

abdominal emergency in children

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Abdominal Pain in Children

- The **most common presentation of abdominal emergency is Pain**
- Types of the abdominal pain may be (visceral) or (somatic).
- In general Pain can be caused by : spasm , distension, peritoneal inflammation, irritation , ischemia or malignant infiltration .
- Newly born children express pain by screaming or crying attacks , However older Children express pain by speech or body language .
- **The cardinal symptoms** in abdominal emergency are : pain (lasting 3-4 h) ,vomiting(**persistent vomiting** should raise the possibility of **bowel obstruction**) and diarrhea (may suggest pelvic lesion if last 24 hr) .

abdominal pain in children

Obstructive

Acquired

Intussusceptions

Adhesions

Strangulated hernia

Congenital

Complicated
meckels
diverticulum

Volvulus

Non Obstructive

Systemic

Septicemia

DM

Sickle cells crises

Uremia

Heart failure

Infectious

Acute appendicitis

Mesentric
lymphadenitis

Obstructive cause

Obstructed Inguinal Hernia

- A loop of small bowel becomes trapped in the hernial sac.
- The obstruction in the sac is almost always at the level of the external ring
- Obstructed hernias are usually seen in infant under six months of age.
- Clinically:
 - The infant cries intensely.
 - No impulse on crying.
 - Swelling and bulge in the groin.
 - Hernia is tense, extremely tender, irreducible.
 - Progressing to generalize abdominal pain, vomiting and abdominal distension.
 - Intestinal obstruction established later.

Strangulated Inguinal Hernia

(Fever , Sudden pain that quickly intensifies , A hernia bulge that turns red, purple or dark)

- Effects

- The testicular vessels can be severely compressed by tense hernia. 15% of baby develop some degree of atrophy.
- bowel obstruction and strangulation, progress to gangrene and perforation.
- In girls the ovary can be trapped and strangulate.

- **incarcerated** means a hernia has become acutely irreducible (it becomes painful, tender)
- **strangulated** implies there is also impairment of the blood supply to the hernia contents.



On exploration shows the strangulated loop of bowel & black testis



Strangulated Inguinal Hernia

U/S for strangulated hernia shows entrapped bowel loops

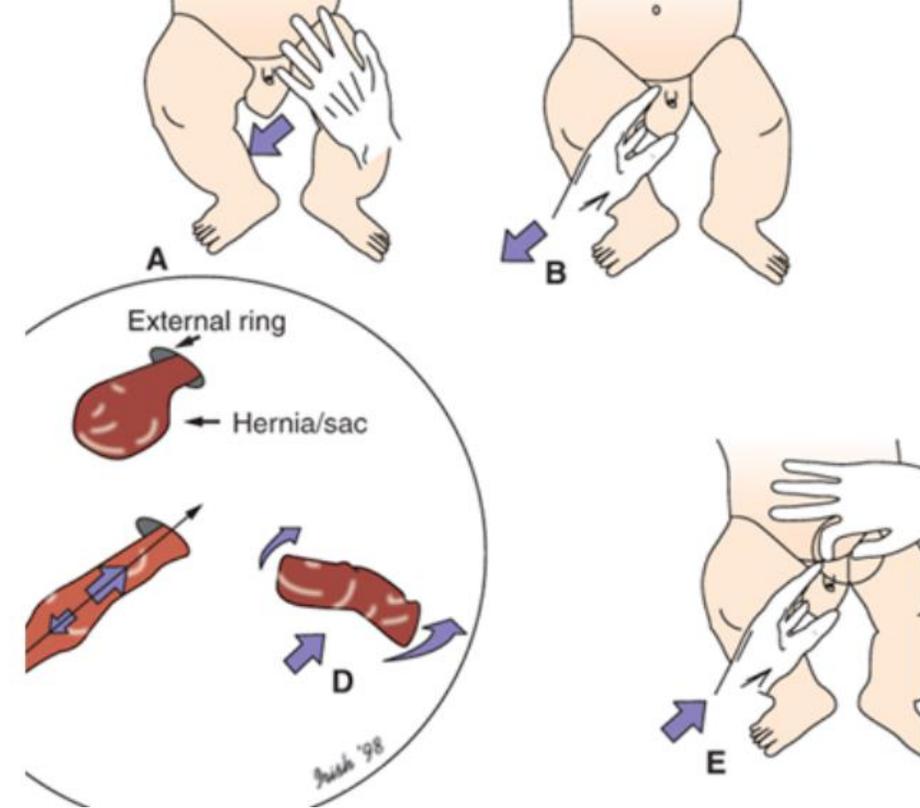
treatment of inguinal hernia

incarcerated hernia :

- reduction of the obstructed hernia by " Taxis"
- taxis is manual reduction
- contraindication in strangulation hernia
- technique :
 - patient in supine position in (trendelenburg position)
 - give iv analgesia /sedation
 - surrounding the external(superficial)inguinal ring with the fingers of one hand loosely, while gently pushing the fundus of the hernia inside with the fingers of the other hand.
 - if successful : a gurgle or sudden release may be felt
 - post op :observation for 2-4 h (for return to normal bowel sound and no abdominal tenderness
 - if the pt remain stable --> can be discharge with plain for elective hernia repair

strangulation hernia :

- herniotomy



INTUSSUSCEPTION

- Definition:

1. Invagination of proximal portion of the intestine into an adjacent distal segment.

*80-90% of intussusceptions occur in children between 3 months and 2 years of age

- Compression of the mesenteric vessels cause a strangulation and it may progress to gangrene and perforation.
- All intussusception consist of:
 - Inner intussusceptum; proximal portion of the intestine
 - Outer intussusceptiens; distal portion of the intestine



■ Causes:

1. Primary (unknown);

1-Weaning theory (i.e, Weaning may lead to a change in the bowel flora, which produce edematous payer's patches).

2- Viral infection theory (i.e, Infection may lead to produce edematous, hyperplastic payer's patches).

2. Secondary;

- I. Meckel's diverticulum or Mucosal polyps
- II. Enteric duplication cyst or Submucosal cyst
- III. Underlying Bowel malignancy (as a lymphoma)

■ Presentation:

