Abdomen: Surface Anatomy

Objectives

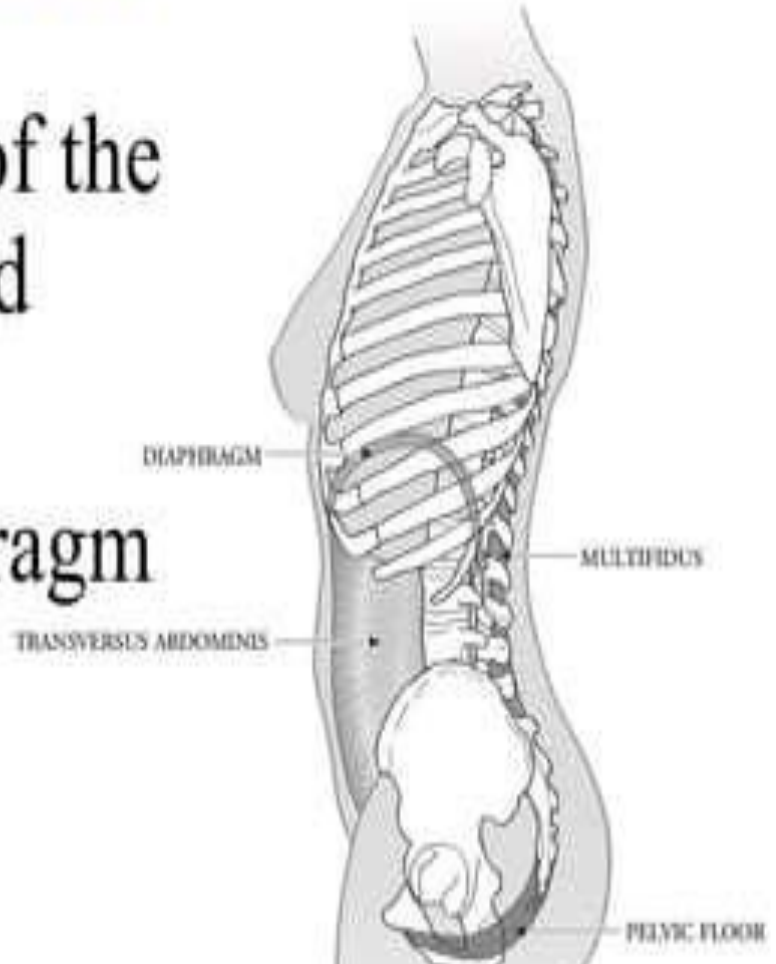
i. Structure and function of abdominopelvic cavity
ii. Abdominal planes and regions
iii. Abdomen landmarks
iv. Superficial reflexes

Overview of abdomen

- The abdomen is the region of the trunk between the thorax and pelvis:

→**Superiorly** – by the diaphragm

→**Inferiorly** – by the pelvic diaphragm



Overview of abdominal cavity

- **Superiorly** - the abdominal cavity is separated from the thoracic cavity by the diaphragm
- **Inferiorly** - the abdominal cavity continues into the pelvis and no floor of its own. It is limited inferiorly by the pelvic floor aka pelvic diaphragm separating abdominopelvic cavity from perineum

Overview of abdominal wall

- The abdominal cavity is enclosed by the abdominal wall
- The abdominal wall can be divided into two main parts:

a. **Anterolateral abdominal wall**

b. **Posterior abdominal wall**

Functions of abdominal wall

- Forms a firm, **flexible wall** which keeps the **abdominal viscera** in the abdominal cavity
- Maintains **anatomical position** of abdominal viscera against gravity
- Assist in **forceful expiration** by pushing abdominal viscera upwards
- Involved in any action that **increases intra-abdominal pressure** like coughing, vomiting

Abdominal planes and regions

- Vertical lines and horizontal planes are commonly used:

a. To facilitate description of **diseased structures**

b. Performing of **abdominal procedures**

Vertical lines

- **Midclavicular lines** drawn vertically from the midpoint of each clavicle
- Bilateral sagittal planes that **intersect** the **costal margin** [tip of the 9th costal cartilage] and the **inguinal folds** [midpoint between the anterior superior iliac spine and pubic symphysis]

Horizontal planes

- All planes are useful in **defining the vertebral levels**

1. **Transpyloric plane** – L1 vertebral level
2. **Subcostal plane** – upper border of L3 vertebral level
3. **Transtubercular plane** – L5 vertebral level
4. **Interspinous plane** – L4 vertebral level
5. **Transumbilical plane** – between L3 & L4

Transpyloric plane

- Vertebral level – L1
- Located midway between the superior borders of the **manubrium of the sternum** and **pubic symphysis**
- Commonly **transects the pylorus** (distal part of the stomach) when the individual is recumbent (supine or prone)

Subcostal plane

- Vertebral level – L3
- Commonly passing through the inferior border of the **9th costal cartilage** on each side

