



### INTRODUCTION

Acute appendicitis is the most common surgical emergency of the abdomen. The goal of therapy is early diagnosis and prompt operative intervention. However, the diagnosis can be difficult, especially in patients less than 3 years of age, pregnant, and older than age 60 years. In the younger and older age groups the diagnosis is often delayed, leading to perforation rates as high as 80 percent. The diagnosis can be challenging in pregnant women, especially in the second and third trimesters due to the displacement of the appendix by the uterus and the resulting changes in the physical examination.

### INCIDENCE

Appendicitis occurs most frequently in the second and third decades of life. The incidence is highest in the 10 to 20 year old age group, in which it is about 233/100,000 population. It is also more common in males.

### ANATOMY

The vermiform appendix is located near the ileocaecal valve where the taenia coli converge on the caecum. The appendix is true diverticulum of the cecum as its wall contains all of the layers of the colonic wall.

It is supplied by the appendicular artery, terminal branch of the ileocolic artery (branch of the SMA), which traverses the length of the mesoappendix and terminates at the tip of the appendix

The attachment of the appendix to the base of the cecum is constant. However the tip may migrate to the retrocaecal, subcecal, preileal, postileal and pelvic positions. These normal anatomic variations can complicate the diagnosis as the site of

pain and findings on the clinical examination will reflect the anatomical position of the appendix.

### PATHOGENESIS

The natural history of appendicitis is similar to that of other inflammatory processes involving hollow visceral organs. Initial inflammation of the appendiceal wall is followed by localized ischemia, perforation, and the development of a contained abscess or generalized peritonitis.

Obstruction of the lumen has been proposed as the primary cause of appendicitis. Obstruction is frequently implicated but not always required for the development of appendicitis.

Appendiceal obstruction may be caused by faecoliths (hard faecal masses), calculi, lymphoid hyperplasia, infectious processes, and benign or malignant tumors.

Obstruction leads to increase in luminal and intramural pressure, resulting in thrombosis and occlusion of the small vessels in the appendiceal wall, and stasis of lymphatic flow. As the appendix becomes engorged, the visceral afferent nerve fibers entering the spinal cord at T8-T10 are stimulated, leading to vague central or periumbilical abdominal pain. Well-localized pain occurs later in the course when inflammation involves the adjacent parietal peritoneum.

Once significant inflammation and necrosis occur, the appendix perforates, leading to localized abscess formation or diffuse peritonitis.

### PRESENTATION

The clinical presentation of acute appendicitis is described as a constellation of "classic" signs and symptoms:

- Right lower quadrant (right iliac fossa) abdominal pain
- Anorexia
- Nausea and vomiting

Abdominal pain is the first symptom, it is peri-umbilical in nature with subsequent migration to the right lower quadrant as the inflammation progresses. Nausea and vomiting follow the onset of pain. Fever and leukocytosis follow later in the course of illness. Low grade fever may be present and high fever may be a sign of a perforated appendix.

Other conditions to be considered in the differential diagnosis include urinary tract infection, renal calculi, gastroenteritis, and ruptured ovarian cyst mid cycle pain, pelvic inflammatory disease, cholecystitis, diverticulitis and small bowel obstruction.

Clinical signs include localized tenderness, rebound tenderness, guarding and generalized peritonitis in case of perforation

### Signs on physical examination

Sign	Description
Rovsing's sign	Palpation of the left lower quadrant eliciting pain in the right lower quadrant
Obturator sign	Pain with internal rotation of the hip (pelvic appendix)
Iliopsoas sign	Extension of the right hip eliciting pain in the right hip (retrocecal appendix)

### INVESTIGATIONS

Most patients with appendicitis have a preoperative leukocytosis and a left shift in the differential. Urinalysis is

done to rule out a urinary tract infection or renal colic and pregnancy test should be performed on all women of childbearing age.

### Imaging Studies

In general a patient with history and physical examination strongly suggestive of appendicitis should undergo appendectomy without further imaging studies. If presentation of acute appendicitis is not typical and diagnosis is unclear then imaging is required.

Abdominal x-rays in patients with appendicitis is non-specific and adds little value but may demonstrate a faecolith, loss of the psoas shadow on the right and a sentinel loop of small bowel in the right lower quadrant.

Ultrasound is useful for excluding pelvic pathology in women. Features suggestive of appendicitis include a thickened wall >2 mm, increased appendiceal diameter >6 mm, and free fluid.

CT scan findings include thick wall >2 mm, increased diameter of the appendix >7 mm, an appendicolith, phlegmon or abscess and free fluid.

### MANAGEMENT

- Hospital admission
- IV fluids and analgesia as required (Opiates do not mask peritonism)
- If confident diagnosis prepare for appendectomy, if still in doubt "active observation" or investigate further
- Diagnostic laparoscopy should be considered especially in young female.

Appendectomy can be done open or laparoscopic, laparoscopic appendectomy has been associated with less postoperative pain, shorter hospital stay, decreased wound infection rate, but requires longer

operative time, more expensive and associated with increased incidence of intra-abdominal collections.

### **APPENDICULAR MASS**

patients present with a longer duration of symptoms (more than five days) and have findings localized to the right lower quadrant and often have a palpable mass on physical examination, should be treated initially with antibiotics, intravenous fluids and bowel rest, many of these patients will respond to non-operative management since the appendiceal process has already been "walled-off".

### **APPENDICULAR ABSCESS**

CT or ultrasound guided percutaneous drainage is the treatment of choice.

### **NORMAL APPENDIX**

If a normal appendix is encountered intra operatively, it is important to remove the appendix to avoid possible confusion about future abdominal pain, and to look for other conditions such as terminal ileitis, Meckel's diverticulitis, mesenteric adenitis, cholecystitis, colonic diverticulitis, and pathology of the pelvic organs in females.

### **SPECIAL CONSIDERATIONS**

#### **Children**

Children with acute appendicitis often have associated diarrhea and may not have symptoms of anorexia. In neonates and infants, the differential diagnoses include midgut volvulus, pyloric stenosis, Meckel's diverticulitis, and intussusception.

#### **Elderly**

Appendicitis in the elderly is not uncommon; the estimated incidence in patients older than 65 years of age is approximately 1 in 2000. Elderly patients may not give detailed history, and the acute abdomen may present with few or minimal subtle signs. CT

scan is particularly helpful in this setting (Beware of caecal cancer)

### **Pregnancy**

The incidence of acute appendicitis is estimated at 0.1% of all deliveries, and it occurs with equal frequency during all three trimesters. As the uterus enlarges, the appendix is pushed more cephalad, making the location of tenderness typically in the right upper quadrant or right flank.

### **Immunocompromised Patients**

May show only mild tenderness on examination, normal WCC on investigation and have broad differential diagnosis, including mycobacterial infection, cytomegalovirus and fungal infections.



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