

APPENDICITIS

Definition

Appendicitis is the **acute inflammation of the vermiform appendix**. It is an important surgical condition that should be easily recognized and treated in the majority of cases.

Epidemiology

- Appendicitis occurs in **10% of the population** most commonly **between the ages of 10 to 30 years**.
- It is the most common abdominal surgical emergency.
- Incidence of appendicitis has declined over the last 30 years.
- The **male to female ratio is 3:2 until the mid 20s** and then **equals after age 30 years**.
- The diagnosis of acute appendicitis can be difficult.
- Delays in diagnosis complicate the illness.
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Aetiology

- The history of appendicitis is similar to that of other inflammatory processes involving hollow visceral organs.
- **Initial inflammation of the appendiceal wall is followed by:**
 - o **Localised ischaemia**
 - o **Perforation**
 - o **Development of a contained abscess or generalised peritonitis**
- The **appendiceal obstruction** can be caused by:
 - o **Faecoliths (hard faecal masses)**
 - o **Calculi**
 - o **Lymphoid hyperplasia**
 - o **Infectious process**
 - o **Benign or malignant tumours**
- The obstruction leads to an **increase in luminal pressure, resulting in thrombosis and occlusion of small vessels in the appendiceal wall and stasis of lymphatic flow.**
 - o **Once obstructed, the lumen becomes filled with mucous and distends increasing intraluminal and intramural pressure.**
 - This results in thrombosis and occlusion of the small vessels and stasis of lymphatic flow.
- As lymphatic and vascular compromise progresses, **the wall of the appendix becomes ischaemic and then necrotic.**
- As the appendix becomes engorged, the **visceral afferent nerve fibres entering the spinal cord at T8-- T10 are stimulated** and this leads to the **vague central or periumbilical abdominal pain.**
- Well-localised pain occurs later in the course of the disease when the inflammation involves the adjacent parietal peritoneum.

Clinical Features

- The history typically begins with **central abdominal pain of a visceral type- ill localised and usually around the umbilicus.**
 - o The pain may be accompanied by a **variable amount of anorexia, nausea** and one or more episodes of **vomiting.**

- As the organ becomes inflamed, **local peritoneal irritation causes the parietal pain felt in the right iliac fossa.**
- Occasionally the progression is so rapid that these symptoms are largely absent or unrecognised by the patient who may present with the diffuse abdominal pain of generalised peritonitis.
- Other valuable features of the history are:
 - **Previous similar attacks**- suggestive of **recurrent appendicitis**
 - More **frequent vomiting if the appendix is retroileal**
 - Variable urinary symptoms
 - **Frequency and dysuria** because of an inflamed appendix close to the **right ureter or bladder**
 - **Mucous diarrhoea** because of the **formation of an appendix mass in the pelvis, which irritates the wall of the rectum or sigmoid colon.**
- **Physical Findings**
 - **Abdomen**
 - Local tenderness and guarding at **McBurney's point**- the **junction of the middle and outer thirds of the imaginary line joining the umbilicus to the right anterior superior iliac spine.**
 - This is present when the appendix is in its most common position, medial to the caecum.
 - These signs vary and are very much reduced in retroileal and particularly retrocaecal appendicitis.
 - They may be absent if the organ is in the pelvis.
 - It is often said that **pressure applied in the left iliac fossa causes increased pain in the right lower quadrant (Rovsing's sign)**, but this is unreliable and is not recommended as a diagnostic sign.
 - **Pelvis**
 - Pelvic examination is especially useful when the inflamed appendix is in the pelvis.
 - Rectal examination is usually sufficient, but in women, where pelvic inflammatory disease and other gynaecological causes are possible, a vaginal examination is usually also done.