Transtubercular plane

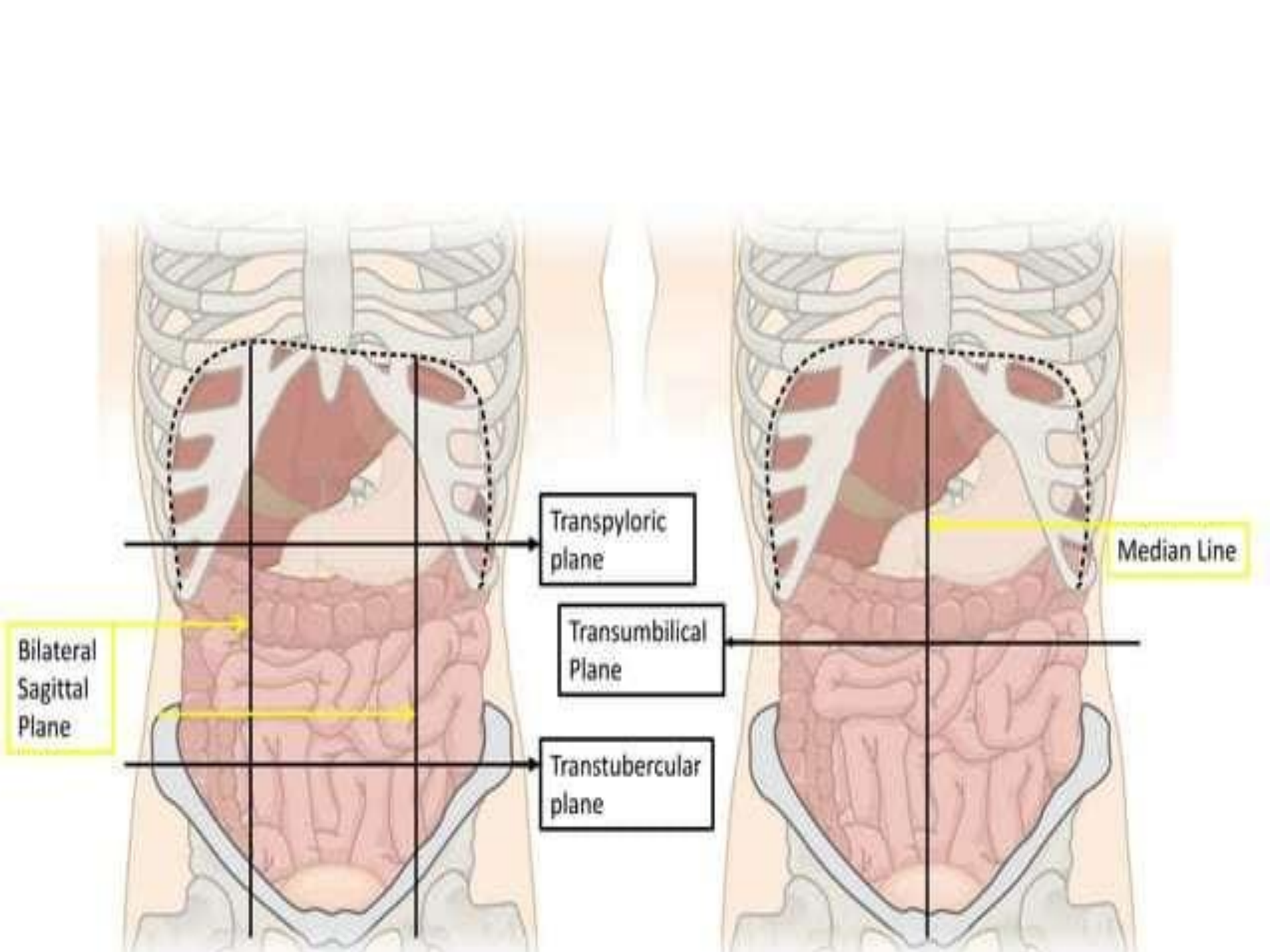
- Vertebral level – L5
- Passes through the **iliac tubercles** and the body of the **L5 vertebra**

Interspinous plane

- Vertebral level – L4
- Passes through the easily palpated **anterior superior iliac** spine on each side

Transumbilical plane

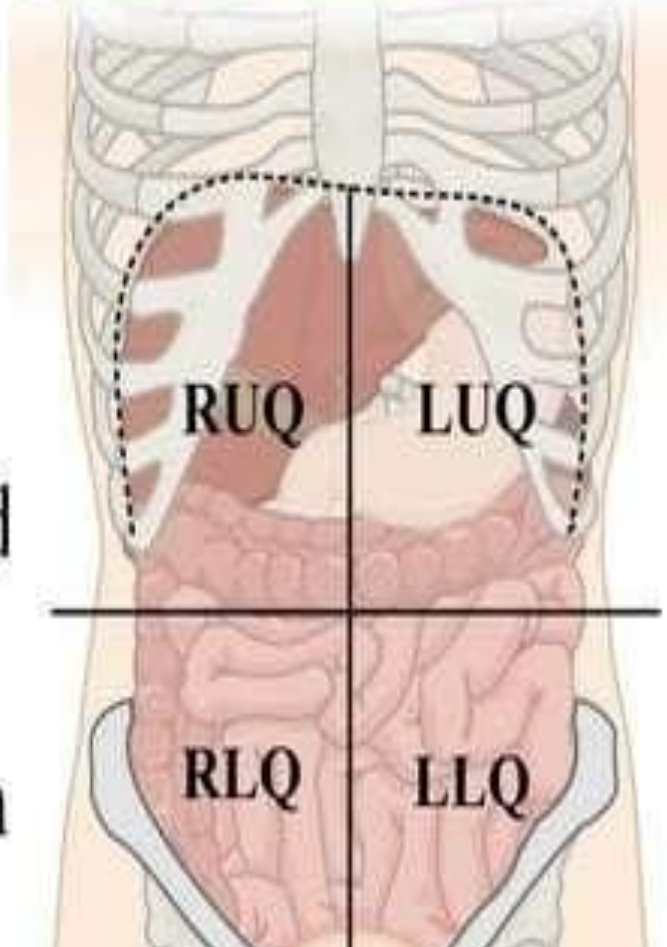
- Vertebral level – between L3 & L4
- Passes through the **umbilicus**
- Commonly used with median plane in demarcating the **abdomen quadrants**


Transpyloric plane
Median Line
Transumbilical Plane
Bilateral Sagittal Plane
Transtubercular plane