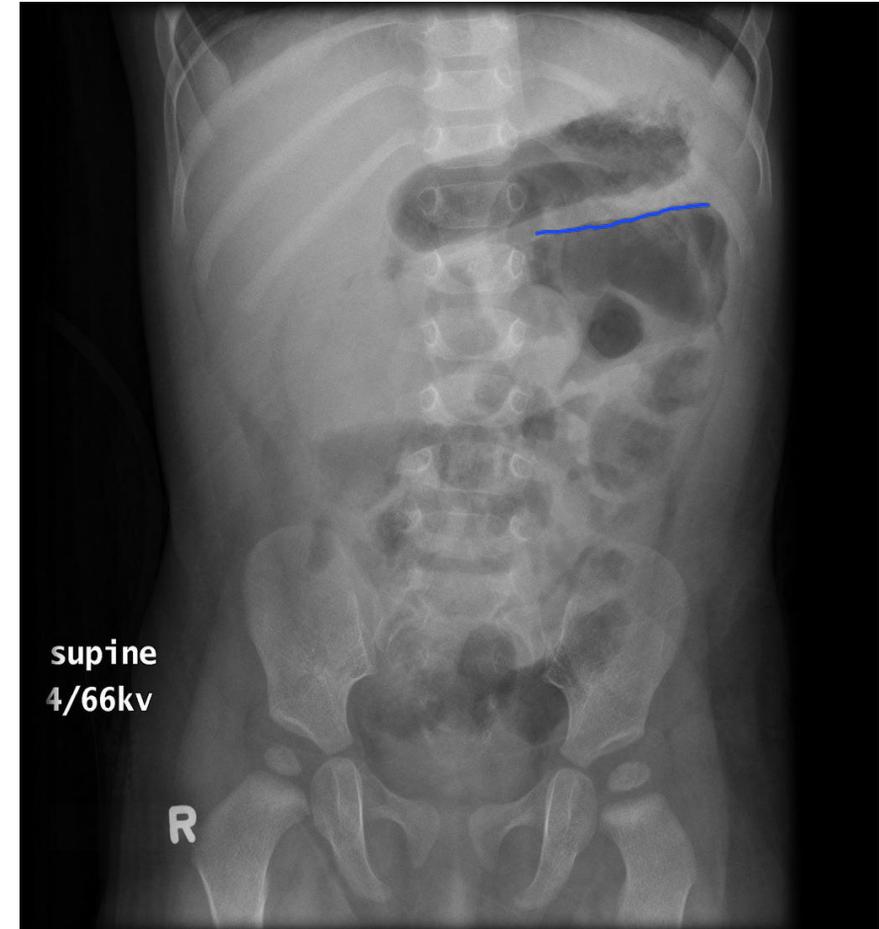
1. Distressing colicky pain lasting for 2-3 min, vomiting.
2. Pass a redcurrant jelly stool (bloody-mucoid stool)
3. Palpable **sausage-like** mass any where around umbilicus
4. Rectal examination reveal blood or feeling the apex

■ Diagnosis:

1. Plain X-ray (signs of small bowel obstruction and soft tissue opacity)
2. Barium enema (**meniscus, coiled spring sign or claw sign**)
3. U/S (a **kidney-like mass or a target sign**)

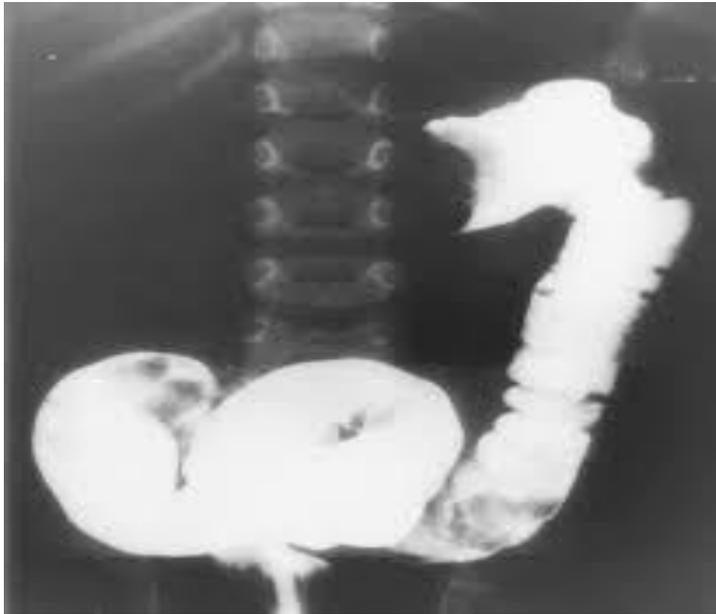
diagnosis

- **1. plain X-Ray**
- **Abdominal x-rays show signs of :**
 - A. Small bowel obstruction (air fluid level and bowel dilation)**
 - B. Soft tissue opacity.**



diagnosis

- **2- contrast barium enema :**



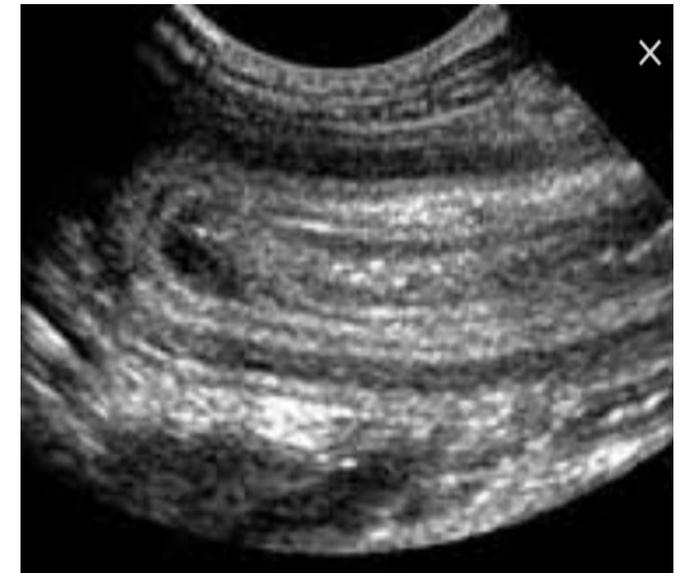
- Crescent or meniscus sign



- Coiled spring sign

diagnosis

- **3-ultrasoud:**
- Saggital scan :kidney like mass
- Transverse scan : target sign



■ management:

IV access, rehydration, Insertion of a nasogastric tube and intestinal decompression are recommended before reduction is attempted.

1. **Non-operative reduction** via hydrostatic reduction or pneumatic reduction

Reduction monitored by fluoroscopy

Using a barium enema or air to controlled pressure

Successful reduction can be accepted only if.:

1. Free reflux of barium or air into the small bowel.
2. Resolution of the symptoms and signs.
3. Disappearance of the abdominal mass by clinical examination and by ultrasound evaluation.

Contraindication in case with; sign of perforation, peritonitis, presence of shock or known pathological lead point.

2. **Surgical operation**

Indications; if non-operative reduction is contraindication, unsuccessful non-operative reduction, if a pathological lead point is suspected, in case of recurrence after reduction

Age > 6 years , Duration of symptoms > 24 hours..

RESECTION AND ANASTOMOSIS

1. Non-viability of the segment.
2. Irreducible intussusception.
3. Presence of a pathological lead point.

70% of intussusception can be reduced non-operatively.

RECURRENT INTUSSUSCEPTION
OCCURS IN UP TO 10 % OF CASES
AFTER NON-OPER REDUCTION.

Hypertrophic pyloric stenosis

- **Definition:**

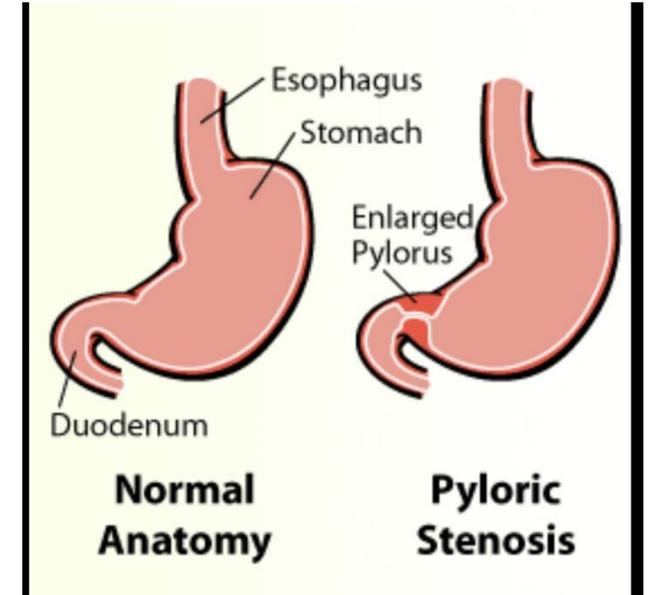
hypertrophy of the muscular layers of the pylorus, which cause a functional gastric outlet obstruction, The antral region is elongated and thickened to as much as twice its normal size.

