

Examination of the Abdomen

*Topographical divisions of the abdomen

- Theoretically, the examination of alimentary system starts from **mouth, oral cavity & throat**. However, in younger children, it is left for the end to avoid discomfort: (mouth: pigmentation & ulcer e.g Crohns disease & Peutz-Jeghers syndrome. Large tongue in hypothyroidism & mucopolysaccharidosis. In Down syndrome there is a small oral cavity with protruded tongue).
- Abdomen can be divided to **9 areas**: Right & Left Hypochondrium + Right & Left Loin (Flank) + Right & Left Iliac fossa + Epigastric, Umbilical & Suprapubic (Hypogastric) areas (2 vertical lines [Right & Left Mid-clavicular lines] + 2 horizontal lines [Transpyloric & Ileac crest lines])

* Inspection of the Abdomen

■ The Shape & of the abdomen

- Normally, in the first few years of life, it looks little protuberant because of the (physiological) lumbar lordosis & thinner abdominal wall.
- When abdominal protuberance is marked (i.e distention), it can be due to:
 1. **Gas or Flatus** (air swallowing, malabsorption as in celiac disease), **Fluid** (ascites as in nephrotic syndrome), **Feces** (Hirschsprung disease & constipation). **Fat** can be the cause for older children. **Fetus** (very unlikely)
 2. Rickets (Pot belly), Hypothyroidism & Down syndrome. Distention is mainly because of the atony of abdominal musculature.
 3. **Intestinal obstruction**: Small intestine (distention is marked in the center) & Large intestine (distention is marked in flanks e.g in Hirschsprung disease).
- A localized bulging may be visible in case of:
 1. Marked hepatomegaly & / or splenomegaly.
 2. Distended urinary bladder.
 3. Lump of pyloric stenosis: A small lump accompanied by visible peristalsis from left to right may be seen in epigastrium, usually when baby is been fed (feeding test).
 4. Sausage shaped lump may be seen in right hypochondrium in intussusception.
 5. Any other lump e.g Wilms tumor & neuroblastoma.
 6. Umbilical hernia: In normal child or in case of rickets, hypothyroidism & Down syndrome.
- Scaphoid abdomen in newborn or in infant is always abnormal & is suggestive of diaphragmatic hernia, unless proved otherwise.

■ The Movement of the abdomen.

- Normally, it bulges during inspiration & goes in during expiration.
- Apposite movement may be seen with paralysis of the diaphragm (birth trauma, bulbar polio).
- See-saw movement of the tow sides of the abdomen is seen in unilateral diaphragmatic paralysis.
- In peritonitis, abdominal wall movement are severely restricted.

■ The Skin of the abdomen

- Purple stria may be seen in Cushing syndrome or with prolonged steroid therapy.
- Brown mottled pigmentation or scar (previous operation) may be seen, mostly at the center of abdomen due to repeated heating by hot water or heat pad (recurrent abdominal pain).
- Superficial veins: If prominent, note the direction of flow. Normally, few veins are visible due to thinness of skin & flow of blood is away from the umbilicus. In abnormal conditions, the amount & direction of changes according the condition (downward flow in Superior vena cava obstruction, upward flow in inferior vena cava obstruction, & caput medusa flow (from umbilicus) in portal hypertension.
- Umbilicus: inverted, everted, flat, or hernia.
- Hernial orifices.
- Pulsation in the epigastrium may be seen in right ventricular hypertrophy (RVH)

* Palpation of the abdomen

- This is the most informative part of abdominal examination. When child is cooperative or asleep, proper information can be obtained.
- Start by putting the flat of your right hand lightly & gently & never poke the fingers. If pain is complained in any region of abdomen, it must be touched at the end.
- A sequence must be made for palpating area wise e.g. start palpating in left lower quadrant, then proceed to left upper, right upper & right lower quadrant.
- There are 2 parts of palpation: Superficial palpation (for superficial mass & tenderness) & Deep palpation (for deep mass, tenderness & organomegally).
- Child may be crying & making abdominal wall tense but even then momentary relaxation is obtained for palpation when child takes breath in between.
- When guarding or rigidity persists (no relaxation occurs during inspiration also) & abdomen is tender, a surgical consultation must be thought of. In tetanus & hypocalcemic tetany, abdominal rigidity will be present without tenderness.
- Try to localize the site of pain & tenderness as follows:
 1. Lower abdomen: Gastroenteritis, Meckles diverticulum with ulceration, Torsion of testes or ovary, Distended urinary bladder.
 2. Right iliac fossa: Appendicitis, Appendicular abscess.
 3. Right hypochondrium: Tender liver (hepatitis, CHF), Intussusception.
 4. Epigastric lesion: Gastritis, Excessive coughing, Gastric or duodenal ulcer.
 5. Umbilical region: Worms.
 6. Poorly localized areas of tenderness may be seen in: Basal pneumonia, Mesenteric adenitis, Localized peritonitis, Rheumatic fever, Crises of sickle cell anemia, Leukemia, Hysteria.
- Abdominal trauma & disease, in or near the spinal cord may also cause the pain.
- Occasionally on palpation, we get (doughy) skin felling. Although it may be normal, it is also seen in hypernatremic dehydration, chronic malnutrition, peritonitis (especially tuberculus) & myxedema.
- If any mass is felt, assess the following:
 1. Is it intra abdominal or in the abdominal wall?
 2. Site
 3. Size & shape
 4. Surface, edge & consistency
 5. Mobility & fixity with other structure
 6. Bimanually palpable or ballotable.
 7. Is it pulsatile?