Differential Diagnoses

- **Intestinal**
 - Regional caecal enteritis
 - Incarcerated hernia
 - Caecal diverticulitis
 - Intestinal obstruction
 - Perforated ulcer
 - Perforated caecum
 - Meckel's diverticulitis
- **Reproductive**
 - Ectopic pregnancy
 - Ovarian cyst
 - Torsion of an ovarian cyst
 - Salpingitis
 - Tubo-ovarian abscess
 - Mittelschmerz
 - Endometriosis
 - Seminal vesiculitis
- **Renal**

- Renal and ureteral calculi
- Neoplasms
- Pyelonephritis
- **Vascular**
 - Leaking aortic aneurysm
- **Psoas abscess**
- **Trauma**
- **Cholecystitis**

Mesenteric adenitis

Investigations

- **Laboratory Tests**
 - A full blood count with differential reveals **leucocytosis with a left shift in 90% of patients with appendicitis.**
 - Total WBC count is generally lower than 20 000/mm³.
 - **Higher counts may be indicative of perforation.**
 - Less than 4% have a normal WBC and differential.
 - **A WBC <10 000/mm³ decreases the likelihood of appendicitis.**
 - Microscopic haematuria and pyuria may occur in <20% of patients.
- **Imaging Studies**
 - **CT of the abdomen/pelvis**
 - Distended appendix, periappendiceal inflammation, and a thickened appendiceal wall are indicative of appendicitis.
 - **Ultrasonography**
 - Ultrasound is useful, especially in pregnancy and in younger women when diagnosis is unclear.
 - Normal ultrasonographic findings should not deter surgery if the history and physical examination are indicative of appendicitis.

Management

- **Initial Resuscitation**
 - **Fluid Resuscitation**
 - Patients are normally kept **nil by mouth** until a decision for theatre is undertaken.
 - Meanwhile, **appropriate fluids should be administered to replace losses** in dehydrated patients and for maintenance therapy.
 - **Antibiotics**
 - Antibiotic therapy **reduces post-operative infection, the development of intra-abdominal abscesses and length of hospital stay.**
 - Intravenous antibiotics should be administered routinely.
 - Cefuroxime and metronidazole are popular choices.
- **Surgical Management**
 - Following the diagnosis, the patient should be taken to theatre as soon as possible
 - Intravenous antibiotics are generally given at the induction of anaesthesia and may be continued post-operatively in cases of perforation.
 - **Appendectomy**
 - The operation is usually performed through a **Lanz incision in the right iliac fossa** using a muscle-splitting (“grid-iron”) approach.
 - The **caecum is found and inflamed appendix is delivered into the wound**

and excised.

- Laparoscopic appendectomy is a technique that is gaining popularity.
- Although wound infection is decreased by half, intra-abdominal abscesses increase by a factor of 2.7.
- Return to normal activities was 6 days faster than with conventional surgery.

- **Medical Management**

- Conservative management is **reserved for patient who present late with an appendix mass.**
 - **Intravenous fluids, antibiotic therapy and regular clinical observations are undertaken.**
 - However, if the patient's clinical situation deteriorates rapidly, urgent surgery will be required.
- Radiographic drainage of an abscess is an option for patients with poor operative risk and an interval appendectomy may be performed a few months later.

Risks of Surgery

- **General Risks**

- **Infection** can occur requiring antibiotics and further treatment.
- **Bleeding** can occur and may require a return to theatre.
 - Bleeding is more common in patients who are taking blood thinning medication such as:
 - Warfarin
 - Aspirin
 - Clopidogrel (Plavix or Isocover)
 - Dipyridamole (Persantin or Asasantin)
- **Small areas of lung can collapse, increasing the risk of chest infection.** This may need antibiotics and physiotherapy.
- **Heart attack or stroke** could occur due to the strain on the heart.
- **Blood clot in the leg (DVT) causing pain and swelling.** In rare cases part of the clot may break off and go to the lungs.
- **Death** as a result of this procedure is possible.