- **Causes:**

1. unknown

- **Presentation:**

1. Projectile non-bilious vomiting.
2. Hunger pain (that appear as Crying with Restlessness).
3. Dehydration.
4. Metabolic alterations (hypochloremic hypokalemic metabolic alkalosis).
5. Failure to thrive and Loss of weight.
6. Visible peristaltic waves (Lt to Rt).
7. Palpable mass “olive-like mass” in the epigastrium.

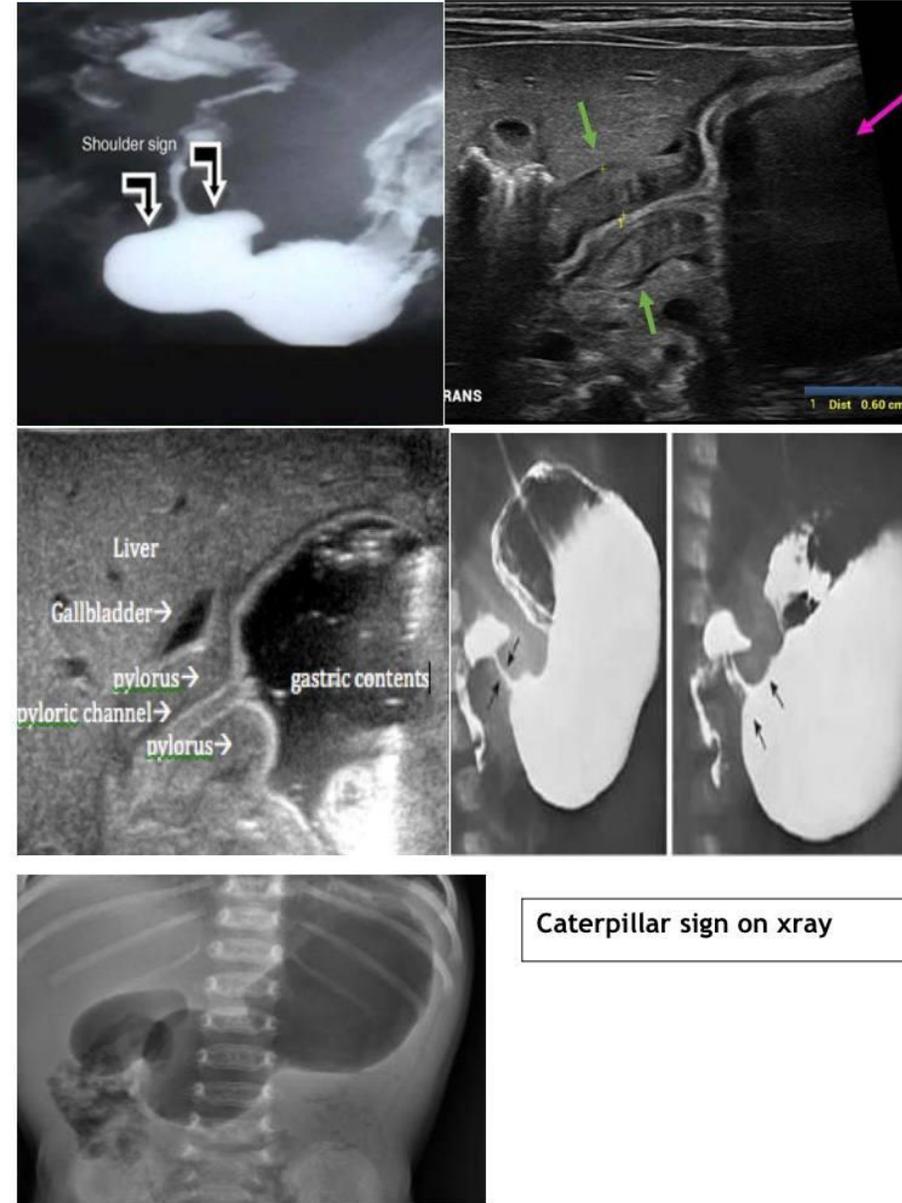


■ **Diagnosis:**

1. **U/S** (canal length > 16mm and the wall thickness > 4mm).
2. **Feeding test** (palpable mass during feeding).
3. **Barium meal** (shoulder sign, “double track” sign).
4. **Xr** (caterpillar sign).

DDx

1. Overfeeding.
2. Gastric-outlet obstruction.
3. GERD.
4. Intracranial condition (Cerebral birth injuries, Meningitis).
5. Septicemia (Infection) .
6. Malrotation(anular pancreas) .



■ Treatment:

1. Fluid and electrolytes correction

2. Dehydration correction

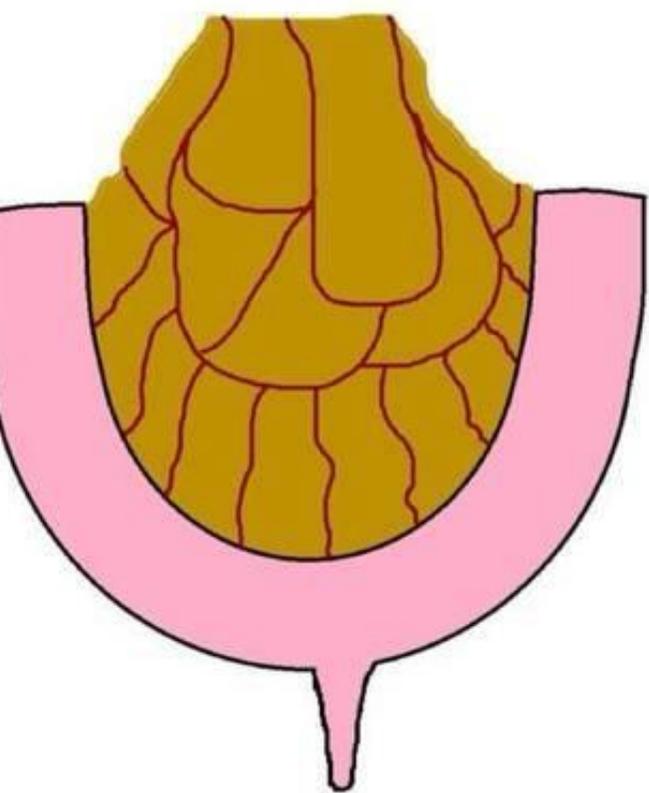
3. Surgery via Pyloromyotomy
(Ramstedt's operation)



Meckle's diverticulum

- * It is true diverticulum contains all intestinal layers.
- * Omphalomesenteric (vitelline) duct connects the primitive gut to the yolk sac.
- * Failed regression of the vitelline duct results in various pathological anomalies such as :
 - * Meckel`s diverticulum.
 - * Umbilical polyps.
 - * Umbilical fistula.
 - * Umbilical sinus.
 - * Umbilical cyst.
 - * Persistent fibrous band.

the rule of 2 in meckel's diverticulum



Rule of 2's:

