CHAPTER OVERVIEW - RIGHT ILIAC FOSSA

This is one of the most common acute presentations and you main differentials should be appendicitis, Gynaecology emergencies and Ureteric colic.

Once again, look at the groin for inguinal and femoral hernias and always dip the urine for beta-HCG in a female of child-bearing age. Often, its just Mittelschmerz (German for middle pain) but you need to prove it's not an ectopic.

CLICKABLE Calculators

SOFA - Sequential Organ Failure Assessment score

AIR - Appendicitis Inflammatory response score

CDAI - Crohn's disease Activity Index

RIF pain +/-

1. Nausea/Vomiting + Anorexia – Think **Appendicitis**
2. Female of childbearing age – Think **Gynecological emergencies**
3. Tender groin swelling – Think **Hernia (Obstructed/strangulated)**
4. L.U.T.S – Think **Urological emergencies**
5. Prolonged history/malnutrition – Think **Inflammatory bowel disease**

Examination:
General + Abdominal
(+ hernial orifices)

Relevant Findings:
- Percussion Tenderness = Peritonism
- Tender, Non reducible hernia +/- Skin changes
- Palpable mass

Observations/NEWS
(**q-SOFA** sepsis criteria)

Q-SOFA Sepsis Criteria
- ❑ SBP < 100 mmHg
- ❑ GCS < 15
- ❑ RR > 22/minute

If 2/3 of the above present = SEPSIS

Investigations:
1. **Bloods**: FBC, U&E, LFT, Coagulation screen, G&S
2. **Urine Dip + Beta HCG**
3. **Radiology:** AXR

1. Peritonism +/- Sepsis (2/3 present) OR
2. Irreducible hernia +/- Obstruction

YES - Urgent senior advice

1. NBM + Strict Input/output charting
2. IV Fluids (see NICE guidelines)
3. Regular Paracetamol + Opiate and PRN Morphine + Antiemetic
4. IV Antibiotics if septic/ deranged inflammatory markers*
5. Stop Anticoagulants if bleeding/Abnormal Coag
6. Follow AKI bundle if AKI**

While awaiting senior review – DO THIS..

NO - Review on ward round

1. Orally Sips only
2. AKI - IV fluids + medication review **
3. Regular Paracetamol + Opiate and PRN Morphine + Antiemetic
4. VTE Prophylaxis
5. Pelvic USS (Female of childbearing age)

* Refer to trust guidelines for choice of antibiotics
** Refer to trust AKI guidelines

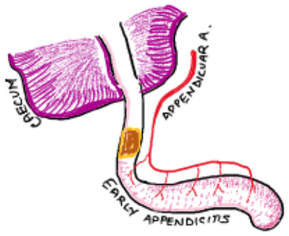
Fluid Guidelines

AKI Guidelines

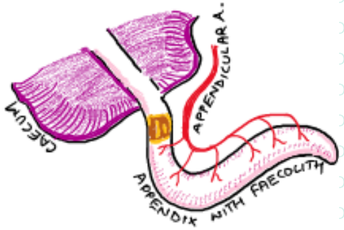
ACUTE APPENDICITIS

Illustration: Pathophysiology of appendicitis.

- **Luminal obstruction:**
Obstruction, commonly from a faecolith is often the initiating point.



- **Dilatation**:
Increased luminal secretion leads to further dilatation which may present as early appendicitis with mild inflammation



- **Acute Inflammation:**
Progressive dilatation along with bacterial translocation will further present as a Turgid appendix impending perforation.

- **Gangrenous appendix with perforation:**
Ultimately, gangrene will result with perforation and localised collection or purulent peritonitis.

Images: Left - CT AP showing Acute appendicitis on transverse section and **Right -** Coronal section

Causes of Obstruction -

1. Luminal obstruction
- Faecolith (solidified faecal matter) - Most common
- Intra-luminal infection causing inflammation
- Caecal malignancy

2. External compression - lymphoid hyperplasia

Presentation -

1. Common presentation -
- <48hr Central --> RIF pain + N,V + Fever (Murphy's triad) +/- Anorexia
- >96hr RIF pain +/- mass in RIF

2. Uncommon presentation - based on position of appendix
- Diarrhoea/ Blood on urine dip

Examination - Tender RIF + McBurneys peritonism + S.I.R.S

Investigation of choice - Diagnosis is usually based on clinical suspicion.
- CT AP + I.V contrast (Adults), MRI (Pregnant women) and AUSS (In children) can be considered where diagnosis is uncertain.
- In women, Pelvic USS is done to rule out ovarian pathologies (For example - Tubo-Ovarian abscesses)

