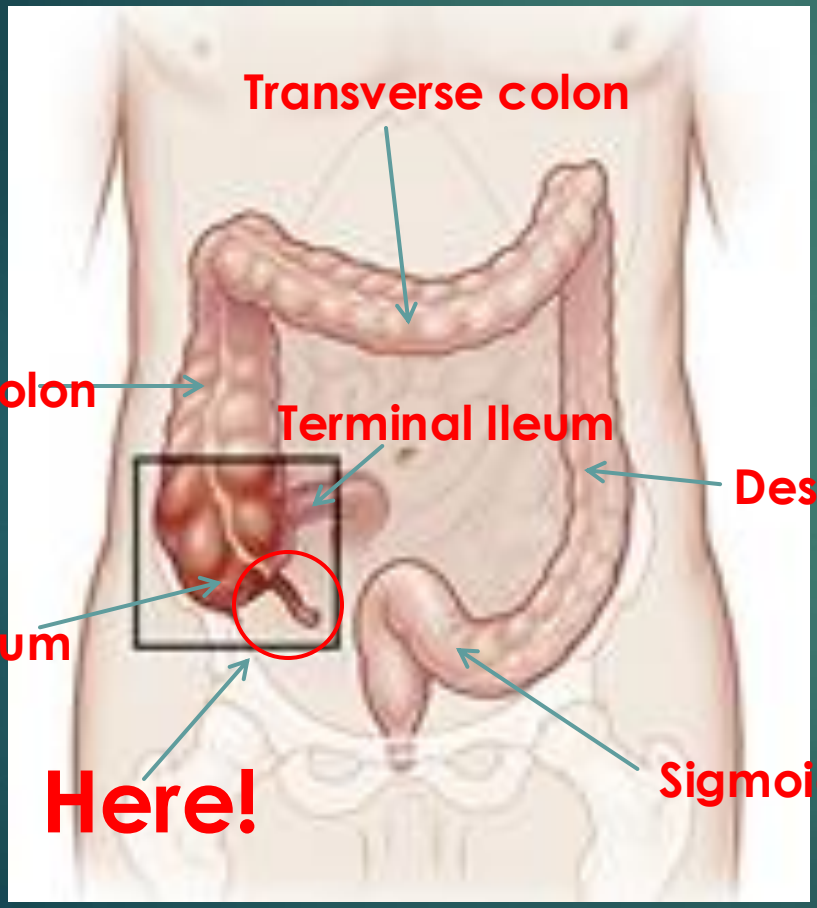
Fig. 8.5 Abdominal pain. Perception of visceral pain is localised to the epigastric, umbilical or suprapubic region, according to the embryological origin of the affected organ.

Acute Appendicitis

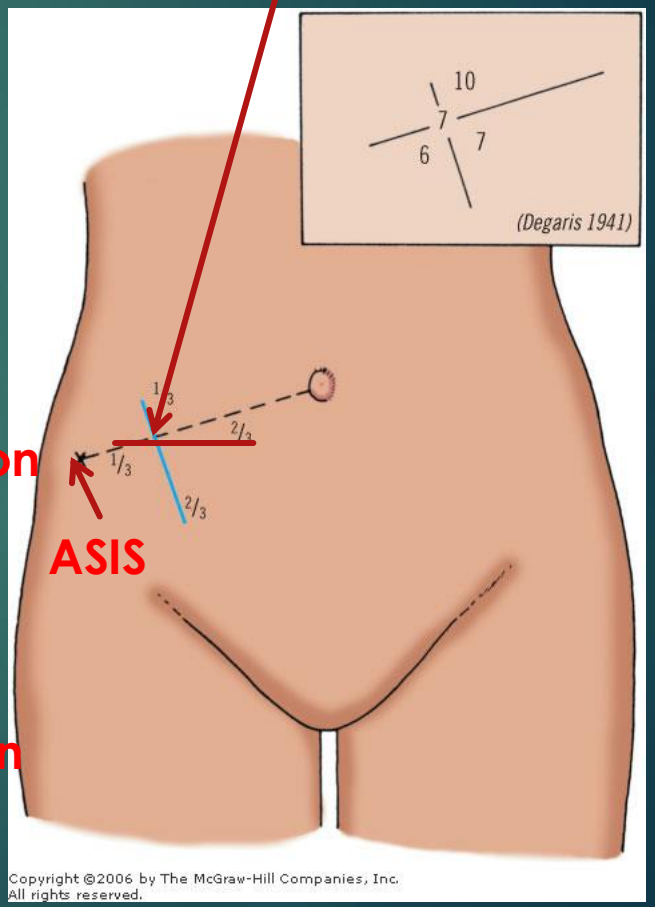
- Appendicitis is common- **7-9% lifetime risk**
- Mostly young people but can present at any age.
- Delay in diagnosis/management causes significant morbidity- **can be a surgical emergency**
- Usually clinical diagnosis- not reliant on imaging
- Has classic presentation but often presents atypically- it is a common pitfall!

