

ACUTE APPENDICITIS

LIFETIME RISK OF DEVELOPING ACUTE APPENDICITIS IS 12% FOR MALES AND 25% FOR FEMALES

IT REMAINS THE MOST COMMON AETIOLOGY OF ATRAUMATIC ABDOMINAL PAIN IN CHILDREN >1 YEAR OLD

PATHOPHYSIOLOGY:

- Caused by luminal obstruction of the vermiform appendix, typically by a FAECALITH (or less common by lymphatic tissue, gallstone, tumour or parasites)
 - Continued secretion results in ↑d intraluminal pressure and appendiceal vascular insufficiency
 - Leads ultimately to bacterial proliferation and inflammation and if unchecked → PERFORATION
- Visceral innervation produces the vague, hard to localise periumbilical or central abdominal discomfort frequently observed early in the course of the disease
- Progressive local inflammation and subsequent irritation of the somatically innervated parietal peritoneum produces classical MIGRATION of pain to the RLQ to McBurney point (1/3 the distance along a line traced superomedially from the ASIS to the umbilicus)
- As many as 1/3 have ATYPICAL PRESENTATION → anatomic variation is one reason
 - Retrocaecal appendix can cause right flank or pelvis pain
 - Malrotation can cause LUQ pain
 - Displacement by gravid uterus → RUQ pain

CLINICAL FEATURES:

- Signs and symptoms lie along a spectrum
- Early → non-specific symptoms of general malaise, indigestion or bowel irregularity. Anorexia not uncommon. N+V, typically follows onset of pain
- Flank pain, haematuria or dysuria can occur with proximity of the appendix to the urinary tract
- Patients will often say that the CAR RIDE TO HOSPITAL WAS PAINFUL, especially going over bumps in the road → suggests a peritoneal process
- Release of intraluminal obstruction with perforation often results in sudden remittance of pain
- Progressive inflammation and peritoneal irritation results in reproducible tenderness to palpation in the RLQ
- SPECIFIC SIGNS:
 - ROVSINGS → palpation of LLQ worsens RLQ pain
 - PSOAS SIGN → abdominal pain is produced with EXTENSION of the right leg at the hip while the patient lies on the left side
 - OBTURATOR SIGN → pain with internal and external rotation of the thigh at the hip

- Prior episodes of similar pain, absence of RLQ pain and absence of classic pain migration make appendicitis less likely
- See below for sensitivity and specificity of various examination findings

Table 84-1 Summary of Clinical Examination Operating Characteristics for Appendicitis*

Procedure	Sensitivity	Specificity	LR+* (95% CI)	LR-† (95% CI)
Right lower quadrant pain	0.81	0.53	7.31-8.46 [‡]	0-0.28 [‡]
Rigidity	0.27	0.83	3.76 (2.96-4.78)	0.82 (0.79-0.85)
Migration	0.64	0.82	3.18 (2.41-4.21)	0.50 (0.42-0.59)
Pain before vomiting [#]	1.00	0.64	2.76 (1.94-3.94)	NA
Psoas sign	0.16	0.95	2.38 (1.21-4.67)	0.90 (0.83-0.98)
Fever	0.67	0.79	1.94 (1.63-2.32)	0.58 (0.51-0.67)
Rebound tenderness test	0.63	0.69	1.10-6.30 [‡]	0-0.86 [‡]
Guarding	0.74	0.57	1.65-1.78 [‡]	0-0.54 [‡]
No similar pain previously	0.81	0.41	1.50 (1.36-1.66)	0.323 (0.246-0.424)
Rectal tenderness	0.41	0.77	0.83-5.34 [‡]	0.36-1.15 [‡]
Anorexia	0.68	0.36	1.27 (1.16-1.38)	0.64 (0.54-0.75)
Nausea	0.58	0.37	0.69-1.20 [‡]	0.70-0.84 [‡]
Vomiting	0.51	0.45	0.92 (0.82-1.04)	1.12 (0.95-1.33)

DIAGNOSIS:

- Largely remains a clinical diagnosis and no one adjunctive test is universally indicated
- ALVARADO SCORE HAS BEEN DEVELOPED TO AID IN DIAGNOSIS, but should not be used as the sole method of diagnosis

Alvarado score for appendicitis	
Symptoms	Score
Migratory right iliac fossa pain	1
Nausea / Vomiting	1
Anorexia	1
Signs	
Tenderness in right iliac fossa	2
Rebound tenderness in right iliac fossa	1
Elevated temperature	1
Laboratory findings	
Leucocytosis	2
Shift to the left of neutrophils	1
Total	10

5-6 → Possible

7-8 → Probable

> 9 → Very probable

- The clinical impression of the experience physician has the highest impact on patient outcome
- As ever, there are numerous mimic and the differential diagnosis is broad (see below):

Table 84-2 Differential Diagnosis of Right Lower Quadrant Pain
GI
Cecal/Meckel diverticulitis
Cecal volvulus
Colitis/terminal ileitis
Constipation/ileus/bowel obstruction
Crohn/ulcerative colitis flair
Functional abdominal pain
Incarcerated inguinal hernia
Intra-abdominal abscess
Intussusception
Malrotation
Mesenteric lymphadenitis
GU
Ectopic/heterotopic pregnancy
Ovarian torsion
Ovarian vein thrombosis
Pyelonephritis
Referred testicular pain
Renal colic
Tubo-ovarian abscess/salpingitis
Musculoskeletal
Abdominal wall/rectus sheath hematoma
Psoas abscess