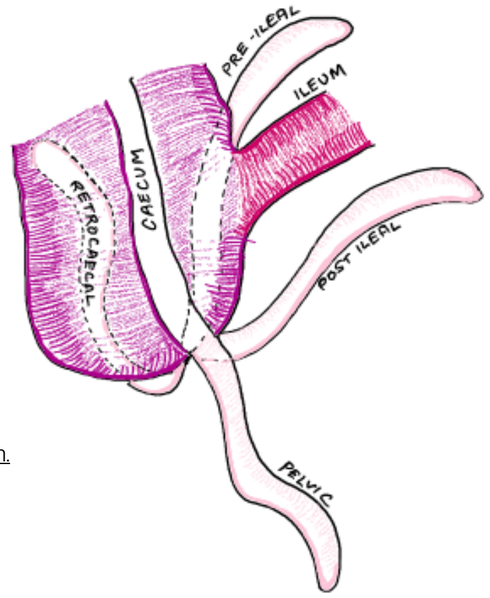


Illustration: Different positions of the appendix.

Differential diagnoses -

1. Meckels' Diverticulitis
2. Ileo-caecal crohns
3. Pyelonephritis (Remember urine dip)
4. Mesenteric adenitis (Children)

Complications - Mainly local

1. Perforation
2. Abscess formation (Peri-appendiceal/pelvic)

Management of Acute Appendicitis -

Calculate Appendicitis inflammatory response score **(AIR)**

AIR SCORE

1. **Simple** appendicitis -
- I.V Antibiotics + Laparoscopic/Open Appendicectomy
- Conservative management with IV Antibiotics (Risk of recurrence 39%)

2. **Complicated** appendicitis - Perforation/abscess formation
- I.V Antibiotics
- Laparoscopic/Open appendicectomy
- IR drainage

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AN INTERESTING CASE

CROHN'S DISEASE

Mostly managed by gastroenterologists but referred to surgery if obstructed due to stricture, fistulating disease or perianal Crohn's with uncontrolled sepsis.

Chronic, transmural inflammatory disease of the GI tract involving any part from the oral cavity till the anal margin. Caused by a complex interplay of genetic and environmental factors.

Precipitating causes -

- Infectious agents(M. paratuberculosis, E coli)
- Immunologic factors(cytokines, IL, TNF)
- Diet - high in refined foods.
- Smoking
- Genetic factors(first degree relative with CD)

Presentation - Depends on location

- Intermittent abdominal pain + diarrhoea + Weight loss
- Recurrent perianal abscesses/fistulas or skin tags
- Obstructive symptoms - Nausea + vomiting + abdominal distension

Examination -

1. General examination
- Weight loss/Cachexia
- Pallor/clubbing/ preipheral oedema

2. Abdominal examination
- Tender RIF +/- Peritonism (Most common)
- Entero-cutaneous fistulae

3. Peri-anal examination
- Abscesses
- Fistula formation
- Skin tags

Investigation of choice -

1. CT A.P with I.V contrast (Obstructing/active disease) - Usually done in emergency setting
2. CT A.P + I.V & Oral contrast (For fistulating disease)
3. Colonoscopy + Biopsy (Definitive diagnosis of Colonic/Ileo-caecal Crohns)
4. MRI enteroclysis/Capsule endoscopy - Small bowel disease

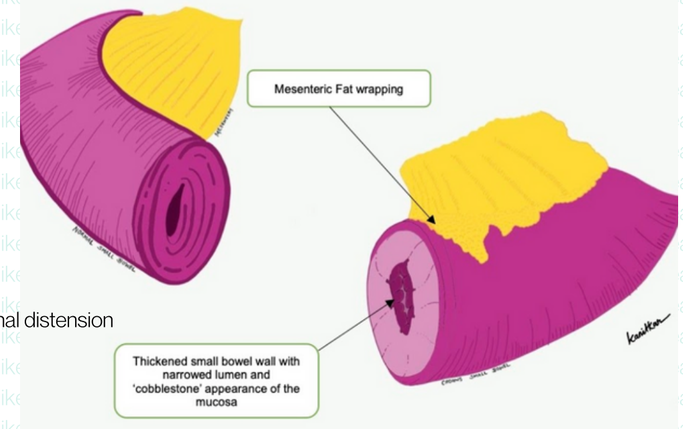

Illustration: CROHNs disease changes (Courtesy of Armandoh Hasudungan - https://armandoh.org/)