Anatomy

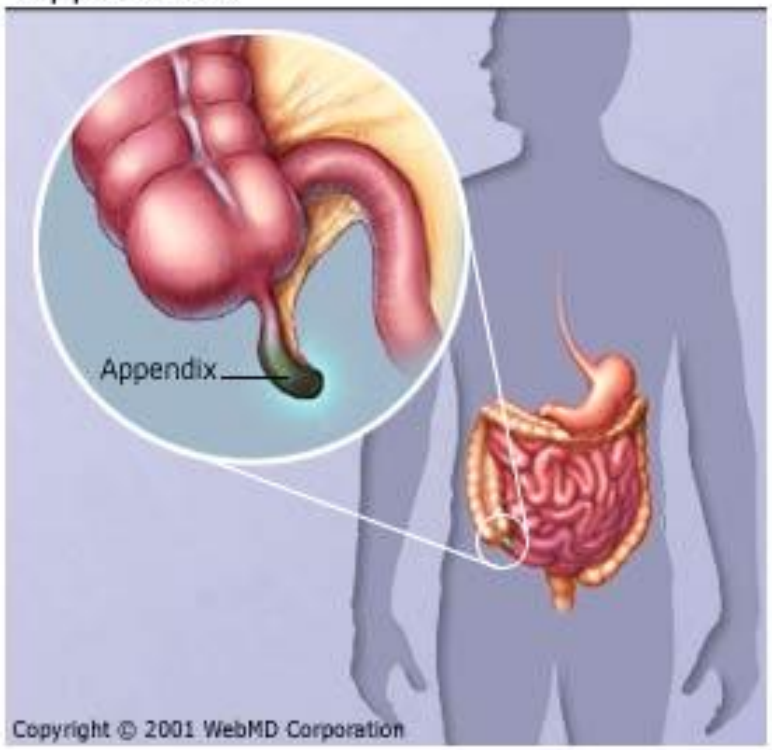
1. The Appendix is…

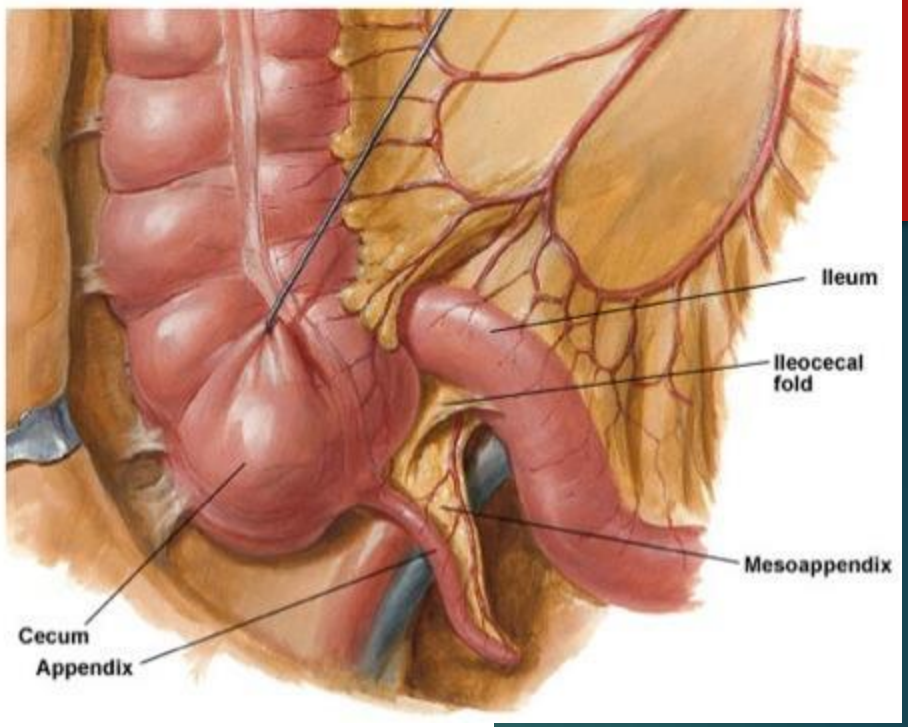


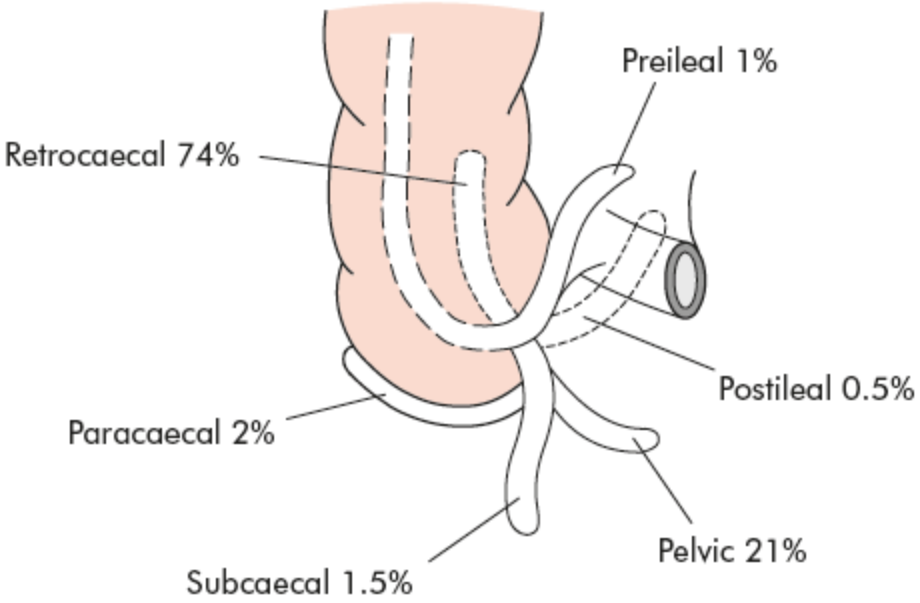
2. McBurney's Poin



Appendicitis







ACUTE APPENDICITIS

Incidence:

- rare in infants, increasingly common in **childhood and early adult life,** peak incidence in the **teens and early 20s**.
- before puberty males = females.
- In teenagers and young adults the **male**–female ratio 3:2
- Thereafter, the greater incidence in males declines.

Aetiology

No definite cause

1-Decreased dietary fibre and increased consumption of refined carbohydrates (low fiber diet)

2-Bacterial proliferation within the appendix,

no single organism is responsible(mixed growth of aerobic and anaerobic organisms).

3- Obstruction of the appendix lumen

- Lymphoid hyperplasia

- faecolith (composed of inspissated faecal material,

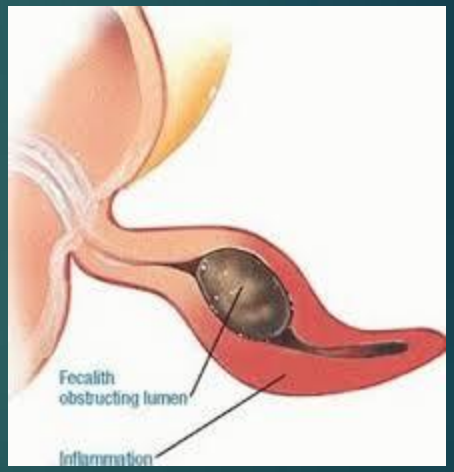
calcium phosphates, bacteria and epithelial debris

- stricture

- foreign body(rare)

- tumour, particularly carcinoma of the caecum(middle age and elderly)

- Intestinal parasites, particularly *Oxyuris vermicularis*

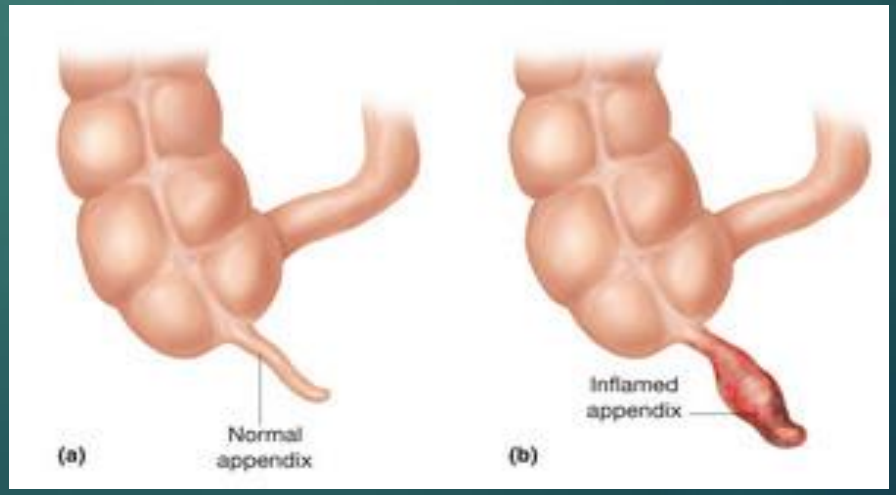


Pathology

- **Lymphoid hyperplasia** narrows the lumen →**luminal obstruction**.
- Continued **mucus secretion** and **inflammatory exudation**→ increase **intraluminal pressure**→ **obstructing lymphatic drainage**→Oedema

- Mucosal ulceration

- Bacterial translocation to the submucosa.



Resolution may occur (spontaneously/antibiotic therapy).

or

Condition progresses,more distension →**venous obstruction & wall ischaemia** →**bacterial invasion** through the muscularis propria and submucosa, producing acute appendicitis.

Ischaemic necrosis → **gangrenous** appendicitis→**free bacterial contamination** of the peritoneal cavity(**peritonitis**).