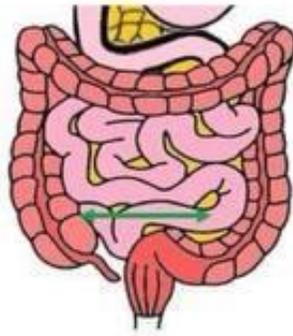
2% of the population



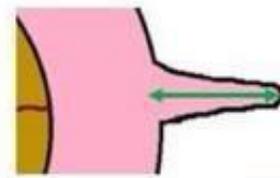
M:F ratio 2:1



2 feet from the ileocecal valve



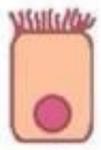
2 inches in length



2% develop complications
(50% before age 2)



2 types of heterotopic mucosa



gastric



pancreatic

- **Congenital anomalies commonly associated with meckel's diverticulum are:**

- Cardiac anomalies
- Congenital diaphragmatic hernia
- Duodenal atresia
- Esophageal atresia
- Imperforate anus
- Gastroschisis /Omphalocele
- Malrotation
- Hirschsprung's disease
- Down's syndrome

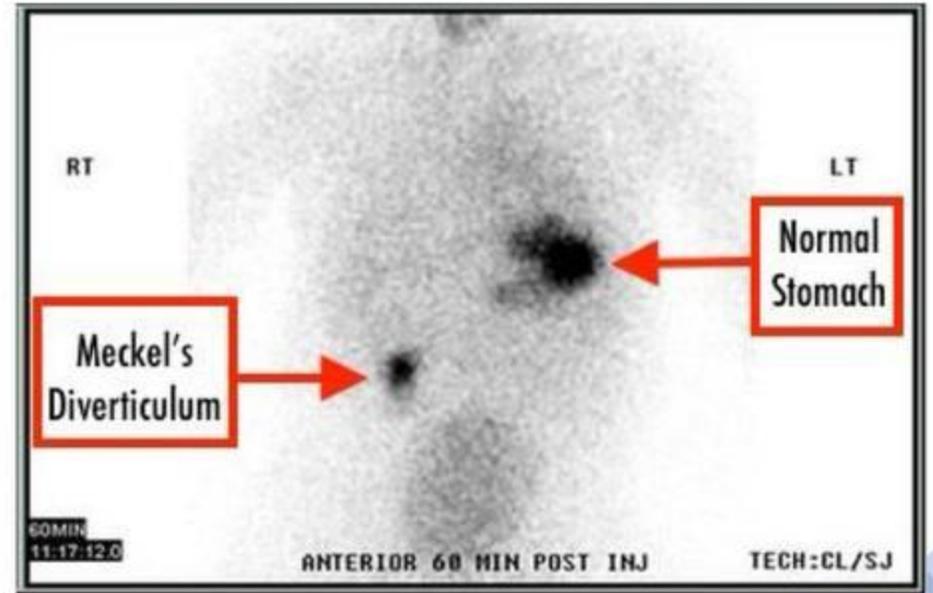
- **Pathophysiology :**

- **Perforation** of a Meckel's diverticulum may occur if the outpouching becomes impacted with food, leading to distention and necrosis.
- Occasionally, bands of tissue extend from the Meckel's diverticulum to the anterior abdominal wall, and these may represent starting points around which **volvulus** may develop.
- Sometimes meckel's diverticulum may become a pathological leading point and cause **intussusceptions**.
- ectopic gastric mucosa may produce ileal **ulcerations** that bleed and lead to the passage of maroon-colored stools

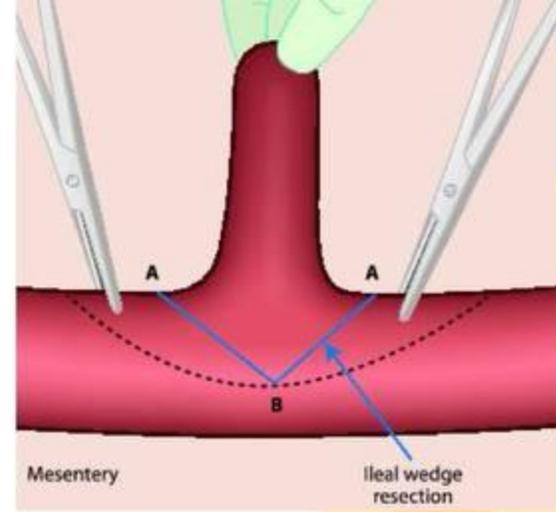
CLINICAL FEATURES

- The presentation of meckel's diverticulum depends on the age.
- **Symptoms**
- **all age groups** : abdominal pain, nausea, vomiting, anorectal bleeding(massive bleeding) and abdominal distention.
- **Newborns** : symptoms of intestinal obstruction due to an under lying volvulus or intussusception.
- **In infants and young children** : painless lower GI bleeding.
- **In older children** meckel's diverticulum may undergo inflammation and be confused a appendicitis. Thus, one of the differential diagnoses c meckel's diverticulitis is acute appendicitis.

Diagnosis may be made by technetium pertechnetate scans when the patient presents with bleeding. Laparoscopy and laparotomy



TREATMENT



Treatment
is surgical.

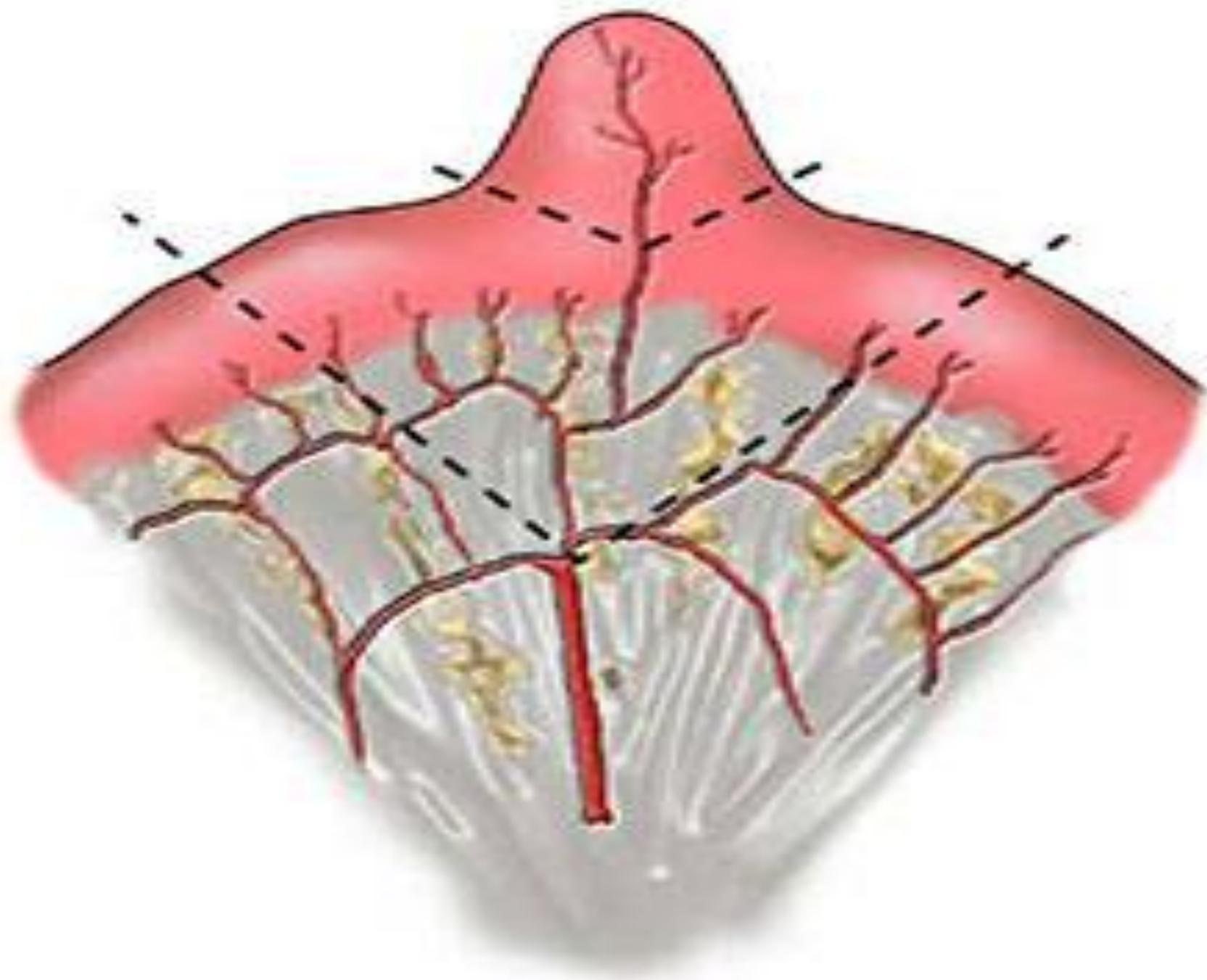
If the base is narrow
and there is no mass
present in the lumen
of the diverticulum,:

