Gross Anatomy of Kidney - I

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Kidneys
Learning objectives

At the end of this teaching session all the students should be able to:

- Describe the location, dimensions and axis of the kidneys
- Enumerate & describe the parts and external features
- Describe and diagrammatically display the anterior & posterior relations
- Enumerate the coverings of the kidneys
- Discuss the horizontal and vertical tracing of renal fascia
- Locate the renal angle
- Enumerate the supports of kidney
Kidneys - functions

1. They maintain **water balance, acid base balance, electrolyte balance**

2. They help to remove toxic metabolic waste eg. urea, creatinine

3. Produces hormones-
   - renin - regulation of blood flow & blood pressure
   - erythropoietin – maturation of red blood cells
   - 1' 25' hydroxycholecalciferol – control of calcium metabolism
Location

- paired viscera
- on posterior abdominal wall
- retroperitoneal
- right is lower than left
- vertebral extent---T12 – L3
- descends about 2 cm with inspiration
Shape, Dimensions and Axis

- Bean shaped
- Length - 12 cm
- Width - 6 cm
- Thickness - 3 cm

- Long axis – downwards and laterally
- Transverse axis – laterally backwards
  (hilum faces forwards)
Parts of Kidneys

- **2 ends**
  - Upper pole
  - Lower pole

- **2 borders**
  - Lateral border
  - Medial border (with special feature called hilum)

- **2 surfaces**
  - Anterior surface
  - Posterior surface
Poles of kidney

- **Upper pole** –
  - at the level of T 12
  - Related to suprarenal gland

- **Lower pole** –
  - at the level of L 3

Diagram showing distance of upper pole, hilum & lower pole from median plane
Borders of kidney

Lateral border:
- Convex, thicker, more posteriorly placed

Medial border –
- Convexocancavoconvex
- Hilum in the middle – at the level of L1
Hilum of the kidney

Structures at HILUM:

- Anterior to posterior
  - Renal vein
  - Renal artery
  - Pelvis of ureter

_gateway to the kidneys_

_5 cm from median plane_

_arrangement of structures at the hilum helps to identify anterior from posterior_
Anterior Surface of Kidney

- Convex
- Directed forwards & laterally
- Relations differ on both sides
- Partially covered with peritoneum

Anterior relations of Left Kidney

Anterior relations of Right Kidney

Suprarenal gland

Spleen

Jejunum

Pancreas

Liver

Splenic flexure of colon

2nd part of duodenum

Hepatic flexure of colon

Jejunum
Posterior Surface of Kidney

**Flat**
- Directed backwards & medially, Non-peritoneal

**Relations-**
- 4 muscles
- 3 nerves
- Subcostal vessels
- Ribs: 12th on right, 11th & 12th on left
Coverings of Kidney

*inside out the coverings are:*

1. Fibrous capsule (True capsule)
2. Perinephric Fat
3. Renal fascia / Fascia of Gerota (False capsule)
4. Paranephric Fat
1. Fibrous capsule

- Condensation of stroma
- Covers entire kidney:
  - Lines renal sinus
  - Ensheaths pelvis of ureter, major calyces & minor calyces
- Can be stripped off from healthy kidney
- CLINICAL SIGNIFICANCE
  - Nephropexy
  - Decapsulation
2. Perinephric Fat

- Outside the true capsule
- Fills the RENAL SINUS
3. Renal fascia/ Fascia of Gerota (False Capsule)

Anterior layer – Fascia of Toldt
Posterior Layer – fascia of Zuckercandl

Tracing the renal fascia

Horizontal Tracing

Vertical Tracing

Suprarenal gland
in separate compartment

Anterior

Posterior

Anterior
4. Paraneoplastic Fat

- Outside the renal fascia
  (false capsule)
- more abundant posteriorly
Renal Angle

- Angle between the lower border of the 12th rib and lateral border of erector spinae.
- It overlies the lower part of kidney.
- Tenderness can be felt in this area in case of perinephric abscess.
What supports the kidney?

1. Pressure exerted by surrounding viscera
2. Tone of abdominal muscles
3. Renal fascia & fat surrounding kidneys
4. Renal artery and vein which are attached at the hilum
Can the kidneys be palpated?

- Kidney: not palpable in normal adult.
- May be able to feel lower right kidney pole in very thin person.

Two hands - one on anterior abdominal wall, other in loin - BIMANUAL EXAMINATION