Contents of Abdominal quadrants and regions

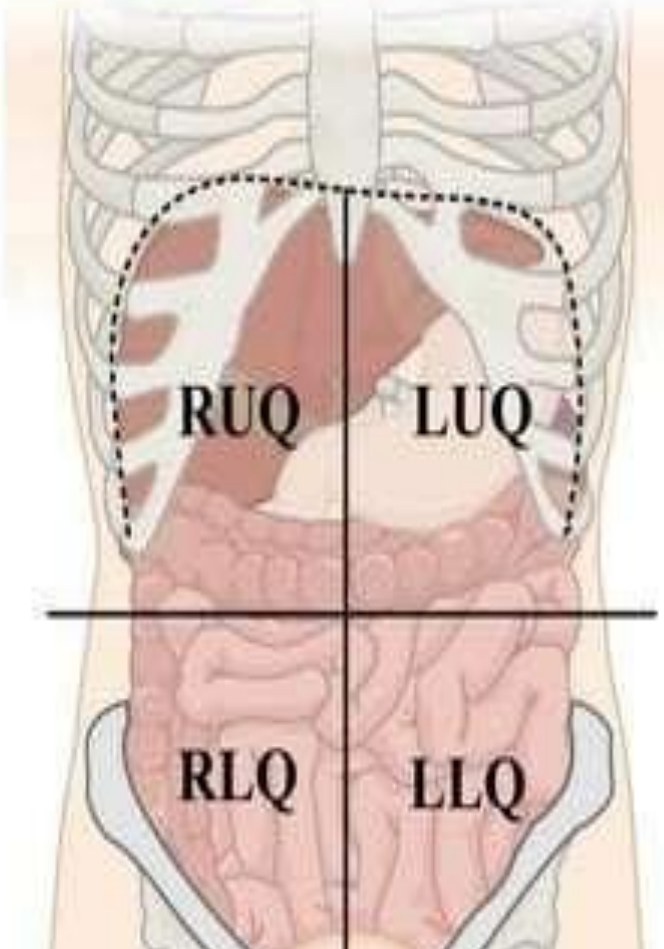
RUQ: Right Upper Quadrant

- Right lobe of the liver
- Pylorus of the stomach
- Duodenum: parts 1-3
- Right kidney & suprarenal gland
- Pancreas head
- Superior part of ascending colon
- Right half of transverse colon



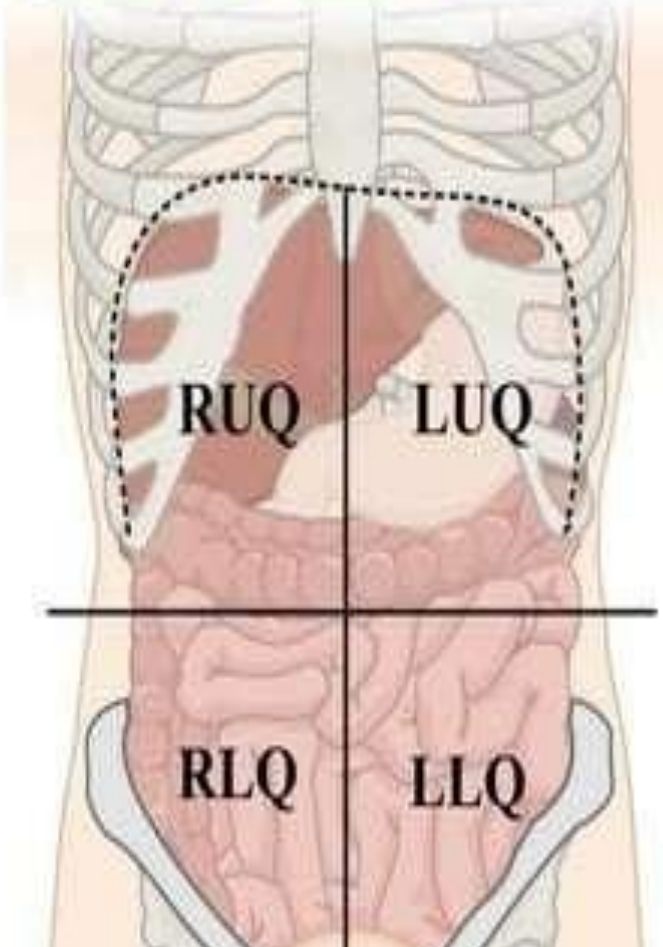
LUQ: Left Upper Quadrant

- Left lobe of the liver
- Spleen
- Stomach
- Pancreas: body and tail
- Left kidney & suprarenal gland
- Left half of transverse colon
- Superior part of descending



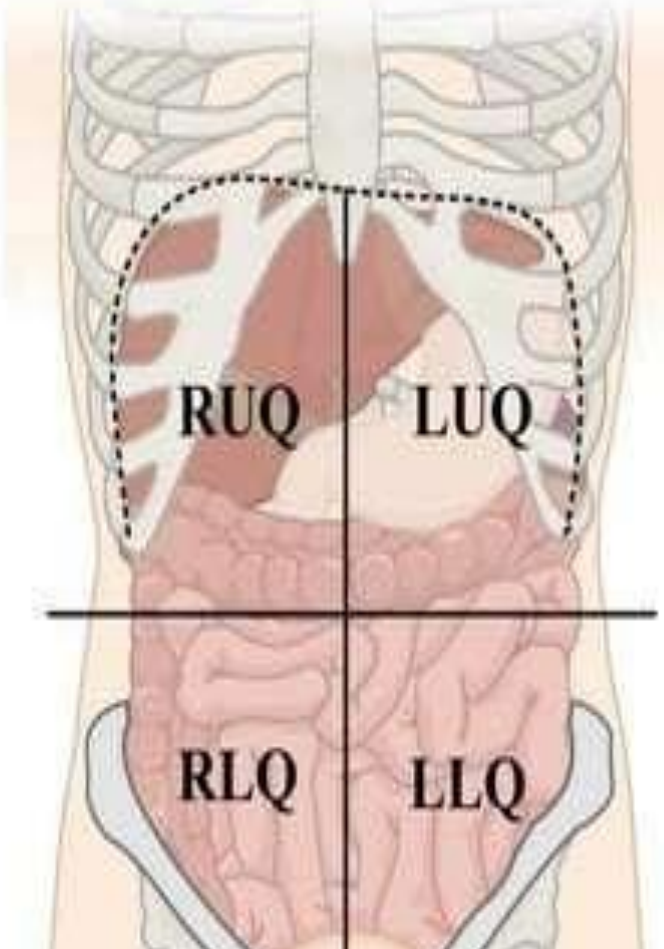
RLQ: Right Lower Quadrant

- Cecum
- Appendix
- Ascending: inferior part
- Right ovary & uterine tube
- Right ureter & urinary bladder (if full)
- Right spermatic cord