a wedge resection of
the diverticulum
(diverticulectomy)
with transverse
closure of the ileum
can be performed.

When a mass of
ectopic tissue is
palpable,
if the base is wide,
there is
inflammation:

it is preferable to
perform a resection
of the involved bowel
and end-to-end
ileoileostomy.

Incidental finding
of meckel's
diverticulum is an
indication for
resection,
especially in
children less than
8 years of age and
in those
containing
heterotopic
tissues



Malrotation

Epidemiology

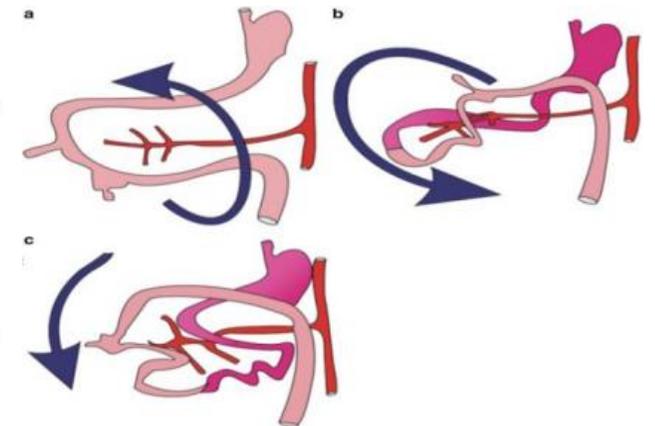
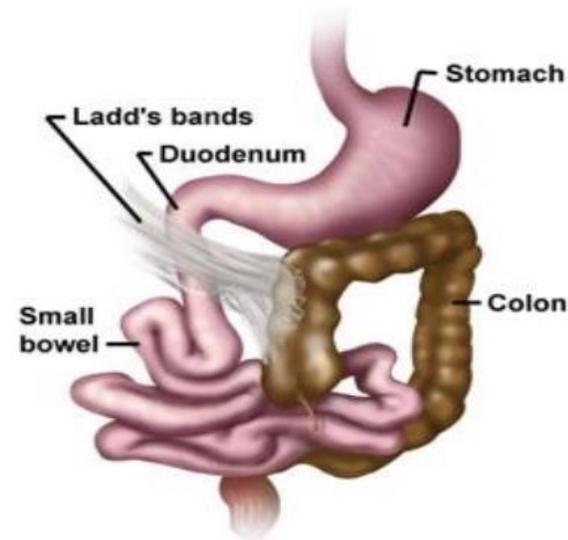
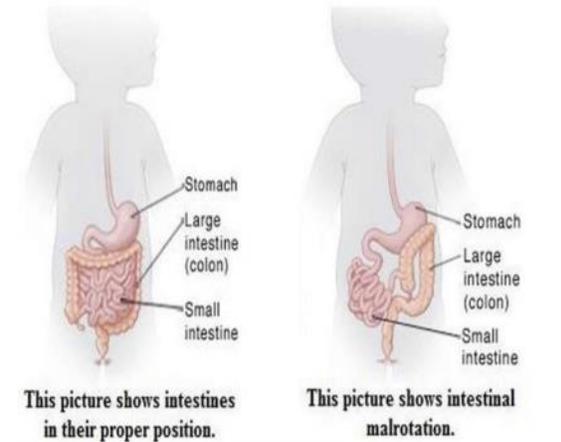
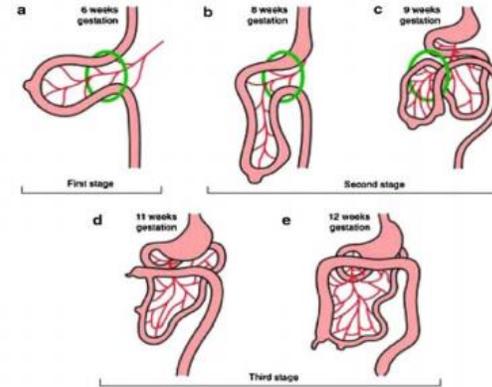
Incidence: symptomatic malrotation (midgut volvulus) in 1:6000 live births in the United States.

Age: neonates and infants.

Pathophysiology

Normal intestinal rotation: the midgut starts to elongate in utero (4th week) → herniation of the midgut out of the umbilicus (6th week) → 90° counter-clockwise rotation of the midgut → reentry of the midgut into the abdominal cavity (10th week) → 180° rotation inside the abdominal cavity (a total of 270°) → fixation of the duodenojejunal flexure and cecum to the posterior abdominal wall .

Intestinal malrotation: arrest in the normal rotation of the gut in utero, resulting in an abnormal orientation of the bowel and mesentery within the abdominal cavity.



Midgut volvulus: torsion of a malrotated midgut causing mechanical bowel obstruction, mostly in neonates and infants.

Torsion of bowel on its axis

- **Closed-loop mechanical bowel obstruction** → accumulation of gas and feces within the loop → increased intraluminal pressure → impaired capillary perfusion of bowel → bowel strangulation, ischemia, and gangrene.
- **Torsion of the mesenteric vascular pedicle** → occlusion/thrombosis of mesenteric vessels → bowel strangulation, ischemia, and gangrene.

Risk factors

- **Intestinal bands/adhesions**
- **Intestinal malrotation:** abnormal rotation of the bowel with abnormal fixation of mesentery to the posterior abdominal wall.
- **Megacolon** (Hirschsprung disease, Chagas disease).