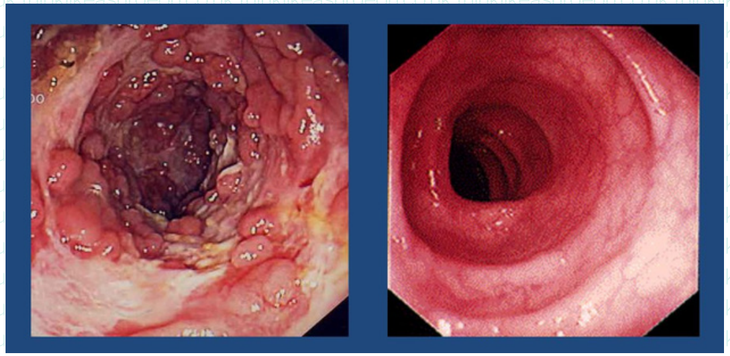

Image : Endoscopy findings -**Left -** CROHNS disease and **Right -** Normal colon

Complications -

1. **Ileo-caecal crohn's**
- Small bowel obstruction (Inflammation or stricture)
- Perforation

2. **Colonic Crohn's**
- Large bowel obstruction (Inflammation or stricture)
- Colo-vesical/colo-vaginal/colo-enteric fistula

3. **Small bowel Crohn's**
- Small bowel obstruction
- Perforation
- Entero-cutaneous fistula

4. **Perianal Crohn's**
- Recurrent perianal sepsis due to fistulae

Management of Crohn's flare up: Needs MDT input with primary treatment with medical management. For refractory cases, Surgical intervention is warranted.

1. **Terminal ileal Crohn's**
- Oral sips + dietician review (If fasting >96hrs)
- Gastroenterology review - Steroids +/- I.V Antibiotics
- Refractory stricture or obstruction - resection and anastomosis/ resection and temporary end ileostomy

2. **Perianal sepsis**
- EUA +/- I&D of abscess
- Refractory/Recurrent sepsis - Defunctioning colostomy

3. **Colonic disease**
- Steroid (I.V/oral/enema) and immunomodulators
- Antibiotics if septic
- Refractory to medical management - colectomy (extent guided by disease)

4. **Fistulating disease**
- SSNAPS ---------->
- Refractory - Defunctioning colostomy

SEPSIS control
I.V Antibiotics + Drainage
Skin care
Wound management/tissue viability nurses
Nutrition
Dietician review +/- TPN
Anatomy
Imaging to identify the anatomy
Plan
Definitive plan of action

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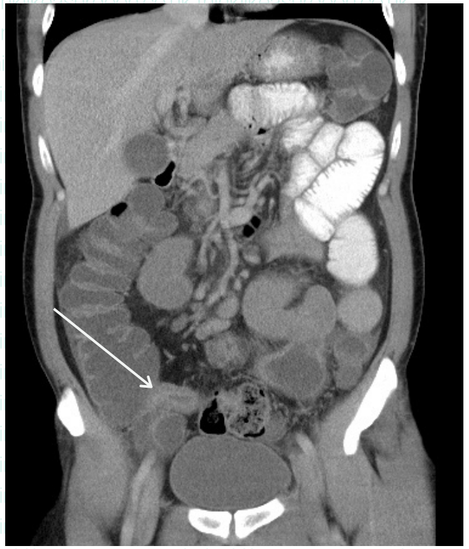

Image: **Above -** CT AP coronal view showing Ileocaecal crohn's causing S.B.O (Case courtesy of Dr Andrew Dixon, Radiopaedia.org, rID 17062)
Below - Abdominal radiograph with featureless colon in Crohn's Colitis (Case courtesy of Dr Chris O'Donnell, Radiopaedia.org, rID 27725)

GROIN HERNIAS

Inguinal hernias can be caused due to a patent processus vaginalis (Indirect) or weakness in the transversalis fascia (Direct). A femoral hernia is caused due to protrusion of intra-abdominal organs through the femoral canal.

Depending on the content of the sac and dimensions of the hernial neck, Hernias can:

- **Obstruct** - Causing upstream dilatation. Key finding on imaging - Collapsed distal limb and dilated proximal limb
- **Strangulate -** Usually follows on from an obstruction that leads to dialatation and subsequent venous and arterial cut off. As a result, Ischaemia and necrosis follow.