- Alternatively, the greater omentum and loops of small bowel become adherent to the inflamed appendix, walling off the spread of peritoneal contamination, and resulting in a **phlegmonous mass** or **paracaecal abscess**.

Rarely, appendiceal inflammation resolves, leaving a distended mucus-filled organ termed a **‘mucocoele’** of the appendix .

Diffuse peritonitis is the great threat of acute appendicitis, it occurs as a result of:

- free migration of bacteria through an ischaemic appendicular wall
- frank perforation of a gangrenous appendix
- delayed perforation of an appendix abscess.

Factors that promote this process include:

- extremes of age
- immunosuppression
- diabetes mellitus
- faecolith obstruction of the appendix lumen
- free-lying pelvic appendix
- previous abdominal surgery

In these situations, a rapidly deteriorating clinical course is accompanied by signs of diffuse peritonitis and systemic sepsis syndrome.

Clinical diagnosis

History

PAIN

-poorly localised, colicky abdominal pain(midgut visceral discomfort in response to appendiceal inflammation and obstruction).

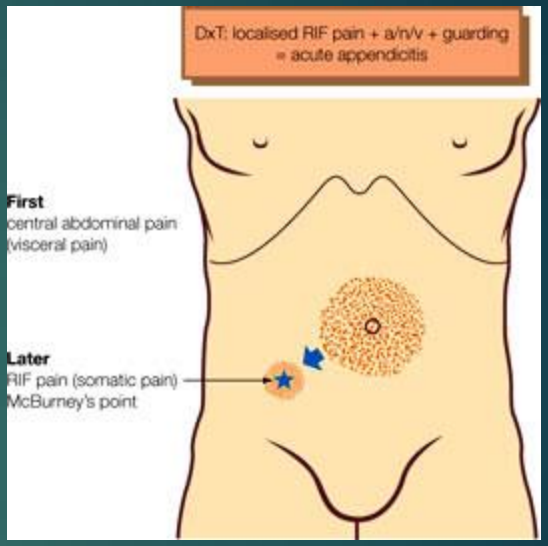
-The pain in periumbilical region.

- Central abdominal pain + anorexia, nausea and usually one or two episodes of vomiting that follow the onset of pain.

With progressive inflammation of the appendix:

Shifting of pain: from central abdominal pain to right iliac fossa(irritation of RIF parietal peritoneum) visceral to **somatic pain** which is :

- more intense
- constant
- localised to right iliac fossa



Typically, coughing or sudden movement exacerbates the right iliac fossa pain.

ANOREXIA

-constant clinical feature, particularly in children.

Family history

1/3 of children with appendicitis have a first-degree relative with a similar history .

One half of acute appendicitis→ classic visceral–somatic sequence of pain .

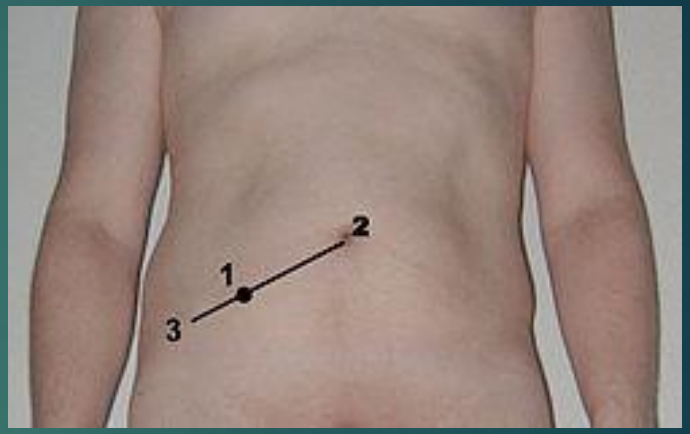
Signs

Temperature and pulse rate:

- **After 6 hours, slight pyrexia** (37.2–37.7°C) with a corresponding increase in the pulse rate to 80 or 90 is usual.

-Changes of greater magnitude may indicate complications.

- Unwell patient with low-grade pyrexia
- Inspection of the abdomen →limitation of respiratory movement in the lower abdomen.
- localised abdominal tenderness maximum at McBurney's point.
- Muscle guarding
- Rebound tenderness



Asking the patient to cough or gentle percussion over the site of maximum tenderness will elicit rebound tenderness .

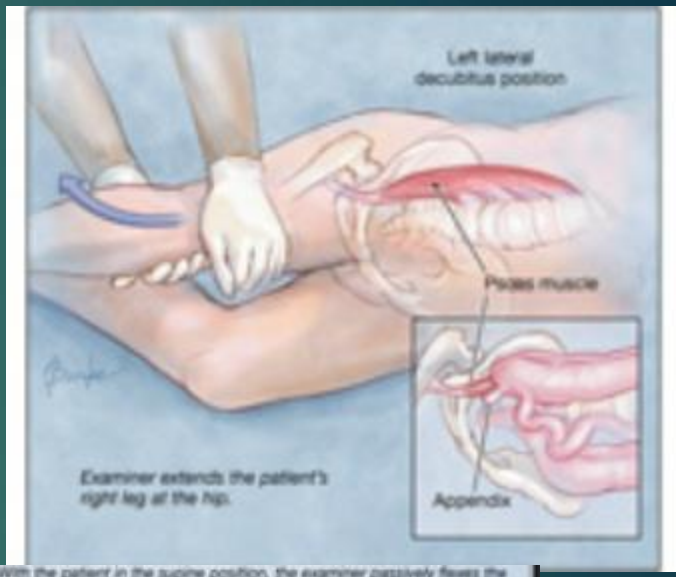
- **Pointing sign:** The patient is asked to point to where the pain began and where it moved .

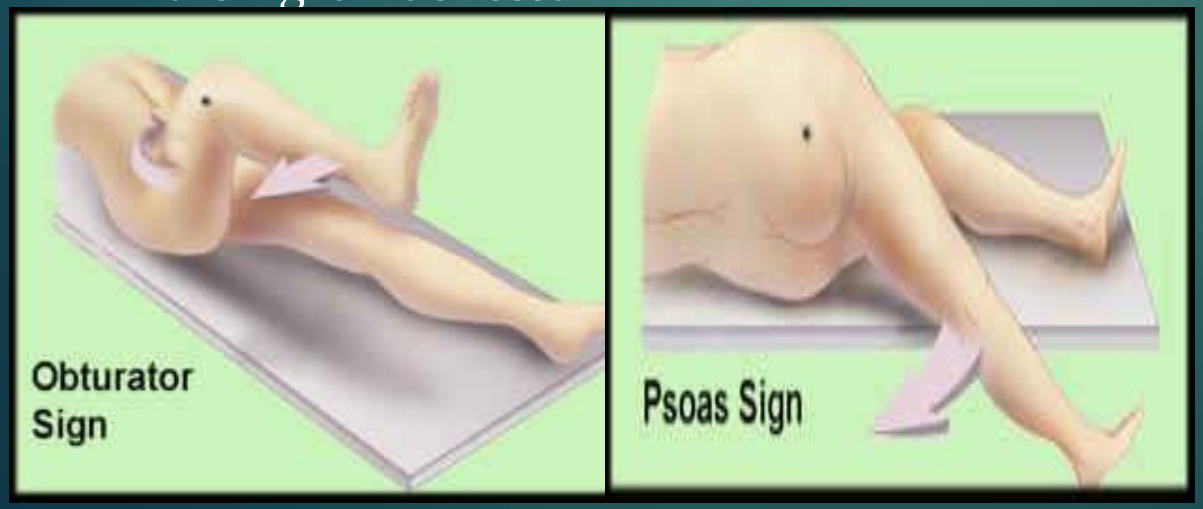
- **Rovsing's sign:** Deep palpation of the left iliac fossa may cause pain in the right iliac fossa.