Clinical features

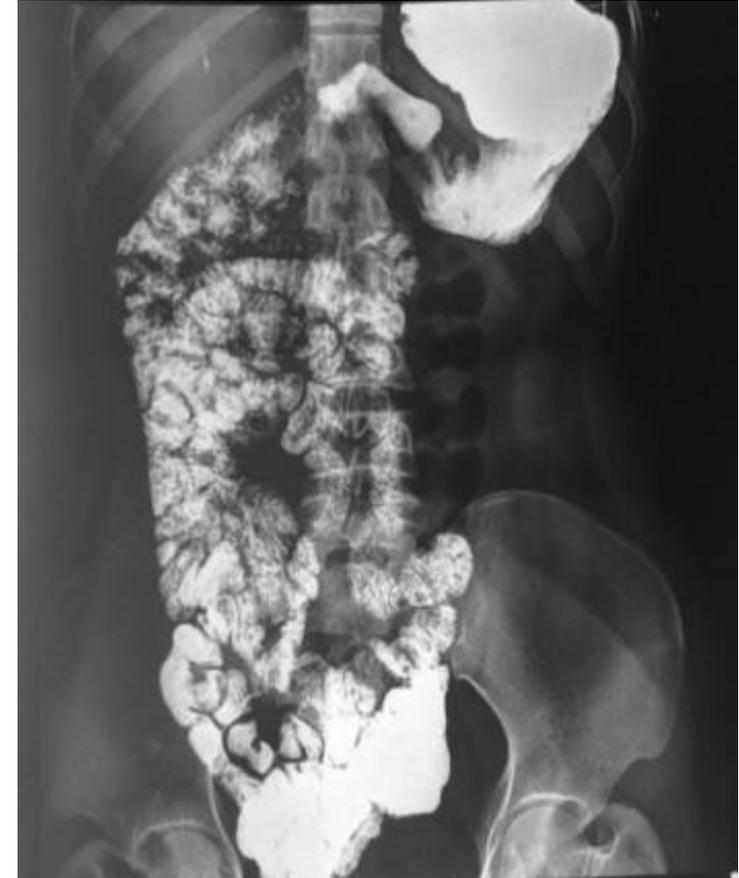
- **Malrotation**: mostly asymptomatic.
- **Recurrent episodes of abdominal pain and vomiting**
- **Failure to gain weight.**
- **Malabsorption**

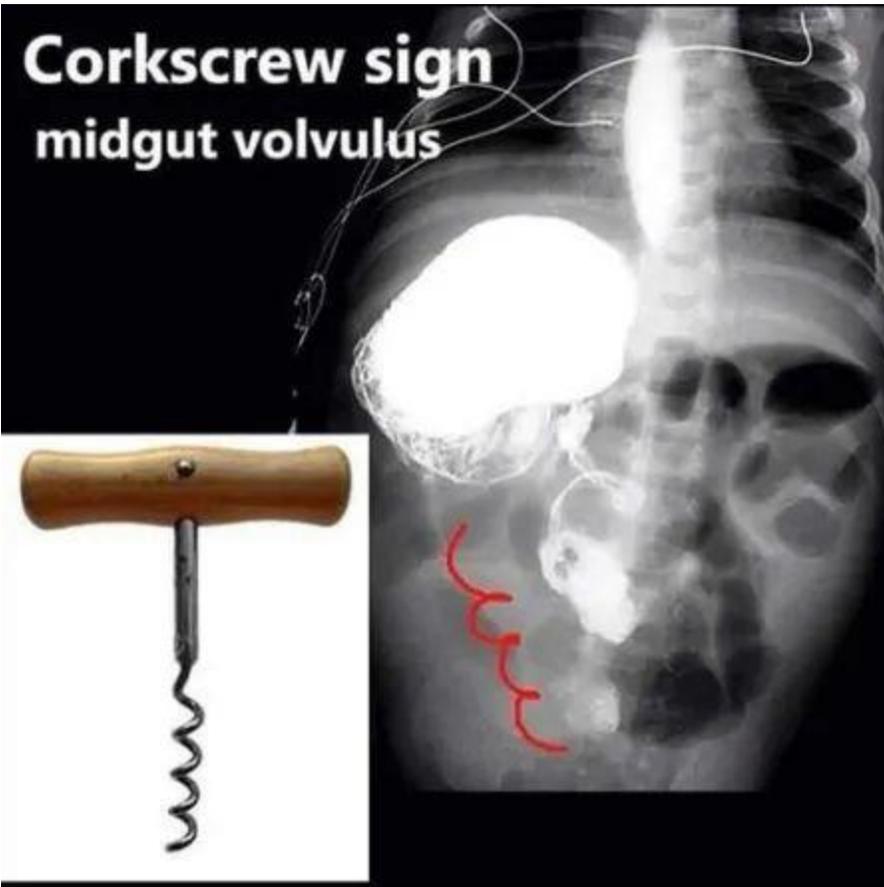
- **:Midgut volvulus:**
 1. Bilious vomiting with abdominal distension in a neonate/infant.
 2. Signs of bowel ischemia hematochezia, hematemesis, hypotension, and tachycardia
 3. Features of duodenal obstruction: bilious vomiting without abdominal distension.
- **Abdominal examination** is unreliable in neonates/infants because:
abdominal tenderness/rebound tenderness is difficult to assess in this population.

- **Commonly associated anomalies**: congenital diaphragmatic hernia (~ 100%), congenital heart defects (up to 90%), omphalocele (up to 45%).

Diagnosis

- **Abdominal X-ray** – Reveals any intestinal obstruction.
- 1. **Barium swallow** upper GI test – Examines the **small intestine** for abnormalities and to check the position of the jejunum. A chalky fluid called barium is swallowed or placed into the stomach through a small nasogastric tube. The barium coats the inside of the stomach and intestine so that they will show up on X-rays.
- 2. **Barium enema** – Examines the **large intestine**, and uses the same radiographic contrast agent as mentioned above. Barium is given into the rectum as an enema. X-rays can show that the large intestine is not in normal position.
- 3. **Abdominal ultrasound** –Ultrasounds can help doctors evaluate the **function** of the intestine and monitor the **blood flow**.
- **Laboratory studies**: complete blood count, electrolyte levels, arterial blood gas analysis