- **Specific Risks**

- **Deep bleeding in the abdominal cavity.** This may need fluid replacement or further surgery.
- **Infections such as pus collections can occur in the abdominal cavity.** This may need surgical drainage.
- **A weakness can occur in the wound** with the development of a rupture. This may need further drainage.
- The **wound may become thickened and red.**
- **Adhesions** (bands of scar tissue) may form and cause **bowel obstruction.** This can be a short term or a long-term complication and need further surgery.
- **Increased risk in smokers of wound and chest infections, heart and lung complications and thrombosis.**

SMALL BOWEL OBSTRUCTION

Definition

Mechanical small bowel obstruction is one of the most common surgical emergencies and refers to the **complete or partial blockage of the small bowel** resulting in **failure of intestinal contents to pass through the lumen**.

The result is a combination of **emesis** (that may be billous), **obstipation** and **abdominal pain**.

Epidemiology

- The incidence of small bowel obstruction varies between 0.1% and 5% in patients who have not undergone previous surgery.
- However, it may rise to over 60% in patients who have undergone previous surgery.
- In patients with Crohn's disease, the incidence may be upwards of 25%.
- In children, 1 in 5000 cases are reported at birth and 0.5% in the first 2 years of life.
- This is a major cause of morbidity and mortality and it is universally fatal in untreated patients due to its progression to intestinal necrosis, perforation, sepsis and multisystem organ failure.

Aetiology

- The most common causes of small bowel obstruction are:
 - **Post-surgical adhesions**
 - **Hernias**
 - Ventral
 - Inguinal
 - Femoral
 - **Neoplasms**
 - Malignant
 - Primary
 - Metastatic
 - Benign
- Other recognised causes include **strictures** caused by either **Crohn's disease or ischaemia, radiation enteritis, intussusception, volvulus, gallstone ileus, bezoar and superior mesenteric artery syndrome**.
- Small bowel obstruction leads to **rapid accumulation of fluid and gas in the bowel proximal to the site of the obstruction** causing **dilatation**.
- In typical cases, there is initial active peristalsis proximal to the obstruction.
- Oedema and increasing distension supervene.
- Stasis and bacterial overgrowth make the fluid faeculent.
 - Appearance of faeculent fluid with a foul odour in the vomitus or from a nasogastric tube confirms the diagnosis of obstruction.

Clinical Features

- Classic presentations of small bowel obstruction include:
 - **Crampy abdominal pain**
 - **Nausea and vomiting**
 - **Abdominal distension**

- **Constipation**
- Patients with small bowel obstruction are likely to **present early** (within a day) **with pain and vomiting**.
 - Abdominal distension and constipation are less likely.
- Patients with **distal obstruction** frequently have a more **prolonged symptom complex with a 2-3 day history of crampy abdominal pain prior to vomiting**. **Distension and constipation are predominant features**.
- The **bowel sounds** are initially **hyperactive** and **high pitched**.
 - In delayed presentation, the bowel sounds may be reduced, indicating onset of secondary ileus.
- The symptom complex tends to vary with the underlying aetiology.
 - Small bowel obstruction due to hernia tends to present early and more acutely with a tense and irreducible external hernia.
 - Small bowel obstruction associated with a neoplasm is more indolent.
 - That due to adhesions is intermediate in presentation.
- It is also important to determine whether there is a **palpable abdominal mass**, which may be suggestive of an underlying **malignancy as the cause of the small bowel obstruction**.
- Similarly, a **palpable rectal mass** on rectal examination along with blood may suggest the presence of a **rectal tumour**.

Differential Diagnoses

- **Ileus**
 - Less crampy abdominal pain
 - In association with other cause (e.g. postoperative, systemic infection, medications)
 - CT scan shows passage of contrast throughout the bowel and rectum
- **Infectious Gastroenteritis**
 - Vomiting typically non-billous
 - X-ray shows gas throughout the abdomen
 - Stool cultures may be positive for viruses or bacteria
- **Large Bowel Obstruction**
 - Very distended abdomen
 - Constipation progressing to obstipation
 - X-ray a very dilated colon
- **Intestinal Pseudo-Obstruction**
 - Chronic condition
 - Constipation
 - Often associated with administration of neurological medications
 - X-ray and CT shows gas throughout abdomen
 - Massively dilated intestine.
- **Appendicitis**
 - Pain in the right lower quadrant with nausea
 - Vomiting (non-billous)
 - Ultrasound and CT may confirm diagnosis in most cases
- **Pancreatitis**
 - Steady pain in the upper abdomen
 - Non-billous vomiting
 - Back pain
 - Increased amylase
 - CT scan shows inflamed pancreas