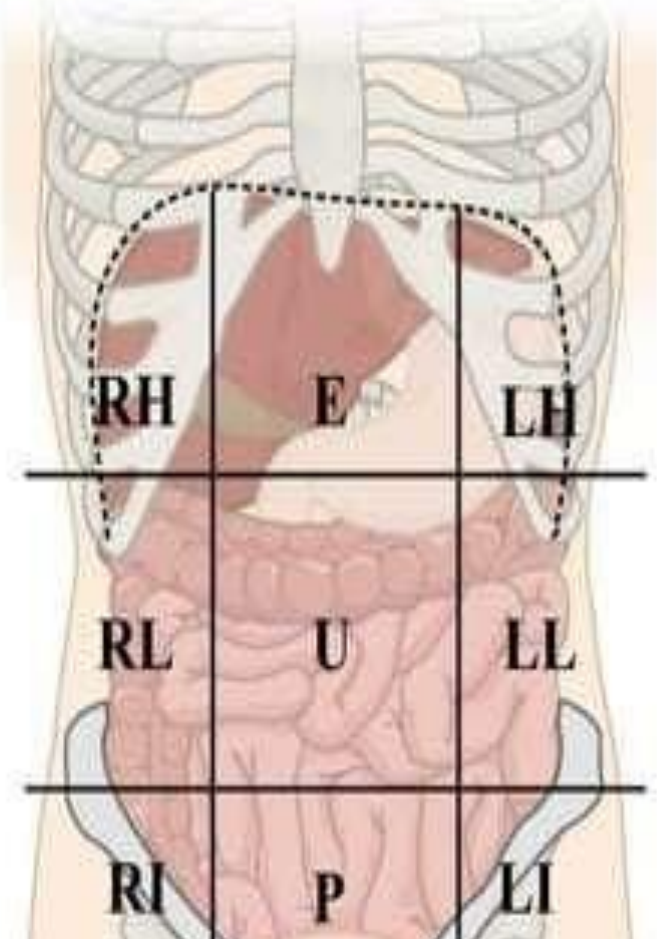
LLQ: Left Lower Quadrant

- Sigmoid colon
- Descending colon: inferior part
- Left ovary & uterine tube
- Left ureter & urinary bladder (if full)
- Left spermatic cord



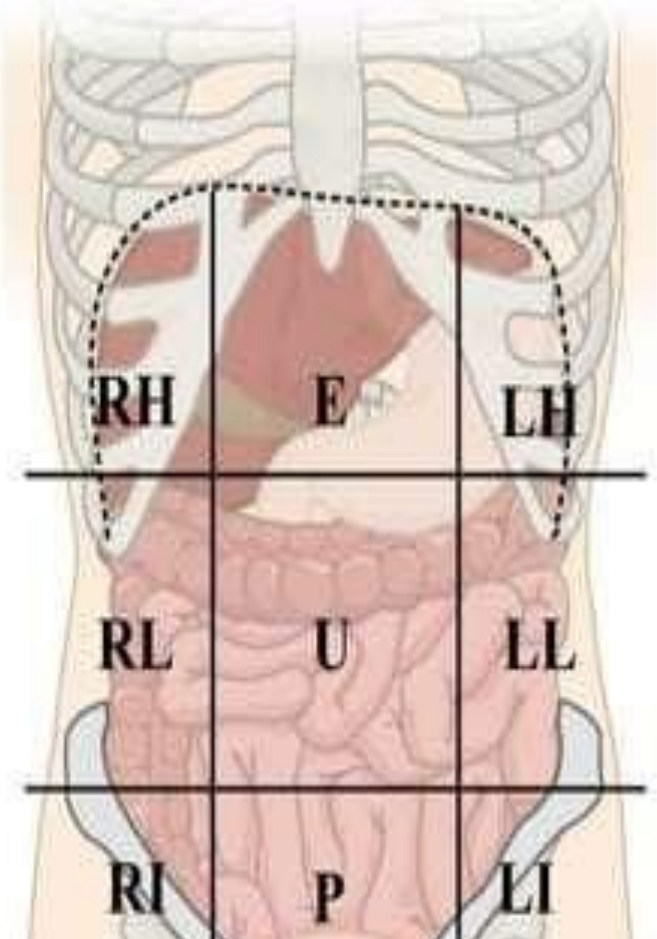
RH: Right Hypochondrium

- Liver
- Gallbladder
- Small intestine
- Ascending colon
- Transverse colon
- Right kidney