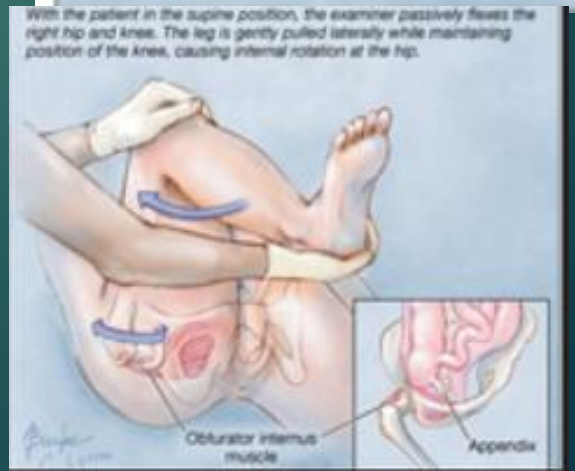
- **Psoas sign :** passive extension of hip or active flexion of hip against resistance→ pain. The patient will lie with the right hip flexed for pain relief .

- **Obturator sign :** hip flexion and internal rotation cause pain in the hypogastrium (the obturator test).

-**Cutaneous hyperaesthesia** may be demonstrable in the right iliac fossa







Two clinical syndromes of acute appendicitis:

1- acute catarrhal (non-obstructive) appendicitis

2- acute obstructive appendicitis:

-more acute course(abrupt)

-generalised abdominal pain from the start.

- Temperature normal

- vomiting common.

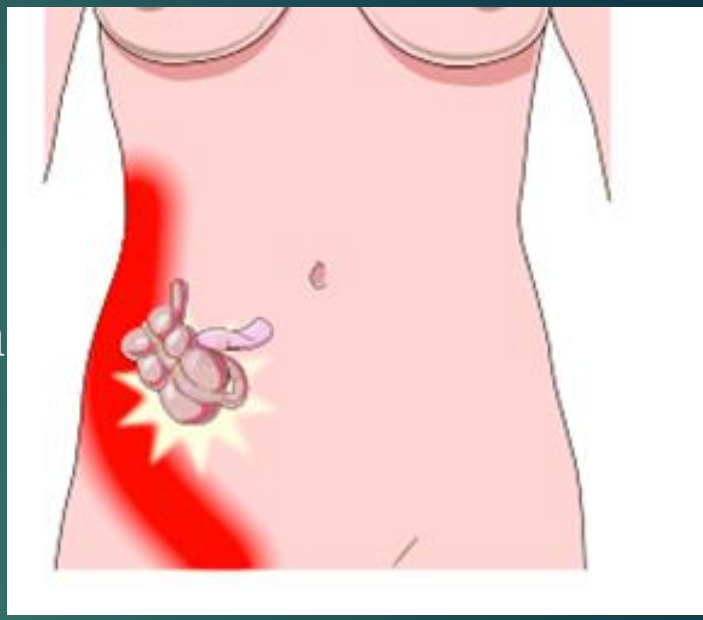
Special features, according to position of the appendix

1-Retrocaecal appendicitis

- Rigidity is often absent
- Application of deep pressure may fail to elicit tenderness (silent appendix)

-Deep tenderness is often present in the loin and rigidity of the quadratus lumborum.

-Psoas spasm leading to flexion of the hip joint. Hyperextension of the hip joint may induce abdominal pain (**Psoas sign +ve**).



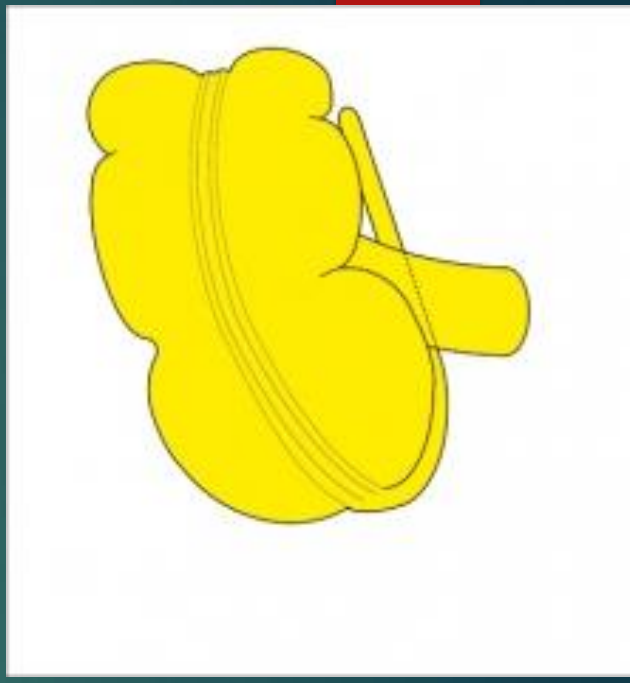
2-Pelvic appendicitis

- More common in **children**
- **Early diarrhoea** (inflamed appendix in contact with the rectum).
- Complete absence of abdominal rigidity
- Tenderness over McBurney's point is also lacking.
- Deep tenderness can be made out just above and to the right of the symphysis pubis.
- Rectal examination **reveals tenderness in the rectovesical pouch or the pouch of Douglas**, especially on the right

side.

- **+ve psoas and obturator** signs.
- **Frequency of micturition** (inflamed appendix in contact with the bladder).

3-Postileal appendicitis



The inflamed appendix lies behind the terminal Ileum(difficult to diagnose)

- Pain may **not shift**
- **Diarrhea** is a feature
- Marked **retching**
- Tenderness, if any, is ill defined, although it may be present immediately to the right of the umbilicus.

Special features, according to age

Infants

- Rare in infants under 36 months of age.
- The patient is unable to give a history. Diagnosis is often **delayed**.
- Higher incidence of **perforation** and postoperative morbidity than older children.
- **Diffuse peritonitis** can develop rapidly because of the underdeveloped greater omentum.

Children

- **Vomiting** is more common.
- complete **aversion** to food.

The elderly

- **Gangrene and perforation** occur much more frequently .

- **The abdominal clinical picture is not obvious** even in the presence of gangrenous appendicitis (lax abdominal walls or obesity)

- Clinical picture **may simulate subacute intestinal obstruction.**

- **Higher mortality**

(coincident medical conditions plus the previous factors)

The obese

- Obesity can **obscure and diminish all the local signs** of acute appendicitis.

- **Midline** abdominal incision

(Delay in diagnosis + technical difficulty of operating in the obese)

- **Laparoscopy** is particularly useful in the obese.

Pregnancy

Appendicitis is the most common extrauterine acute abdominal condition in pregnancy.

- **Delay in presentation** (early non-specific symptoms are often attributed to the pregnancy).

- The **physiologic leukocytosis** of pregnancy (high as 16,000 cells/mm3).

Obstetric teaching has been that the caecum and appendix are progressively pushed to the right upper quadrant of the abdomen as pregnancy develops during the second and

third trimesters.