Investigations

- **Abdominal X-rays**
 - Upright and supine x-rays of the abdomen help to determine whether the patient has a **complete or partial obstruction** and whether the **obstruction is simple or complicated**.
 - The abdominal x-ray may show **air fluid levels, dilated intestinal loops, absence of gas in the rectum** (in complete small bowel obstruction) and **pneumoperitoneum**.
 - *Partial Small Bowel Obstruction*
 - Gas throughout the abdomen and into the rectum
 - *Complete Small Bowel Obstruction*
 - No distal gas
 - Staggered air-fluid levels
 - *Complicated Small Bowel Obstruction*
 - Free air under the diaphragm suggestive of perforation
 - Thumb printing of the bowel suggestive of ischaemia

- **FBC**
 - May indicate **potential severe intestinal obstruction with necrosis**.
 - May indicate **blood loss into obstructed bowel**, a potential signs of intestinal necrosis.
 - Anaemia may also suggest a malignant cause.
 - *Increased WBC*
 - *Rarely decreased RBC*

- **Urea and Electrolytes**
 - Increase in urea shows **severity of dehydration/renal failure** in complicated small bowel obstruction.
 - *Increased in the setting of volume depletion*
 - Electrolyte imbalance is consistent with **dehydration**
 - *Hyponatraemia*
 - *Hypokalaemia*
 - *Metabolic alkalosis*

- **Abdominal CT Scan**
 - Helps to determine diagnosis of underlying cause, and extent and location of the obstruction when x-rays are inconclusive.
 - **Should only be performed in cases in which peritonitis is not present**.
 - May visualise transition zone, mass, tumour or appendicitis.

Management

- **Non-Operative Management**
 - **Fluid Resuscitation**
 - Placement of **intravenous lines** and administration of **large volumes of intravenous fluid** is indicated in all patients.
 - A **Foley Catheter** should be placed to monitor urine output.
 - **Bowel Decompression**
 - In cases of partial or complete SBO, the placement of a **nasogastric tube** is indicated to **decompress air/fluid in the upper GI tract**.
 - Surgical consultation is recommended at this stage.
 - **Antiemesis**

- Although patients with small bowel obstruction may have severe nausea, **anti-emetics are generally not administered** as they do not provide significant relief.
 - The most effective anti-emetic strategy is nasogastric decompression
 - **Analgesia**
 - It is essential to provide adequate analgesia to patients with complete or partial obstruction.
 - This can be readily accomplished with **morphine**.
 - **Antibiotics**
 - **Antibiotic prophylaxis** may be indicated **if surgery is needed**.
- The administration of intravenous fluids and passage of a nasogastric tube will result in the correction of partial small bowel obstruction in approximately one-third to one-half of cases.
- Rarely, will a complete small bowel obstruction respond to non-operative therapy and for this reason, **surgery is generally indicated, except in cases of Crohn's disease or radiation enteritis** where nasogastric decompression alone may be beneficial.
- **Operative Management**
- In **adhesive obstruction**, surgery is indicated where there are **concerns of intestinal ischaemia or the patient fails to improve after a short period of non-operative treatment**.
 - Pre-operative preparations include:
 - Adequate fluid and electrolyte replacement
 - Prophylaxis with broad spectrum antibiotics covering aerobes and anaerobes
 - Anti-thrombotic prophylaxis with compressive stockings and subcutaneous heparin
 - The nature of the obstruction determines the type and extent of the surgery.
 - Exploratory laparotomy should be performed in patients with complete small bowel obstruction, in all cases in which there is documented peritonitis or evidence of strangulation and in patients who do not respond to non-operative treatment as manifest by persistent abdominal pain, leucocytosis, worsening air-fluid levels on abdominal x-ray.
 - The object of the surgery is to find the junction of the dilated and collapsed small bowel.