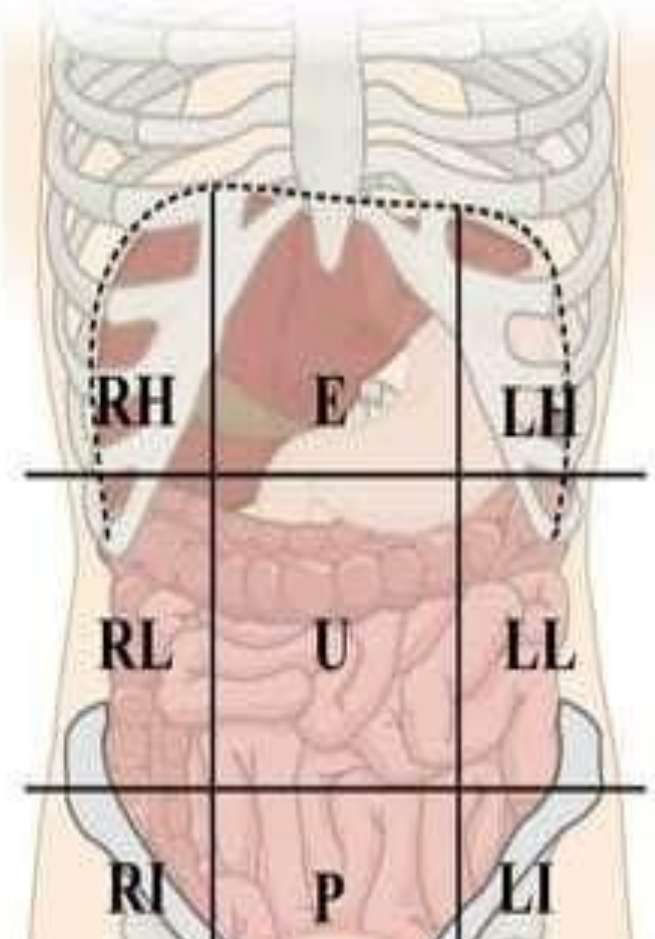
LH: Left Hypochondrium

- Stomach
- Top part of the left lobe of the liver
- Left kidney
- Spleen
- Tail of pancreas
- Transverse colon
- Descending colon



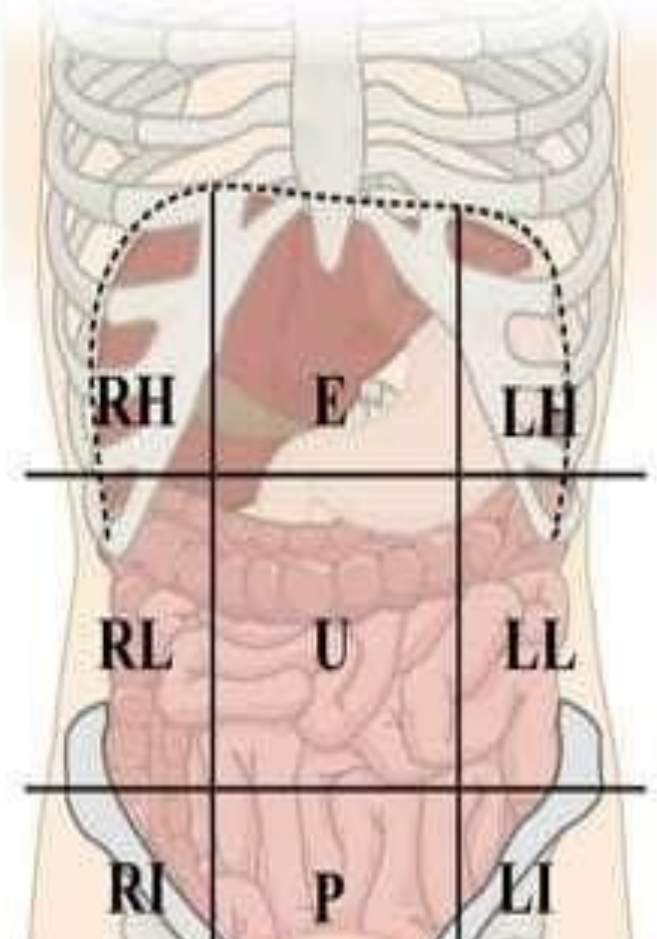
E: Epigastric

- Oesophagus
- Stomach
- Liver
- Spleen
- Pancreas
- Right and left suprarenal glands
- Small intestine



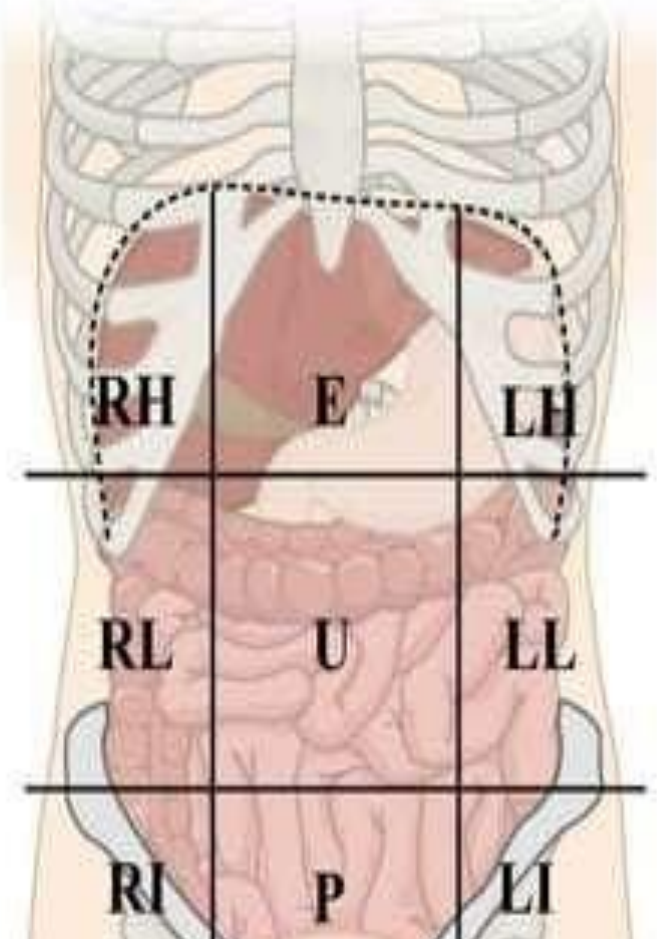
RL: Right Lumbar

- Tip of the liver
- Gallbladder
- Small intestine
- Ascending colon
- Right kidney