- **Pain in the right lower quadrant** of the abdomen remains the cardinal feature of appendicitis in pregnancy.

- **Fetal loss** occurs in 3–5 per cent of cases, increasing to 20 per cent if perforation is found at operation.

Differential diagnosis

Children

1- **Acute gastroenteritis and mesenteric lymphadenitis:**

the pain is diffuse, and tenderness is not as sharply localized and cervical lymph nodes may be enlarged.

2- **Meckel's diverticulitis:**

signs may be central or left sided.

history of antecedent abdominal pain or intermittent lower gastrointestinal bleeding.

3- **Intussusception:**

Appendicitis is uncommon before the age of two years, whereas the median age for intussusception is 18 months.

A mass may be palpable in the right lower quadrant,

4- **Henoch–Schönlein purpura**

preceded by a sore throat or respiratory infection.

Abdominal pain can be severe.

ecchymotic rash, affecting the extensor surfaces of the limbs and on the buttocks.

The face is usually spared.

Microscopic haematuria is common.

5-Lobar pneumonia and pleurisy, especially at the right base

Abdominal tenderness is minimal,

pyrexia is marked

+ve pleural friction rub or altered breath sounds on auscultation.

A chest radiograph is diagnostic.

Adults

1- Terminal ileitis

- a doughy mass of inflamed ileum may be felt.

- history of abdominal cramping, weight loss and diarrhoea.

The ileitis may be non-specific, due to Crohn's disease or *Yersinia infection*.

- serum antibody titres are diagnostic, and treatment with intravenous tetracycline is appropriate.

2- Ureteric colic:

Urinalysis should always be performed, and the presence of red cells → supine abdominal radiograph. Renal ultrasound or intravenous urogram is diagnostic.

3- Right-sided acute pyelonephritis

increased frequency of micturition.

tenderness confined to the loin, fever (temperature 39°C) and possibly rigors and pyuria.

4- perforated peptic ulcer

the duodenal contents pass along the paracolic gutter to the right iliac fossa.

- history of dyspepsia
- very sudden onset of pain that starts in the epigastrium and passes down the right paracolic gutter.
- rigidity is usually greater in the right hypochondrium.
- rigidity and tenderness in the right iliac fossa
- erect chest radiograph →gas under the diaphragm in 70 %.
- abdominal (CT) examination in difficult cases.

5- Testicular torsion (teenage or young adult male)

Pain can be referred to the right iliac fossa, and shyness on the part of the patient may lead the unwary to suspect appendicitis unless the scrotum is examined in all cases.

6-Acute pancreatitis
should be considered in the differential diagnosis of all adults suspected of having acute appendicitis and, when appropriate, should be excluded by serum or urinary amylase measurement.

7- Rectus sheath haematoma

- relatively rare
- acute pain and localised tenderness in the RIF
- after an episode of strenuous physical exercise.
- Localised pain without gastrointestinal upset is the rule. Occasionally, in an elderly patient, particularly one taking anticoagulant therapy, a rectus sheath haematoma may present as a **mass and tenderness** in the right iliac fossa after minor trauma.

Adult female

pelvic disease in women of childbearing age most often mimics acute appendicitis.

A careful gynaecological history should be taken in all women with suspected appendicitis, concentrating on:

- menstrual cycle

- vaginal discharge

- possible pregnancy .

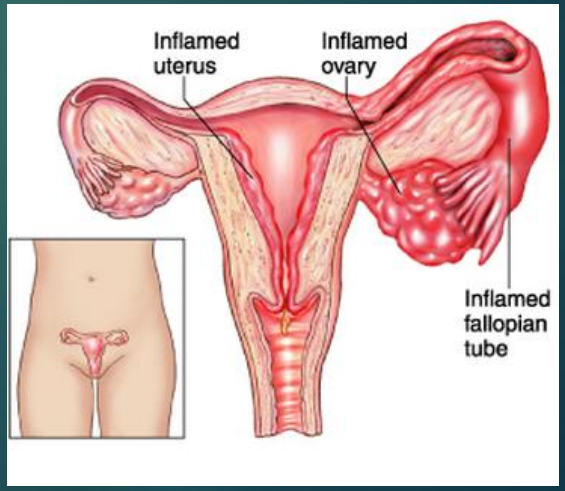
The most common diagnostic mimics are

pelvic inflammatory disease (PID), Mittelschmerz, torsion or haemorrhage of an ovarian cyst and ectopic pregnancy.

1-Pelvic inflammatory disease

(salpingitis, endometritis and tubo-ovarian sepsis)

- The pain is **lower** than in appendicitis and is **bilateral**.
- history of **vaginal discharge**, **dysmenorrhoea** and **dysurea** .
- vaginal examination → adnexal and cervical tenderness .
- High vaginal swab & culture →*Chlamydia trachomatis and Neisseria gonorrhoeae*.
- gynaecologist opinion should be obtained.
- Transvaginal ultrasound
- diagnostic laparoscopy



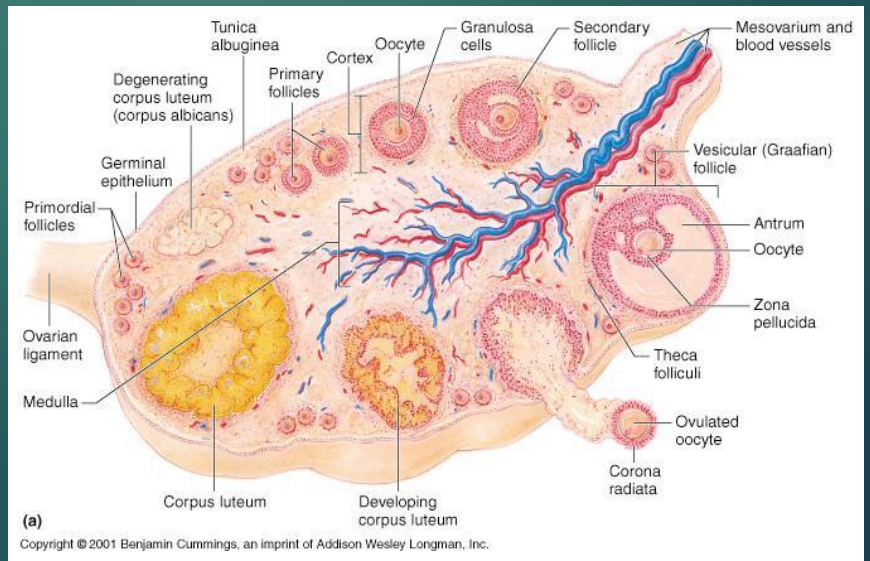
2- Mittelschmerz

Midcycle rupture of a follicular cyst with bleeding produces **lower abdominal and pelvic pain**, typically **midcycle**.

- No systemic upset

- Pregnancy test is negative
- Symptoms usually subside within hours.

Occasionally, diagnostic laparoscopy is required. Retrograde menstruation may cause similar symptoms.