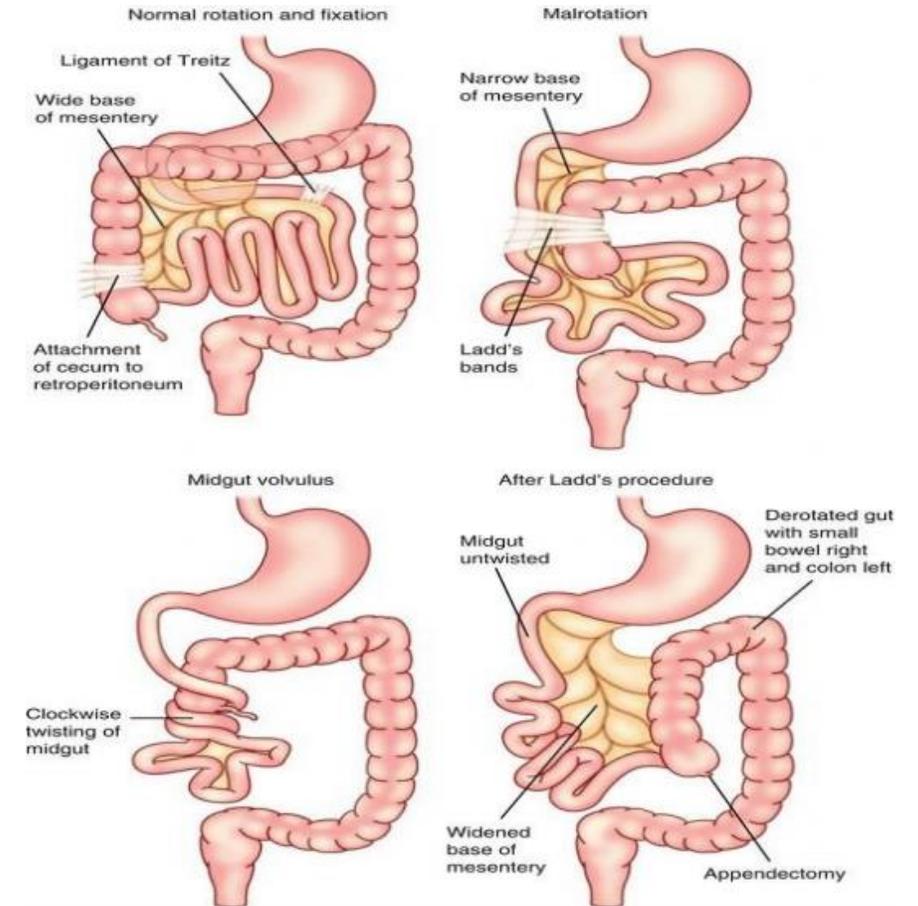
in midgut volvulus, the small intestine
assumes a **corkscrew configuration**

Treatment

Midgut volvulus with/without peritonitis

- Initial resuscitation: NPO; nasogastric tube insertion; IV fluids; correction of electrolyte imbalance; broad spectrum IV antibiotics
- Emergency surgery (**Ladd procedure**) The volvulus is reduced/untwisted and the Ladd bands removed.
- Gangrenous/necrotic bowel, if present, is resected and either anastomosed or created into a stoma.
- **Appendix is removed** (to prevent future diagnostic/operative difficulties)
- Development of postoperative adhesions decreases the chance of recurrent volvulus.

Incidentally detected/asymptomatic intestinal malrotation: elective surgery (Ladd procedure)



Non Obstructive cause

APPENDICITIS

- Acute appendicitis is the **most common surgical emergency** in children .
- Peak incidence between 10-12 years

ETIOLOGY

1-Obstruction of the lumen is the dominant causal factor in acute appendicitis.

Fecaliths are the usual cause of appendical obstruction. (appendicolith)

Less-common causes are – Lymphoid hyperplasia (viral infection) , tumors, fruit seeds, and intestinal parasites.

2-Non obstructed by direct spread of micro-organisms to the lumen or hematogenous spread (pneumonia and tonsillitis)

Pathogenesis:

- Tradition holds ->that once the appendix becomes obstructed,
- bacteria trapped within the appendicular lumen begin to multiply, and the appendix becomes distended.
- The increased intraluminal pressure obstructs venous drainage, and the appendix becomes congested and ischemic.
- The combination of bacterial infection and ischemia produce inflammation, which progresses to necrosis and gangrene.
- When the appendix becomes gangrenous, it may perforate.
- The progression from obstruction to perforation usually takes place over 72 hours.

Clinically:

- The classic history :
- Anorexia
- vague periumbilical pain, followed by migration of pain to the right lower quadrant (RLQ)
- fever
- vomiting, is observed in fewer than 60% of patients.
- ** All patients with appendicitis have abdominal pain, and many have anorexia; absence of both of these findings should place the diagnosis of appendicitis in question.
- In patients with an appendix in a pelvic location, inflammation of the appendix occasionally results in an irritative stimulation of the rectum. These patients often report diarrhea

Physical Examination

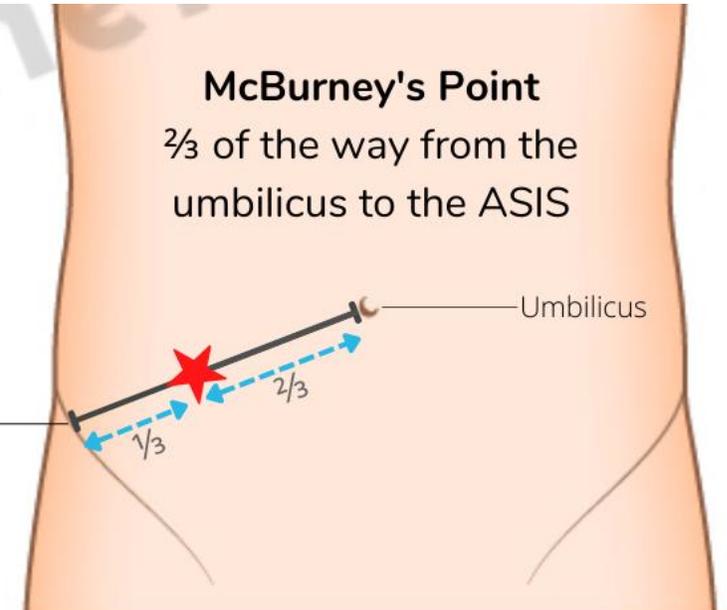
- The physical examination findings in children may vary depending on age.
- ❖ Typically, maximal tenderness can be found at the McBurney point (1.5-2 inches from ASIS) in the RLQ. Also guarding and tenderness
- A mass may be palpable in the RLQ if the appendix is perforated.

A positive **McBurney's sign** is indicated when there is significant pain upon palpation of this area in the right lower quadrant.

Anterior Superior Iliac Spine

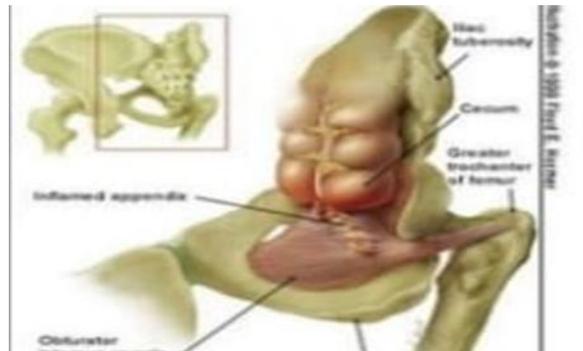


McBurney's Point
 $\frac{2}{3}$ of the way from the umbilicus to the ASIS



The obturator sign by internally rotating the flexed right thigh.

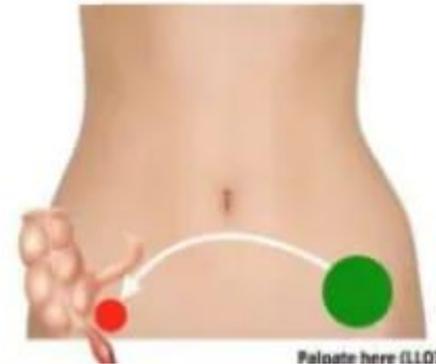
A positive response suggests an inflammatory mass overlying the obturator space (pelvic appendicitis).



The Rovsing sign (pain in the RLQ in response to left-sided palpation or percussion) strongly suggests peritoneal irritation.