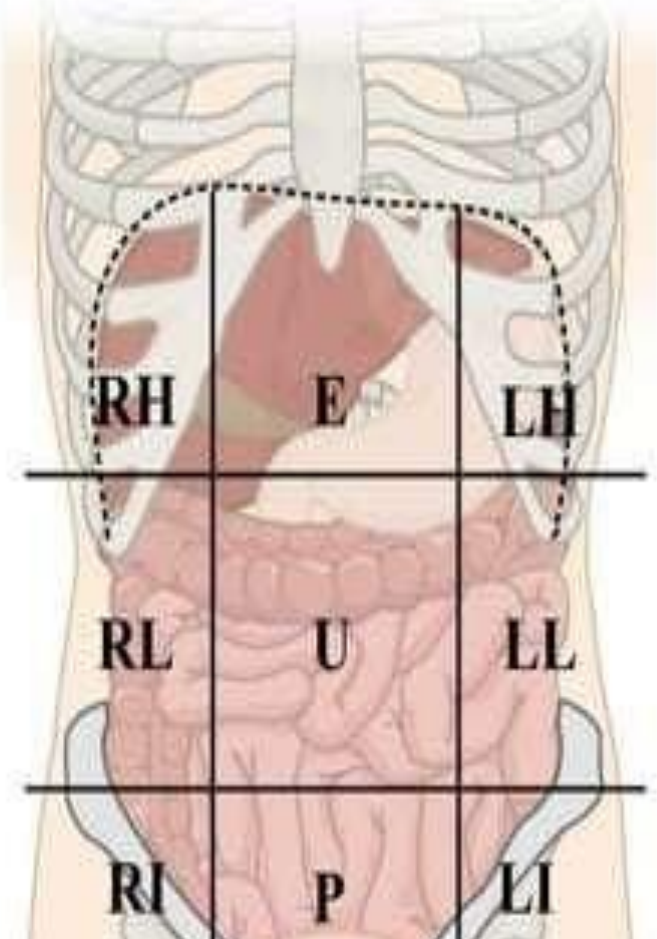
LL: Left Lumbar

- Portion of small intestine
- Part of descending colon
- Tip of left kidney



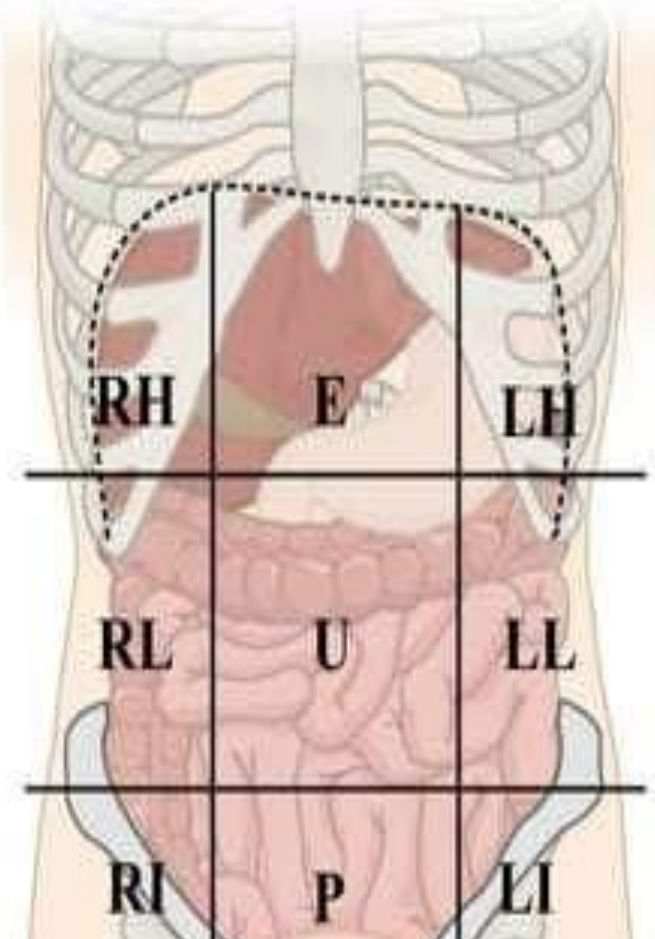
U: Umbilical

- Stomach
- Pancreas
- Small intestine
- Transverse colon
- Right and left ureters
- Cisterna chyli



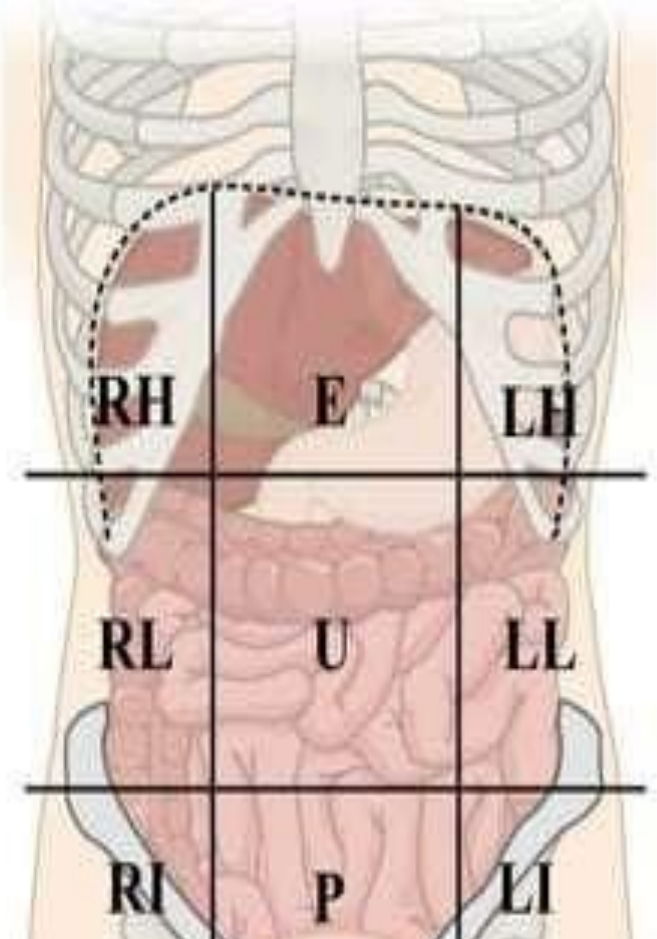
RI: Right Inguinal

- Small intestine
- Appendix
- Cecum
- Ascending colon
- Right ovary and uterine tube
- Right spermatic cord