Approach to examining any hernia -

1. **Inspection**
   - Location
   - Size
   - Skin changes
2. **Palpation**
   - Tenderness
   - Cough impulse (Ask the patient to cough, if the hernia increases in size, it - increased risk of obstruction/strangulation)
   - Reducible or Irreducible
3. **Auscultation** - To assess contents

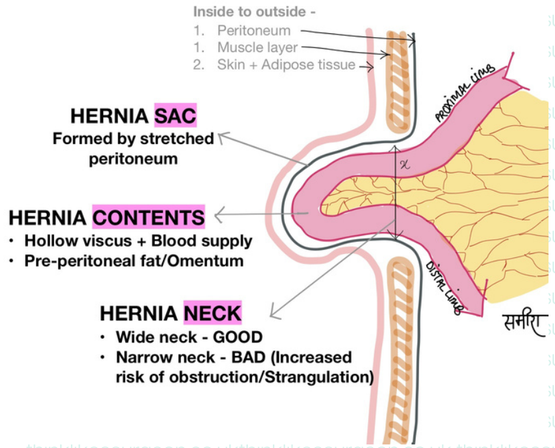

Illustration: Key features of a hernia - sac, content and neck

Type of HERNIA	GROIN HERNIAS	
	INGUINAL Most common ~70%	**FEMORAL** 6% of all groin hernias
Risk factors	• Defective collagen synthesis • Factors causing raised intra-abdominal pressures	• Females (70%)
Presentation	1. Pain 2. Obstruction	50% - Emergencies 1. Pain 2. Obstruction
Examination	ABOVE & MEDIAL to pubic tubercle	BELOW & LATERAL to pubic tubercle
Risk of obstruction/ strangulation	Narrow neck – High risk	Narrow neck – High risk
Investigation of choice	Ultrasound Groin CT AP + I.V contrast	CT AP + I.V contrast
Radiology		
Image credits	Right inguinal hernia - Case courtesy of Assoc Prof Frank Gaillard, Radiopaedia.org, rID 9323	S.B.O due to femoral hernia - Case courtesy of Dr Haji Mohammed Nazir, Radiopaedia.org, rID 79368

Table - Information taken from The British Hernia Centre - https://www.hernia.org/types/

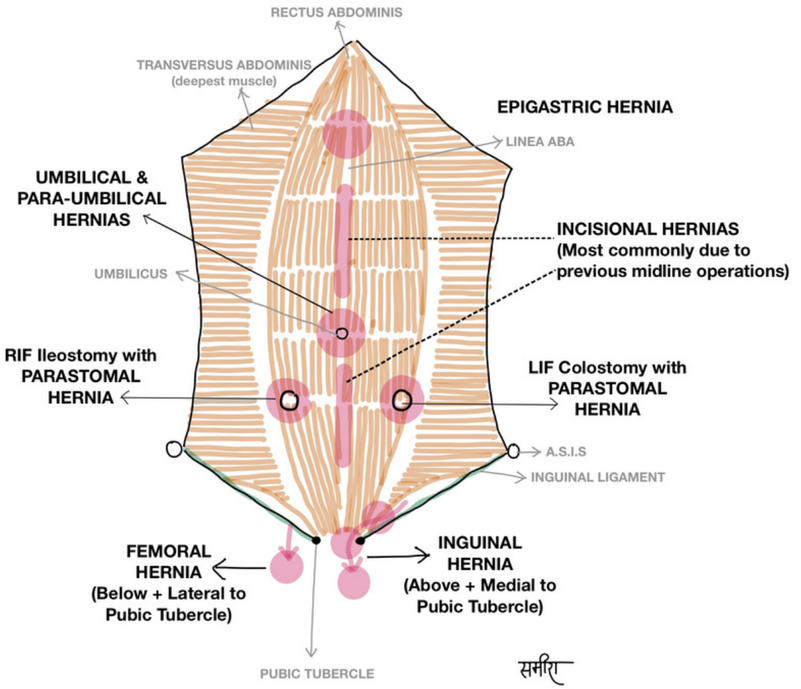

Illustration: SIX types of hernias you should familiarize yourself with. This diagram is an over simplification.

Management of hernias -

Asymptomatic and reducible hernias can be managed conservatively. Femoral hernias are commonly symptomatic. Mesh repair is the preferred method.