ROVSING'S SIGN

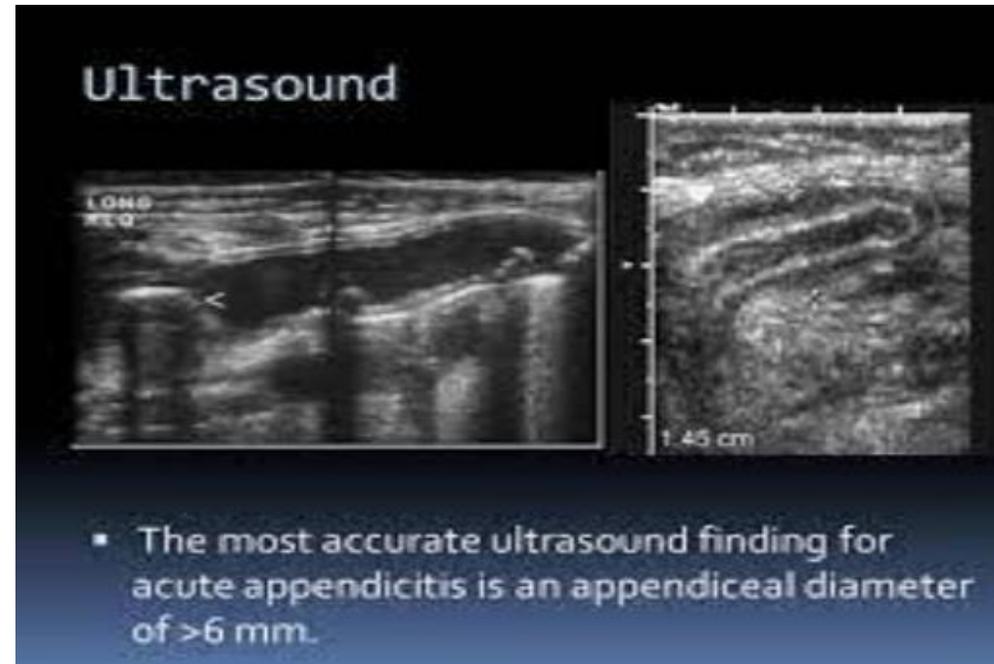
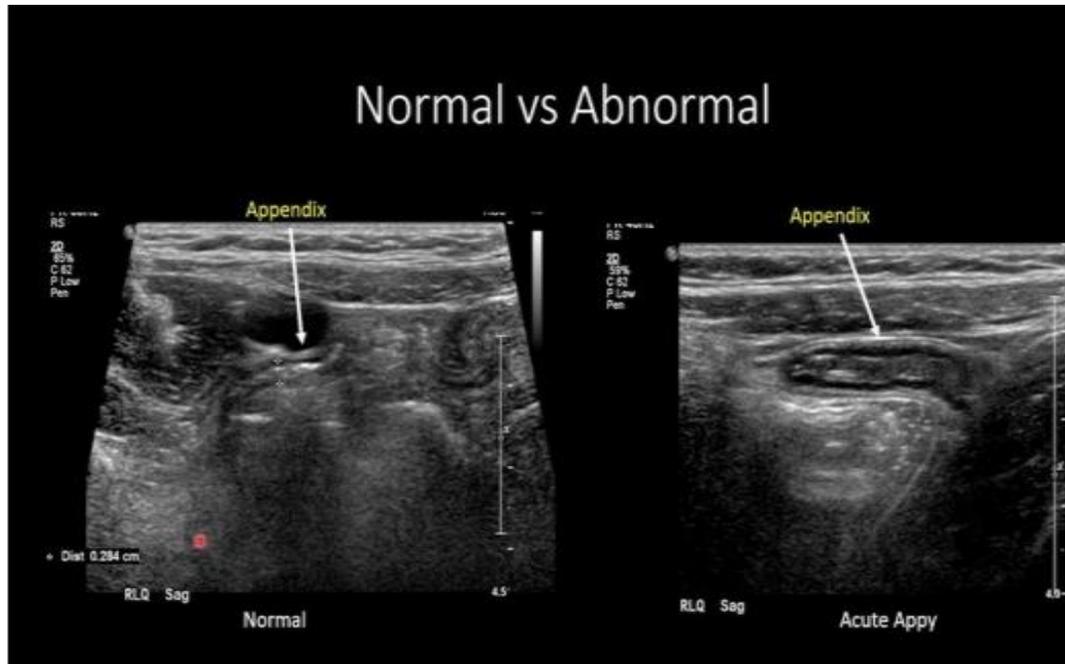
- ▶ Palpating in the left lower quadrant causes pain in the right lower quadrant



The **psoas sign**, place the child on the left side and hyperextend the right leg at the hip. A positive response suggests an inflammatory mass overlying the psoas muscle (retrocecal appendicitis).



- **DX :**
- **Laboratory findings :** neutrophil leukocytosis , urinalysis.
- **Abdominal X RAY:** may show abnormal **bowel dilatation**, **fecalith** calcification.
- **US -** A positive finding is a **non-compressible tubular structure 6 mm or wider** in the RLQ , Additional supportive findings include **an free peritoneal fluid**, mesenteric thickening, appendicular **mass or abscess**, **appendicular fecolith**



Paediatric appendicitis scores

Features	Score
Fever > 38°C	1
Anorexia	1
Nausea/Vomiting	1
Cough/percussion/hopping tenderness	2
Right lower quadrant tenderness	2
Migration of pain	1
Leukocytosis > 10,000/L	1
Polymorphonuclear neutrophilia > 7500/L	1
Total	10

- ≤ 2 low likelihood
- 3-7 needs further evaluation
- ≥ 8 high likelihood

Management

- The definitive treatment for appendicitis is **appendectomy** (open or laproscopy) .
- Ensure **adequate hydration** for patients who present with suspected appendicitis.
- Iv antibiotics should be started once the diagnosis is confirmed.
- **Antibiotic therapy** should be directed against gram-negative and anaerobic organisms such as E-coli and Bacteroides species.
- **Perforation or abscess** , the approach is conservative (nonoperative) management, with **percutaneous drainage** if possible and surgery after 8-12 weeks (ie, **interval appendectomy**).
- ✓ Antibiotic therapy for ruptured appendicitis is continued for a minimum of 7-10 days

- **Differential diagnosis***

- mesenteric lymph adenitis.
- Primary peritonitis.
- Meckel's diverticulitis.
- Ruptured ovarian cyst in female.
- Torsion of an ovarian cyst or ovary in female.
- Torsion of the omentum.
- Suppurating deep iliac lymph nodes

ACUTE MESENTERIC ADENITIS :

- Mesenteric lymphadenitis refers to **nonspecific self-limiting** inflammation of the mesenteric lymph nodes .
- This process may be acute or chronic, depending on the causative agent, and it causes a clinical presentation that is often difficult to differentiate from acute appendicitis particularly in children.
- **Clinical presentations include the following:**
 - Abdominal pain - Often right lower quadrant (RLQ) but may be more diffuse
 - Fever
 - Diarrhea
 - Malaise
 - Anorexia
 - Concomitant or antecedent upper respiratory tract infection
 - Nausea and vomiting (which generally precedes abdominal pain, as compared to the sequence in appendicitis)
- **No set of physical findings is pathognomonic** , but the following may be found in affected patients:
 - Fever (38-38.5°C)
 - Right lower quadrant (RLQ) tenderness - Mild, with or without rebound tenderness
 - **Voluntary guarding rather than abdominal rigidity**
 - Patients with mild, uncomplicated presentations **do not require antibiotics, and supportive care generally suffices**

Thank

YOU