LI: Left Inguinal

- Part of the small intestine
- Descending colon
- Sigmoid colon
- Left ovary and uterine tube
- Left spermatic cord



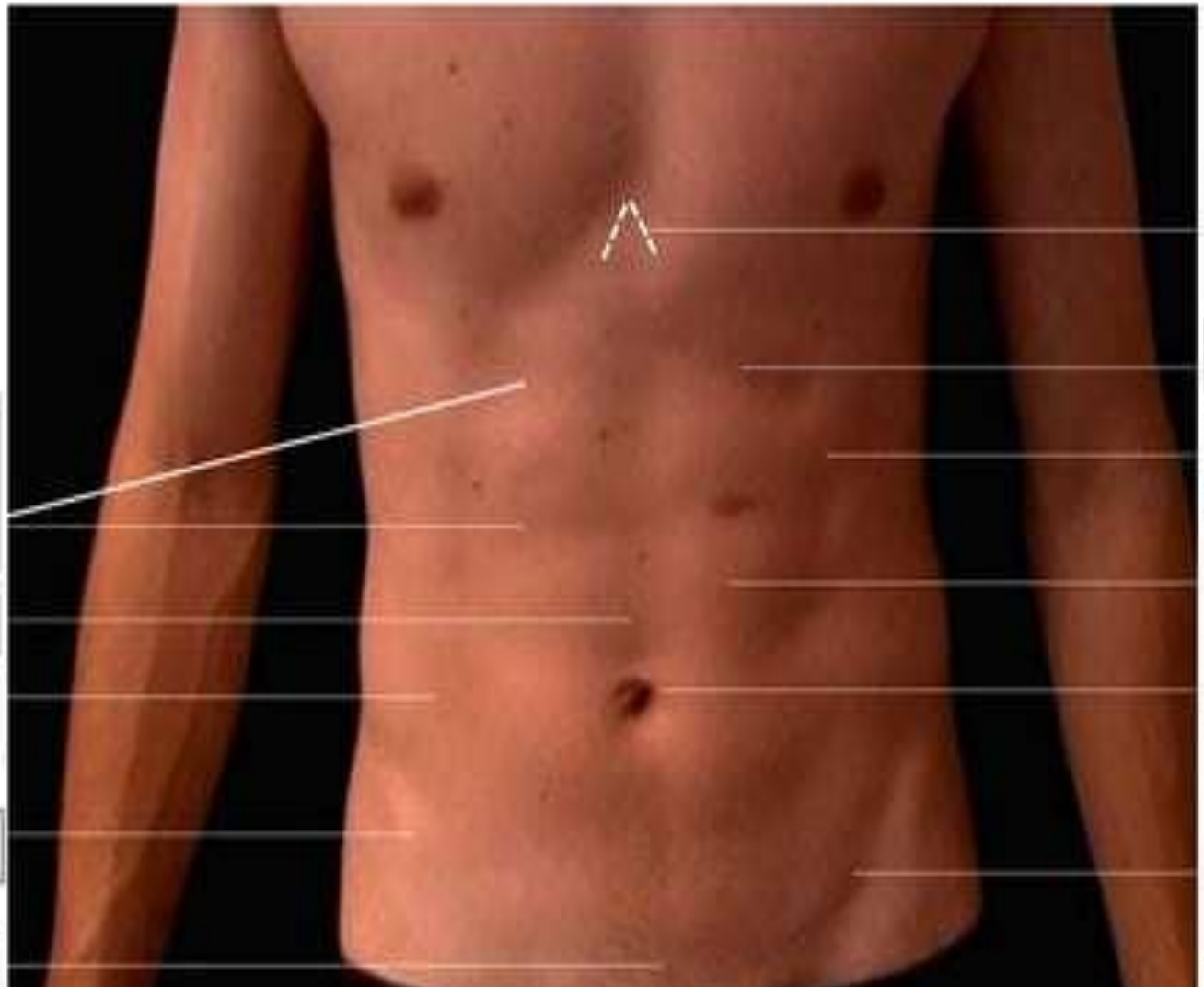
Surface of the trunk

→**Superiorly** – xiphisternal joint and costal margin

→**Inferiorly** – symphysis pubis, inguinal folds, and iliac crest

→**Posteriorly** – lumbar paravertebral musculature

Surface Landmarks of the Abdomen



Surface landmarks of abdomen

1. Xiphoid process
2. Costal margin
3. Iliac crest
4. Pubic symphysis
5. Linea alba
6. Linea semilunaris
7. Umbilicus

Surface landmarks of abdomen

Xiphoid process

- Thin cartilaginous, lower part of the sternum
- Easily palpated in the depression where the costal margins meet in the upper part of the anterior abdominal wall
- Xiphisternal joint

Surface landmarks of abdomen

Costal margin

- The curved lower margin of the thoracic wall formed **anteriorly** by the cartilages of the *7th*, *8th*, *9th*, & *10th ribs* and **posteriorly** by the cartilages of the *11th* & *12th ribs*
- Costal margin reaches its **lowest level** at the **10th costal cartilage** which lies opposite the body of **L3 vertebra**

Surface landmarks of abdomen

Iliac crest

- When palpated can be felt along entire length
- Ends **anteriorly** at the anterior superior iliac spine and **posteriorly** at the posterior superior iliac spine
- Along the iliac spine, the outer margin projects to form tubercle of the crest lying at level of