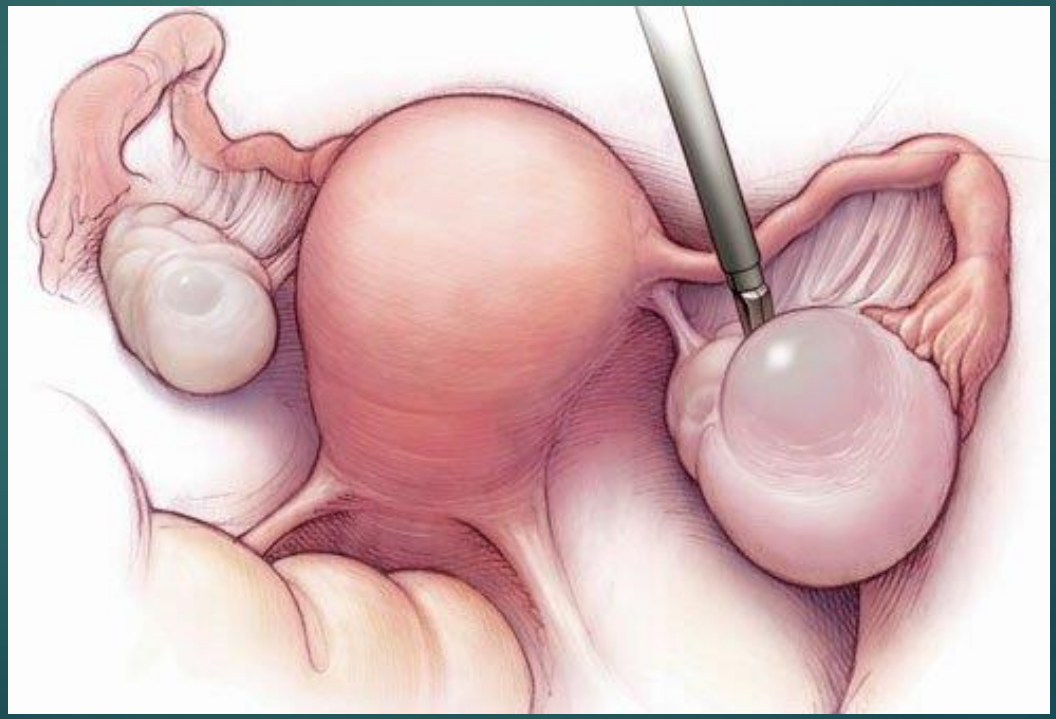


3- Torsion/haemorrhage of an ovarian cyst

(difficult differential diagnosis)

pelvic ultrasound and a gynaecological opinion should be sought.

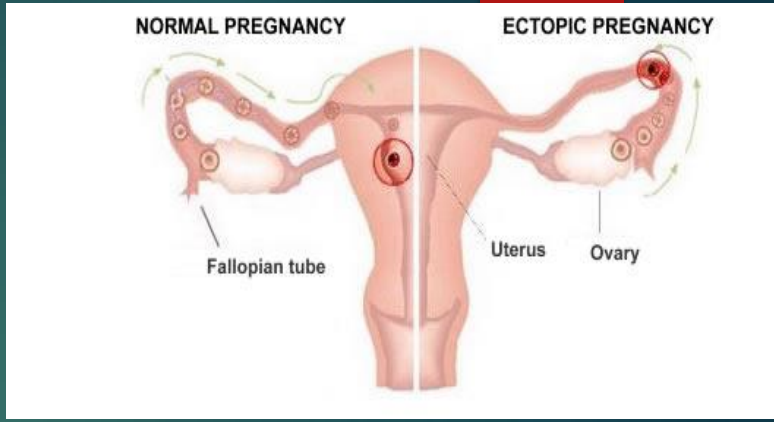
If encountered at operation →untwisting of the involved adnexa and ovarian cystectomy should be performed.



4- Ectopic pregnancy

- Ectopic preg. → signs of haemoperitoneum

-right-sided tubal abortion or right-sided unruptured tubal pregnancy.



Right-sided unruptured tubal pregnancy :

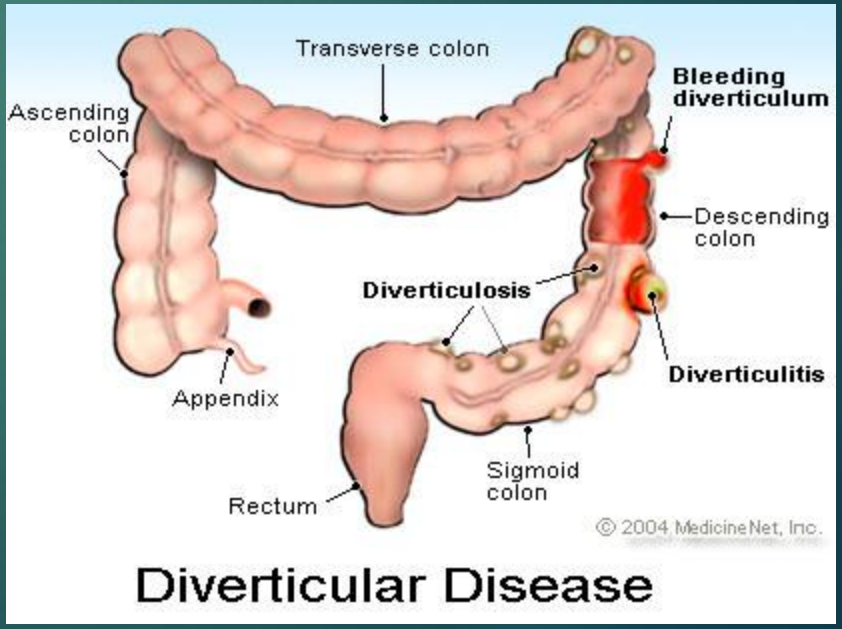
- pain commences on the right side and stays there.
- pain is severe.
- history of a missed menstrual period
- Signs of intraperitoneal bleeding with referred pain in the shoulder.
- cervical excitation test positive
- urinary pregnancy test may be positive.
- Pelvic ultrasonography.

Elderly

1- Diverticulitis

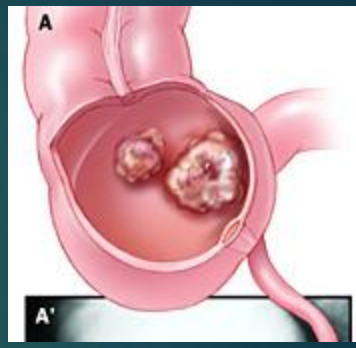
Abdominal CT scanning is particularly useful and should be considered in the management of all patients over the age of 60 years.

Right-sided diverticulitis is unusual and may be clinically indistinguishable from appendicitis.



2-Intestinal obstruction

In **elderly**, occasionally, it may be difficult to differentiate IO from acute appendicitis



3-Carcinoma of the caecum

-Carcinoma of the caecum when **obstructed** or locally **perforated**, may mimic or cause obstructive appendicitis in adults.

-history of antecedent **discomfort**, **altered bowel habit** or unexplained **anaemia**.

- **mass** may be palpable and an **abdominal CT** scan

diagnostic.

Rare differential diagnoses

1-Preherpetic pain of the right 10th and 11th dorsal nerves.

- no shift of pain
- marked hyperaesthesia.
- no intestinal upset, no rigidity.

The herpetic eruption may be delayed for 3–8 hours.

2-Diabetic crises.

3-Spinal conditions include tuberculosis of the spine, metastatic carcinoma, osteoporotic vertebral collapse and multiple myeloma.