- A big size intra-abdominal mass in a child of less than 7 years is commonly due to one of the two causes: Neuroblastoma or Wilms tumor. Wilms tumor usually remains localized to one side of the midline while neuroblastoma crosses midline early when it grows. However, rarely Wilms tumor may be bilateral. Ovarian tumors palpable in preadolescent period may be malignant. After the menarche, they are more likely to be functional.

■ Palpation of the Liver

- Start palpating the right iliac fossa & move upward. During inspiration, press the radial edge of right hand (or tips of fingers) inwards & upward till you feel the regular border of the liver. After that, trace the border towards epigastrium & to the right side.
- Note the tenderness, the extent of enlargement, the surface & the consistency of liver (smooth, firm, hard, nodular) & if it is pulsatile (hepatic AV malformation) or expansile (tricuspid regurgitation). Normal liver is soft & not tender.
- If it is tender, the child will wince or cry while palpating.
- Percuss the right side of the chest from above downwards for localizing the upper border of liver (normally, in 5th intercostal space or underneath 5th rib) so that the downward displacement of liver can be differentiated from real enlargement. In normal children, it can be palpable up to 2 cm till 2 years of age & up to 1 cm till 4-5 years of age. Normal liver span in newborn: 4.5-5 cm & in 12 year of age: female: 6-6.5 cm & male: 7-8 cm.
- Tender, soft enlarged liver can be seen in CHF, viral hepatitis, bacterial hepatitis (abscess) & amebic abscess.
- Soft, non-tender hepatomegaly is seen in kwashiorkor, hemolytic anemias, leukemias & storage disorders (usually associated with splenomegaly).
- Hepatomegaly in newborn may be due to CHF, TORCH, neonatal hepatitis, congenital biliary atresia, hemolytic anemia or leukemia.
- Firm or hard hepatomegaly is seen in cirrhosis. This is usually associated with ascites & other signs of hepatic function impairment.
- Rapidly reducing size of liver may be diagnostic of acute liver cell necrosis.
- Pulsatile liver is rarely seen & can be due to tricuspid incompetence or stenosis or constrictive pericarditis.

■ Palpation of the Spleen

- Normally, it can be palpable in newborns (due to extra-medullary hematopoiesis in fetal life).
- Before it becomes palpable, it has already enlarged 2-3 times. When enlarged further, the direction is downward & towards right iliac fossa.
- For palpation, stand on the right side of the child, place the flat of left hand over the lateral & posterior part of the chest wall & the right hand on the abdomen starting from right iliac fossa & proceed palpating diagonally toward the left hypochondrial area. When child takes inspiration, press the chest wall by the left hand medially & insinuate the right hand towards underneath the costal margin to feel the spleen. If still not palpable, turn the patient halfway to the right & repeat the maneuver. Assess the tenderness, surface, consistency & any pulsation.
- It may be felt as a firm structure with smooth rounded border.
- The spleen can be differentiated from kidney by 1. You can get above a kidney but not a spleen. 2. A splenic notch may be felt on its medial margin. 3. The kidney is ballotable & palpable bimanually, the spleen is not. 4. The percussion note is dull over the spleen & resonant over the kidney.
- Massive splenomegaly is seen in chronic malaria, hemolytic anemia, leukemia, storage disorders & kala-azar. Slight to moderate splenomegaly is seen in portal hypertension & CHF. Slight splenomegaly occurs in septicemia, iron deficiency anemia, typhoid fever, infective hepatitis & infectious mononucleosis.

■ Palpation of the Kidneys

- Place the left hand posteriorly in loin & right hand in lumbar region anteriorly. When child takes inspiration, push the left hand forward & the right hand upward. Lower pole of the kidney is felt slipping between your hands as it moves up on expiration.
- Left kidney is felt at higher level. In newborns, one or both kidneys may be palpable normally.

■ Palpation of the Urinary bladder

- It is palpable only when distended & is felt as a **smooth, cystic oval swelling** in the suprapubic region, arising from the pelvis. Upper border may reach as high as umbilicus. It is **dull** on percussion. On pressure, either the child passes urine or cries due to discomfort.