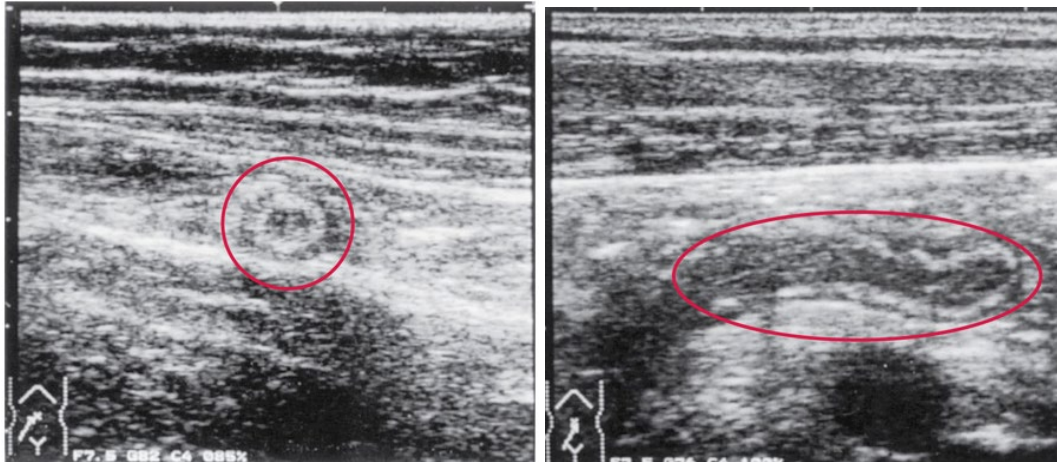
LABORATORY TESTING:

- MILD LEUKOCYTOSIS WITH LEFT SHIFT is common BUT NOT UNIVERSAL and a normal WCC is not uncommon
 - Elevated WCC and/or CRP have a combined sensitivity of as high as 98%, and normal values of BOTH MAKE PATHOLOGICALLY CONFIRMED APPENDICITIS VERY UNLIKELY

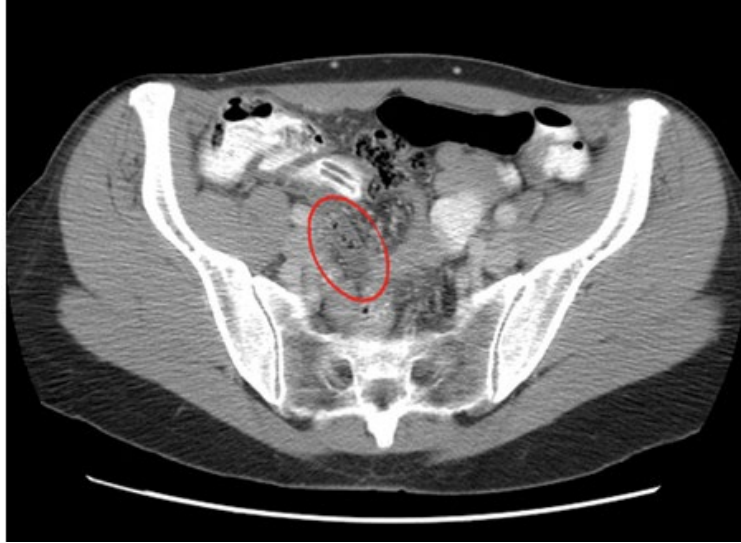
- Pyuria may support pyelonephritis and isolated haematuria may support renal colic, but both can be present in acute appendicitis

IMAGING:

- **EARLY SURGICAL CONSULTATION** should be obtained before imaging in straightforward cases of suspected appendicitis
- The goal of any imaging study should be to establish a prompt diagnosis and to avoid negative appendicectomy or perforation
 - In addition, it can identify alternate causes of abdominal pain, particularly in patients with equivocal presentations
- **GRADED COMPRESSION SONOGRAPHY** should be the initial imaging modality of choice in both pregnant females and children
 - Appendix is characterised by absence of peristalsis, oval in axial plane, ends blindly in longitudinal plane
 - Typical findings in appendicitis → thickened, noncompressible appendix >6mm in diameter
 - **HIGHLY OPERATOR DEPENDENT**



- **CT SCANNING:**
 - In most adult males and nonpregnant females in whom the diagnosis is NOT SUFFICIENTLY CLEAR, CT is the test of choice
 - Overall sensitivity is 96% and 96% PPV (compared to US, which has sensitivity of 86% and 95% PPV)
 - Women derive the greatest benefit from pre-operative imaging
 - Findings are of dilated appendix >6mm, thickened wall, stranding of periappendiceal inflammation, appendicolith or abscess



Acute
appendicitis as
evidenced by
dilated and
inflamed
appendix

- MRI → continues to evolve. Beware, gadolinium crosses the placenta and has teratogenic effects in animal studies. Hence should be avoided in pregnancy

TREATMENT:

- Typically these patients require appendectomy, so immediate surgical consultation is needed
- Appropriate fluid resuscitation, analgesia, antiemetics
- Perioperative antibiotics should be given once the diagnosis has been made or if the patient exhibits signs of peritonitis
- Appropriate choices should include broad coverage of aerobic and anaerobic gram-negative organisms → triple antibiotics typically
- Some are trialling nonoperative management of uncomplicated acute appendicitis, but this is not yet considered the accepted standard of care
- If the diagnosis is not clear, prolonged observation in the ED or hospital with serial examinations
 - Discharge may be considered stable, nontoxic patients with adequate pain control who are able to tolerate oral hydration
 - RE-EVALUATE IN 12 HOURS TIMES

SPECIAL POPULATIONS:

- Elderly patients are likely to have preexisting comorbidities that alter their presentation, management and outcomes
 - More vague complaints are typical including diffuse pain, fever or alteration in mental state
- Pregnant women warrant special attention and appendicitis is the most common surgical emergency in pregnant patients with delay in diagnosis being the greatest cause of increased morbidity (consider ovarian torsion and ectopic pregnancy as alternate diagnoses)