4-porphyria and diabetes mellitus

5-Typhlitis or leukaemic ileocaecal syndrome

Investigation

The diagnosis of acute appendicitis is essentially clinical

- Routine

Full blood count→ WBC > 10,000

Urinalysis→ hematuria/ pyuria due to irritation of nearby ureter/ urinary bladder

- Selective

Pregnancy test

Urea and electrolytes

Supine abdominal radiograph

Ultrasound of the abdomen/pelvis

Contrast-enhanced abdomen and pelvic computed tomography scan

Diagnostic Scoring

- Diagnosis is essentially clinical;
- A number of clinical and laboratory-based scoring systems have been devised to assist diagnosis.
- The most widely used is Alvarado score.

Source: *Bailey & Loves Short Practice of Surgery 25th ed*

The Alvarado (MANTRELS) Score

	Score
Symptoms	
• **M**igratory RIF pain	1
• **A**norexia	1
• **N**ausea and vomiting	1
Signs	
• **T**enderness (RIF)	2
• **R**ebound tenderness	1
• **E**levated temperature	1
Laboratory	
• **L**eucocytosis	2
• **S**hift to the left (segmented neutrophils)	1
TOTAL	10

1-4: Very unlikely
5-6: Possible
7-8: Very probable
9-10: Definite

- < 5 is strongly against a diagnosis of appendicitis
- **7 or more is strongly predictive of acute appendicitis**
- In patients with an equivocal score of 5 or 6, abdominal USG or contrast-enhanced CT scan is used to further reduce the rate of negative appendicectomy

Table 1 Appendicitis Inflammatory Response (AIR) score, 0–12 points

Item	Scoring point
Vomiting	1
Pain in right inferior fossa	1
Rebound tenderness or muscular defence	
Light	1
Medium	2
Strong	3
Body temperature ≥38.5 °C	1
White blood cell count	
10.0–14.9 * 109/L	1
≥15.0 * 109/L	2
Proportion polymorphonuclear leucocytes	
70–84%	1
≥85%	2
C-reactive protein concentration	
10–49 mg/L	1
≥50 mg/L	2

Seven variables are assessed and scored accordingly. After the revision proposed in this report a score 0–3 points suggest low probability, a score 4–8 medium probability and a score 9–12 high probability

Abdominal ultrasound is useful in:

- children and thin adults
- if gynaecological pathology is suspected, with a diagnostic accuracy >90 %.

Contrast-enhanced CT scan is most useful in:

- diagnostic uncertainty+older patients
- acute diverticulitis, intestinal obstruction and neoplasm suspected.

Appendicectomy

- no unnecessary delay
- short period of intensive preoperative preparation:

1- NPO

2- Intravenous fluids

(catheterisation is needed only in the very ill)

3- IV antibiotics

In the absence of purulant peritonitis give single preoperative dose of antibiotics .

When peritonitis is suspected, therapeutic intravenous antibiotics to cover Gram negative bacilli, as well as anaerobic cocci, should be given.

Appendicectomy

- general anaesthetic
- patient supine on the operating table.
- When a laparoscopic technique is to be used, the bladder must be empty

(ensure that the patient has voided before leaving the ward).

palpated for a mass prior to preparing the entire abdomen with an antiseptic solution.(mass → conservative)

Draping of the abdomen

Incisions used:

1- The gridiron incision(most common)

2- Rutherford Morison incision(muscle cutting)

3- Transverse skin crease (Lanz) incision

4- lower midline abdominal incision(doubtful diagnosis)

1-The caecum is identified by the presence of taeniae coli and is withdrawn.

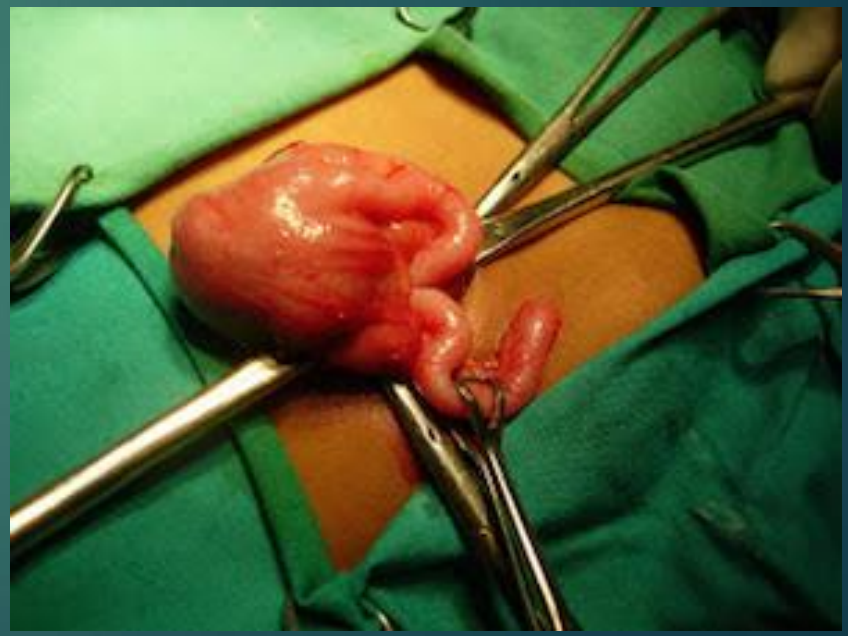
2- Appendix may be felt at the base

of the caecum.

3- Inflammatory adhesions must be gently broken with a finger, the appendix delivered into the wound.

4- Mesoappendix devided between ligature, the base of appendix ligated and divided.

5- Purse-string to invaginates the stump of the appendix(?????)



Laparoscopic appendicectomy

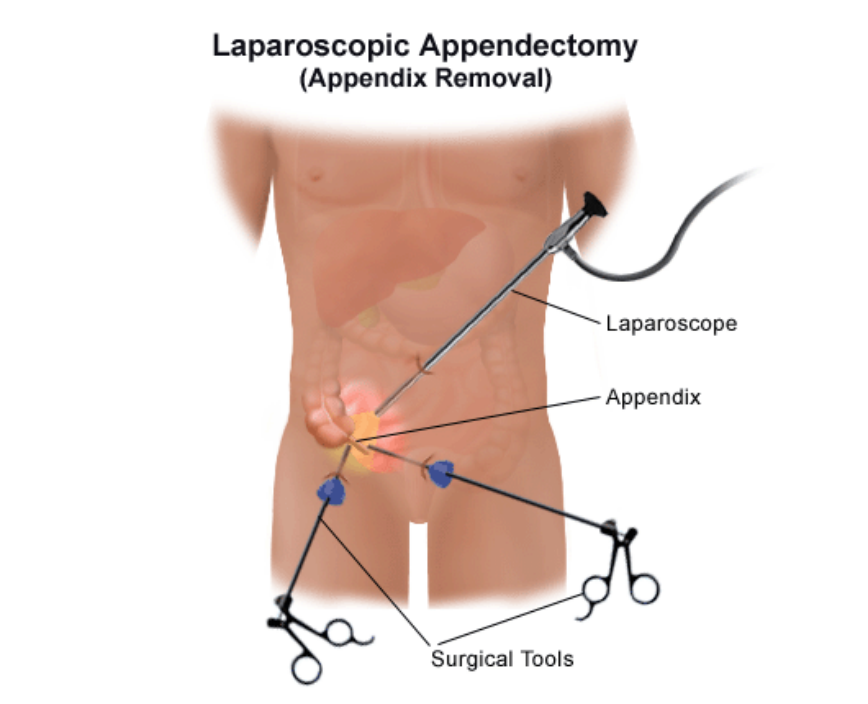
Laparoscopy is diagnostic tool(esp. in female) and therapeutic.