1. **Inguinal hernia**
   - Open/Laparoscopic mesh repair
   - Conservative management -TRUS for support
2. **Femoral hernia**
   - Open mesh repair (Low, inguinal or high approach)
   - Sutured repair if gangrenous bowel

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UROLOGICAL EMERGENCIES

UROLITHIASIS -

Symptomatology of urinary tract stones depends on their location, size and associated infection.
Risk factors associated are:

1. General factors
- Childhood onset of stone formation
- Family history
- Solitary kidney (Stone recurrence PREVENTION is key)

2. Stone forming diseases
- Hyperparathyroidism

3. Genetic conditions
4. Drug induced stone formation
5. Anatomical and environmental risks

Presentation - Flank pain, Loin to groin pain

Investigation of choice -

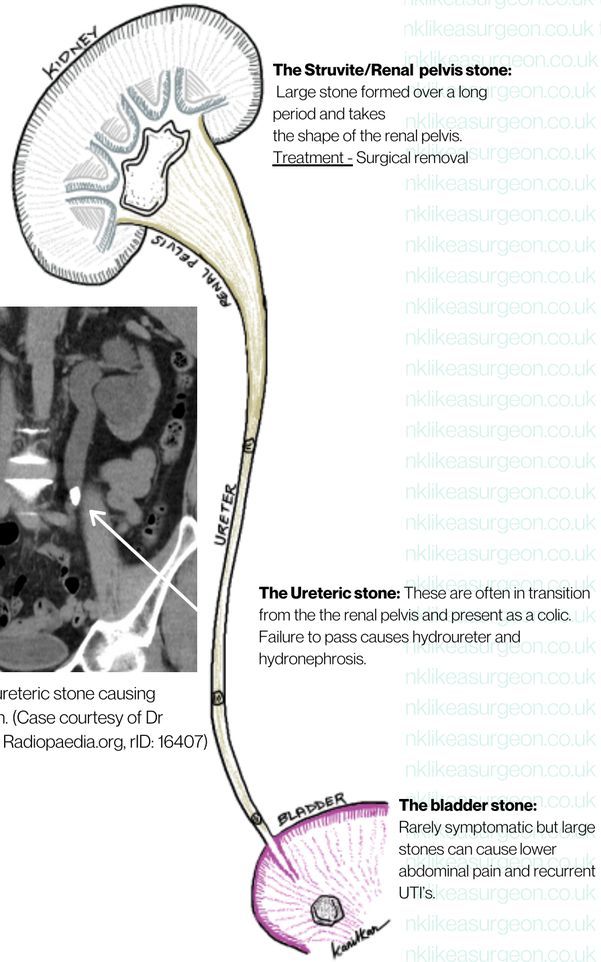
- Ultrasound KUB
- CT KUB (Non-contrast)
- Bloods - FBC, U&E, Electrolytes (Ca, Mg & PO4), Uric acid, CRP, Coagulation
- Urine dip + Culture (ALWAYS)
- Intravenous Urogram (IVU) if anatomy needs to be assessed for surgery

Management -

1. **Renal colic**
- Analgesia - NSAIDs
- If analgesic refractory - Renal decompressions or ureteroscopic stone removal
- If infected, obstructed kidney- Antibiotics and renal decompression

2. **Ureteric stones**
- Analgesia - NSAIDs
- If infected, obstructed kidney- Antibiotics and renal decompression
- Small stone - observe and review
- Stone removal - URS (Ureterorenoscopy) > SWL (Shock wave lithotripsy)

3. **Preventative measures**
- Fluid intake (2.5-3L/day)
- Nutritional advice - balanced diet
- Weight loss (aim normal BMI)



The Struvite/Renal pelvis stone: Large stone formed over a long period and takes the shape of the renal pelvis.
Treatment - Surgical removal

Image: Distal left ureteric stone causing upstream dilatation. (Case courtesy of Dr Roberto Schubert, Radiopaedia.org, rID: 16407)

The Ureteric stone: These are often in transition from the the renal pelvis and present as a colic. Failure to pass causes hydroureter and hydronephrosis.

The bladder stone: Rarely symptomatic but large stones can cause lower abdominal pain and recurrent UTI's.

Illustration: Different levels and types of stones with their presentation

PYELONEPHRITIS -

Uncomplicated - pyelonephritis in non pregnant, non-menopausal women

- **Investigation** - Urine analysis, urine culture & sensitivities and routine bloods
- **Management** - Intravenous or oral antibiotics (Based on trust formulary)

Complicated - Infection that is difficult to eradicate.