Surface landmarks of abdomen

Pubic symphysis

- Cartilaginous joint lying in the midline between the bodied of the **pubic bones**

Surface landmarks of abdomen

Linea alba

- **Vertically running fibrous band** that lies in the midline extending from the pubic symphysis to the xiphoid process
- Linea alba is formed by **aponeuroses of the muscles** of the anterior abdominal wall and **represented by a slight median groove**

Surface landmarks of abdomen

Linea semilunaris

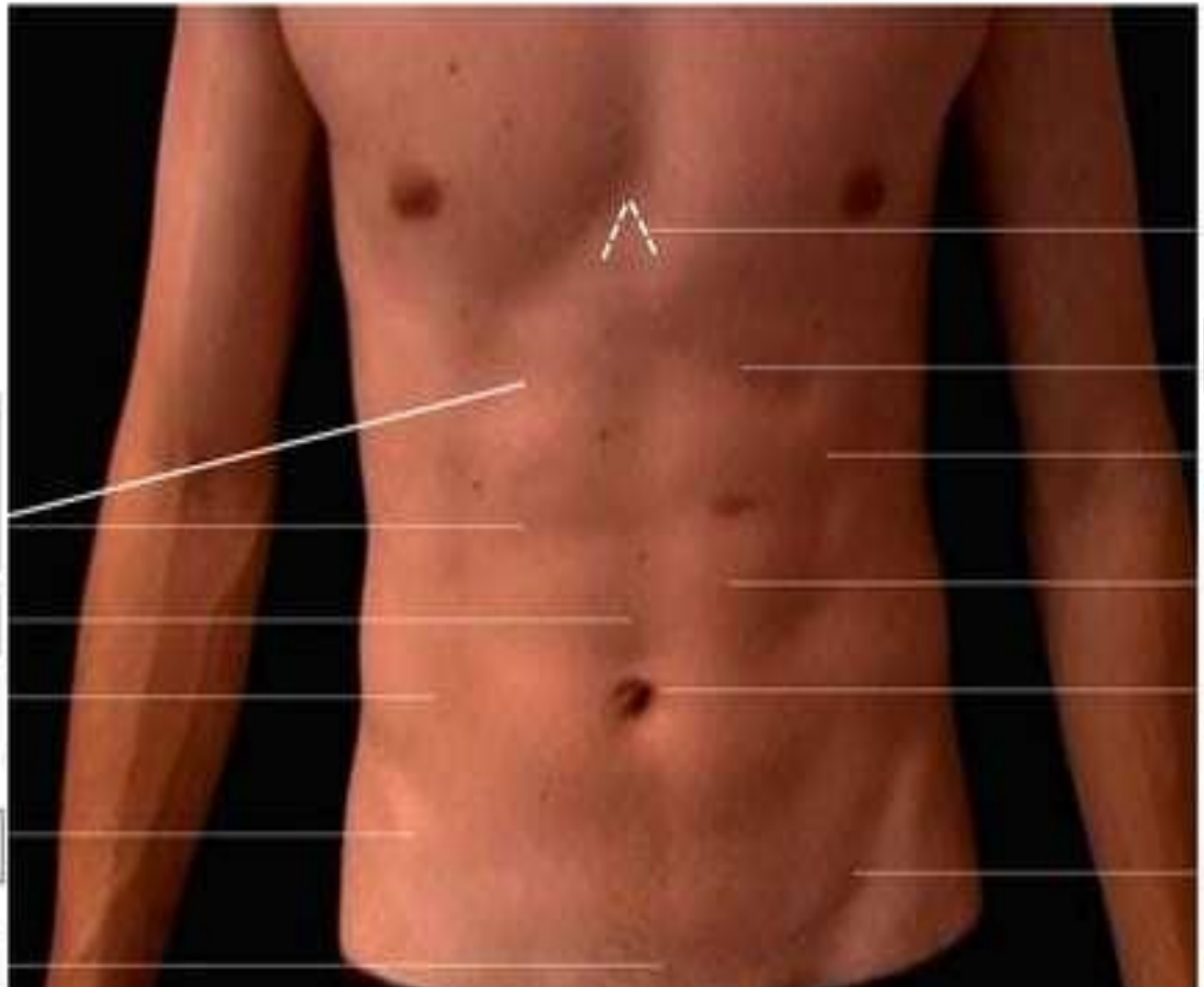
- **Lateral edge** of the rectus abdominis muscle
- To **accentuate the semilunar lines**, the patient is asked to lie on the back and raise off the shoulder without using the arms
- To accomplish this, patient **contracts rectus abdominis muscles** to allow the lateral edges

Surface landmarks of abdomen

Umbilicus

- Lies in the linea alba and normally inverted
- Umbilicus is a scar that represents site of attachment of the umbilical cord in fetus

Surface Landmarks of the Abdomen



Clinical association: Superficial reflexes

Cremasteric reflex

- Stroking the skin of the medial side of the thigh evokes a reflex **contraction of cremaster**, which elevates the ipsilateral testis in males
- Reflex is mediated by **genitofemoral nerve** [L1 and L2 nerve roots]

Clinical association: Superficial reflexes

Superficial abdominal reflex

- Stroking each of the four **quadrants of the anterior abdominal wall** normally elicits a visible contraction of ipsilateral abdominal muscle
- Reflex used to **localise lesions** in the spinal cord

Questions

During an appendectomy, the surgical resident asked an attending senior medical student the following questions:

a. Which abdomen quadrant and region will you find the appendix?

b. When making a transverse incision in the anterolateral abdominal wall for an appendectomy, what nerve must be identified

Questions

A young man who was thrown from his motorcycle complained of sharp pain on his left side and held his hand over his lower ribs. Radiographic studies revealed fractures of the 10^{th} & 11^{th} ribs:

a. What abdominal organ was most likely injured?

b. Why is this organ so vulnerable to injury?