Used more in:

- Female (child bearing age)
- in obese patients
- early pregnancy

Advantages:

- less postoperative pain
- Early discharge from hospital
- Early return to daily activities



NOTES

Natural Orifice Transluminal Endoscopic Surgery

Problems encountered during appendicectomy

1-A normal appendix is found

- exclude other possible diagnoses, particularly terminal ileitis, Meckel's diverticulitis and tubal or ovarian causes in women.

- remove the appendix (avoid future diagnostic difficulties)

2-The appendix cannot be found.

The caecum should be mobilised, and the taeniae coli should be traced to their confluence on the caecum before the diagnosis of 'absent appendix' is made.

3-An appendicular tumour is found.

Small tumours (under 2.0 cm in diameter) can be removed by appendicectomy.

Larger: right hemicolectomy

4- An appendix abscess is found and the appendix cannot be removed easily.

Preoperatively diagnosed abscess→Percutaneous drainage of the abscess and intravenous antibiotic .

At operation→draine the abscess +intravenous antibiotics.

Frankly necrotic appendix(very rarely) → caecectomy or partial right hemicolectomy .

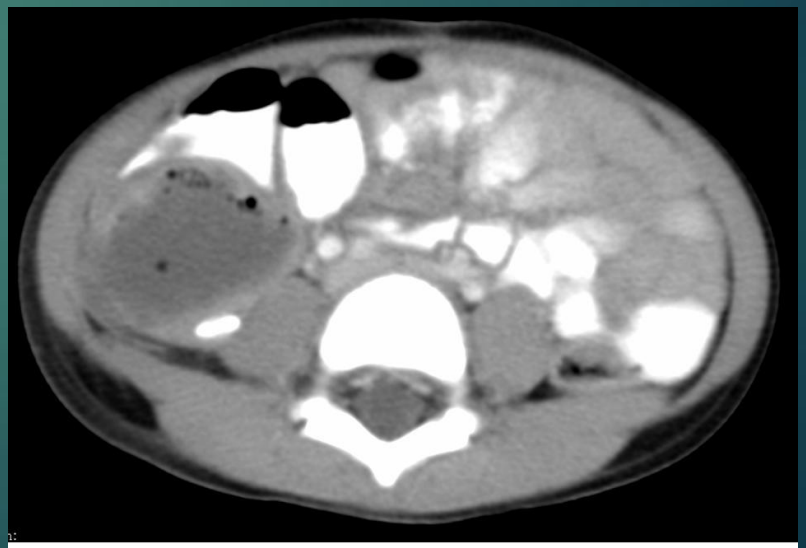
Appendix abscess

Failure of resolution of an appendix mass or continued spiking pyrexia usually indicates that there is pus within the phlegmonous appendix mass.

Treatment :

Ultrasound or abdominal CT scan percutaneous drain.

If unsuccessful → laparotomy through a midline incision is indicated.



Appendicolith

Pelvic abscess

- an occasional complication of acute appendicitis.
- Presented with **spiking pyrexia** several days after appendicitis

- **Pelvic pressure or discomfort**
- **loose stool or tenesmus** is common.
- Rectal examination → mass in the pelvis.

Pelvic ultrasound or CT scan confirm.

Treatment:

- Radiologically guided percutaneous drainage
- Transrectal drainage under general anaesthetic.

Postoperative complications

1- *Wound infection*

most common postoperative complication

usually presents with pain and erythema of the wound on the 4th or 5th postoperative day.

Treatment: wound drainage + antibiotics.

2- Intra-abdominal abscess

presented with **spiking fever**, malaise and anorexia developing **5–7 days** after operation .

Sites of collection:

Interloop, paracolic, pelvic and subphrenic

Abdominal ultrasonography and **CT scanning** diagnostic and allow percutaneous drainage.

Laparotomy in intra-abdominal sepsis without localised collection.

3- slipped ligature

internal bleeding, hypotension, tacchycardia→ reoperate

4- Ileus

Ileus persisting for more than 4 or 5 days + fever→continuing intra-abdominal sepsis →investigation.

5- Respiratory

- rare

- Adequate postoperative analgesia and physiotherapy reduce the incidence.

6- Venous thrombosis and embolism

- rare after appendicectomy

- more in elderly and in women taking the oral contraceptive pill and prophylactic measures should be considered.

7- Portal pyaemia (pylephlebitis)

- rare
- complication of gangrenous appendicitis
- high fever, rigors and jaundice.
- caused by septicaemia in the portal venous system → intrahepatic abscesses (multiple).

Treatment: systemic antibiotics + percutaneous drainage of hepatic abscesses.

screen for underlying thrombophilia

8- *Faecal fistula*

- Rare
- leakage from appendicular stump.
- More in appendicectomy in Crohn's disease.

Treatment: Conservative management with low-residue enteral nutrition.

9- Adhesive intestinal obstruction

This is the most common late complication of appendicectomy.

Management of an appendix mass

Conservative Ochsner–Sherren regimen;

A nonoperative programme but to be prepared to operate should clinical deterioration occur . This includes:

Careful recording of the patient's condition

1- Temperature and pulse rate should be recorded 4-hourly

2- Fluid balance record

3- The abdomen regularly reexamined.

4- The extent of the mass should be made (mark the limits of the mass on the abdominal wall using a skin pencil)

5- A contrast-enhanced CT examination of the abdomen

6- Antibiotic

7- An abscess, if present, should be drained radiologically.

Criteria for stopping conservative treatment of an appendix mass

_ A rising pulse rate

_ Increasing or spreading abdominal pain

_ Increasing size of the mass

Clinical deterioration or evidence of peritonitis is an indication for early laparotomy.

If the mass resolve, Patients over the age of 40 should have colonoscopy and follow-up imaging to ensure resolution and exclude appendicular or colonic malignancy.

Recurrent acute appendicitis

- not uncommon

- attacks vary in intensity and may occur every few months.

- majority of cases ends in severe acute appendicitis.

The appendix in these cases shows fibrosis indicative of previous inflammation.

Neoplasms of the appendix

1-Carcinoid tumours

- arise in argentaffin tissue (Kulchitsky cells of the crypts of Lieberkühn)
- most common in the vermiform appendix.
- appendix removed because of symptoms of subacute or recurrent appendicitis.

-frequently in the distal third of the appendix.
-moderately hard , yellow tumour
-the intact mucosa .
-Microscopically→characteristic pattern using immunohistochemical stain for chromogranin B .
-rarely gives rise to metastases.

Treatment:

- Appendectomy .
- Right hemicolectomy is indicated if:
  - caecal wall involvement .
  - 2 or more in size.
  - Involved lymph nodes.

2- Goblet cell carcinoid tumour

3- Primary adenocarcinoma of the appendix

extremely rare, presented as appendicitis

treated by right hemicolectomy

Mucinous cystadenoma

- A mucin-secreting adenoma of the appendix

- rupture into the peritoneal cavity , seeding it with mucussecreting cells.
- delayed presentation with gross abdominal distension as a result of pseudomyxoma peritoneii, which may mimic ascites .

Treatment

radical resection of all involved parietal peritoneal

surfaces and aggressive intraperitoneal chemotherapy.

Thank you