- **Risk factors** - Host factors (Diabetes or immunosuppression) or due to abnormal anatomy or function of the urinary tract (obstruction)
- **Investigation** - Urine analysis, urine culture & sensitivities and routine bloods. Consider CT KUB to look for obstruction/abscess formation
- **Management** - Intravenous or oral antibiotics (based on trust formulary) and management of urological abnormality/decompression if obstructed

Associated with urosepsis (Defined as a life threatening organ dysfunction caused by a dysregulated host response to infection from the urinary tract and/or male genital organs)

- Quick SOFA score + sepsis 6 investigation
- **Investigation** - Urine cultures & sensitivities and CT KUB to look for obstruction/abscess formation
- **Management** - Intravenous antibiotics + source control (removal of stone/ decompression/ drainage of abscess

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GYNAECOLOGICAL EMERGENCIES

ECTOPIC PREGNANCY -

An ectopic pregnancy is when a fertilised egg implants itself outside of the uterus, usually in one of the fallopian tubes. Incidence is 2-3%. A Heterotopic pregnancy is where there is a viable intra-uterine pregnancy and an ectopic pregnancy.

Presentation -

- Asymptomatic
- Missed period
- Lower abdominal pain + fresh vaginal bleeding

A ruptured extopic pregnancy can lead to catastrophic intra-abdominal bleeding and haemorrhagic shock

Investigations -

1. Serum beta-HCG
2. Transvaginal ultrasound
3. MRI can be considered for equivocal diagnoses

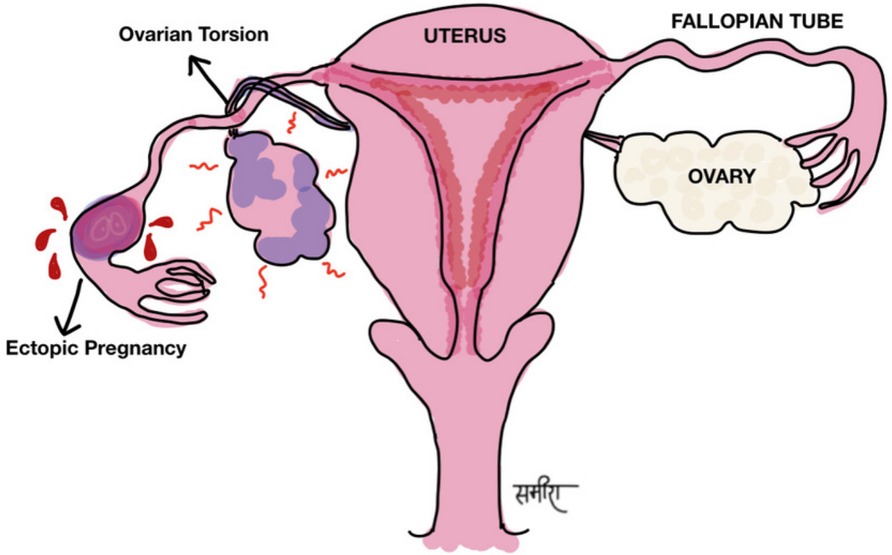
Management -

1. **Surgical management - Laparoscopic**

- Healthy contralateral tube - SalpingECTOMY
- History of fertility reducing factors - SalpingOTOMY

2. **Medical management - Systemic methotrexate**

- Cervical pregnancy
- Confirmed tubal pregnancy without intra-uterine pregnancy



Normal female reproductive anatomy and Emergencies

Illustration: Female reproductive tract and associated major emergencies

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OVARIAN TORSION -

A twisting of the ovary and/or fallopian tube on its vascular and ligamentous supports, blocking blood flow to the ovary. It is a surgical emergency.

Presentation - Clinically, can have variable presentation. Abdominal pain is the most common symptom.

Investigations -

1. Serum beta-HCG
2. Transvaginal ultrasound with doppler flow

Management -

1. **Surgical detorsion via laparosopcy/laparotomy**

- Non-viable ovary after detorsion - Salpingo-OophorECTOMY
- Viable after detorsion - Oophoropexy

2. **Adjunct treatments**

- Oophoropexy
- Cystectomy for ovarian cysts (possibility of future cystic torsion)

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- **Radiology Masterclass** – A high-quality, world-class educational service providing free access to radiological tutorials. They also offer courses that cover the undergraduate imaging curriculum as specified by the Royal College of Radiologists. We have linked to a few of their courses throughout our book. If you want to further your radiological skills or get a certificate (for your portfolio) and CPD points, be sure to explore their website https://www.radiologymasterclass.co.uk/