*Percussion of the abdomen

- Only light percussion is necessary, it has limited but important place in the examination of abdomen. It gives **tympanitic notes** all over except where solid organs or masses are underlying. This technique is mostly utilized to define the boundaries of these abdominal organs & abdominal masses.
- **Liver:** to determine its upper border, percuss over the right side of the chest from above downwards. Dulness of underlying liver is felt in 5th intercostal space normally & extends downwards to the subcostal margin or down depending upon the size of the liver. The dullness over upper border of liver may be reduced in right pneumothorax or emphysema. Liver dullness may be totally obscured in case of gas in peritoneal cavity due to perforation of viscera. In this case, X-rays in standing position will show gas under the diaphragm displacing the liver down.
- **Spleen:** dullness extends from left subcostal margin towards left hypochondrium & left hypochondrial area in case of splenomegaly.
- **Urinary bladder:** in case of distended urinary bladder, there is suprapubic dullness surrounded by resonance over intestine.
- **Detection of fluid in peritoneal cavity:** when sufficient quantity of free fluid is present in peritoneal cavity (ascites), it can be elicited by : positive **shifting dullness** (between the center & the sides of the abdomen with changing position from supine to either side) or positive **transmitted thrill** (through fluid when obscuring transmission through subcutaneous fat)

*Auscultation of the abdomen

- Place the stethoscope on one site on the abdominal wall till the bowel sounds are heard. Normal bowel sounds are intermittent low pitched or medium pitched gurgling sounds with occasional high pitched tickles.
- Bowel sounds are **increased** & occur in a rhythmic pattern synchronized with peristaltic wave (which may be visible also) in case of **small intestinal obstruction**. But if obstruction is not relieved & strangulation or **gangrene or paralytic ileus set in, the bowel sounds disappear totally**. But before labeling the abdomen as 'silent', one must listen carefully for few minutes at least. Some faint, very high pitched tinkling sounds may be heard in paralytic ileus due to spilling of the fluid from one distended loop of intestine to other.
- '**Succussion splash**' may be elicited in case of pyloric stenosis. **Auscultation over aorta** may give a bruit if coarctation is present. In children having hypertension or neurofibromatosis, the renal areas posteriorly must be auscultated with the bell of the stethoscope for a systolic murmur, indicating **renal artery stenosis**.

* Examination of the inguinal region

- See the inguinal region for any swelling. Then stand behind the child & keep the right hand over the right groin & the left hand over the left groin. While the child is coughing or crying, feel for any expansile impulse. It is usually due to **hernia**: inguinal (direct or indirect) or femoral hernia.
- In children, indirect inguinal hernia is the commonest variety because of shortness of inguinal canal & approximation of internal & external inguinal rings.
- Feel the **inguinal lymph nodes** (3-4 in number on each side). These are usually enlarged due to frequent infections & injuries on legs & feet in children.

* Examination of genitalia

- Male genitalia: Examine the scrotum, testes & penis.
- **The scrotum**: In premature, the scrotal skin is pinkish in color & has no rugosities while in full term, it has acquired dark pigmentation & rugosities. Feel for both **testes**. If there is any lump in scrotum, try to see whether you can get above it. If yes, it is arising from testes, epididymis or spermatic cord. **Hydrocele is the commonest cause of such lump**. See whether it is cystic or solid, its relation to testes & its transillumination. A small or underdeveloped scrotum may indicate cryptorchidism.
- The testes: Palpate each testicle by right hand. One or both testes may not be in scrotum as it happens quite often in prematures. Try to confirm whether a normally descended testis has retracted up (**retractile testis**) or it is really undescended testis.
- **Penis**: Examine for **phimosis** (the prepuce can not be retracted), **hypospadias** (meatus may not be located at the tip of the glans but on undersurface in the midline to anywhere from glans to the perineum) or **epispadias** (meatus on the dorsum in midline). Assess **signs of puberty** in adolescents (penile & testicular size & pubic hair).
- Female genitalia: Unless the complaints specify the detailed examination of genitalia, an external examination is sufficient. Per rectal examination may be needed in older girls. Assess for development of **labia minora & labia majora** in neonate. Assess for any **vaginal discharge**: A mucoïd discharge in diaper age is usually due to irritation by diaper or the powder used in diaper region. A foul smelling discharge in children may be due to **tight undergarments, intertrigo, pinworms, foreign body & secondary infection**. A white odorless discharge has no significance. Social factors may limit (to a high extent) the feasibility of such examination especially in older females.

* Per-rectal examination

- It is **not a routine** examination but it should be done when it is indicated (e.g imperforated anus in neonate, Hirschsprung disease or intussusception).
- Examine the perineal area for **meningocele** or **pilonidal sinus** in sacro-coccygeal area. The **anal fissure** may be present as a mucosal tear (it can be the only cause of constipation & bleeding per rectum up to 2 years of life). **Rectal prolapse** is usually seen after chronic diarrhea or whooping cough especially with severe malnutrition.
- The best position for rectal examination is **lying supine with leg flexed**. Examination must be done by little finger. Bladder must be emptied before it. In case of **imperforated anus**, neither the finger, nor a thermometer can be introduced beyond a few millimeters. A spastic segment of anal canal may be felt around finger, beyond which the lumen is normal, in case of congenital aganglionic megacolon (**Hirschsprung disease**). In case of **intussusception**, a soft mass protruding in the rectum, around which the finger can be moved, may be felt as well as other signs of intestinal obstruction & a red currant jelly stool around finger when removed. **Uterus, ovaries & foreign body in vagina** can also be felt per rectum.