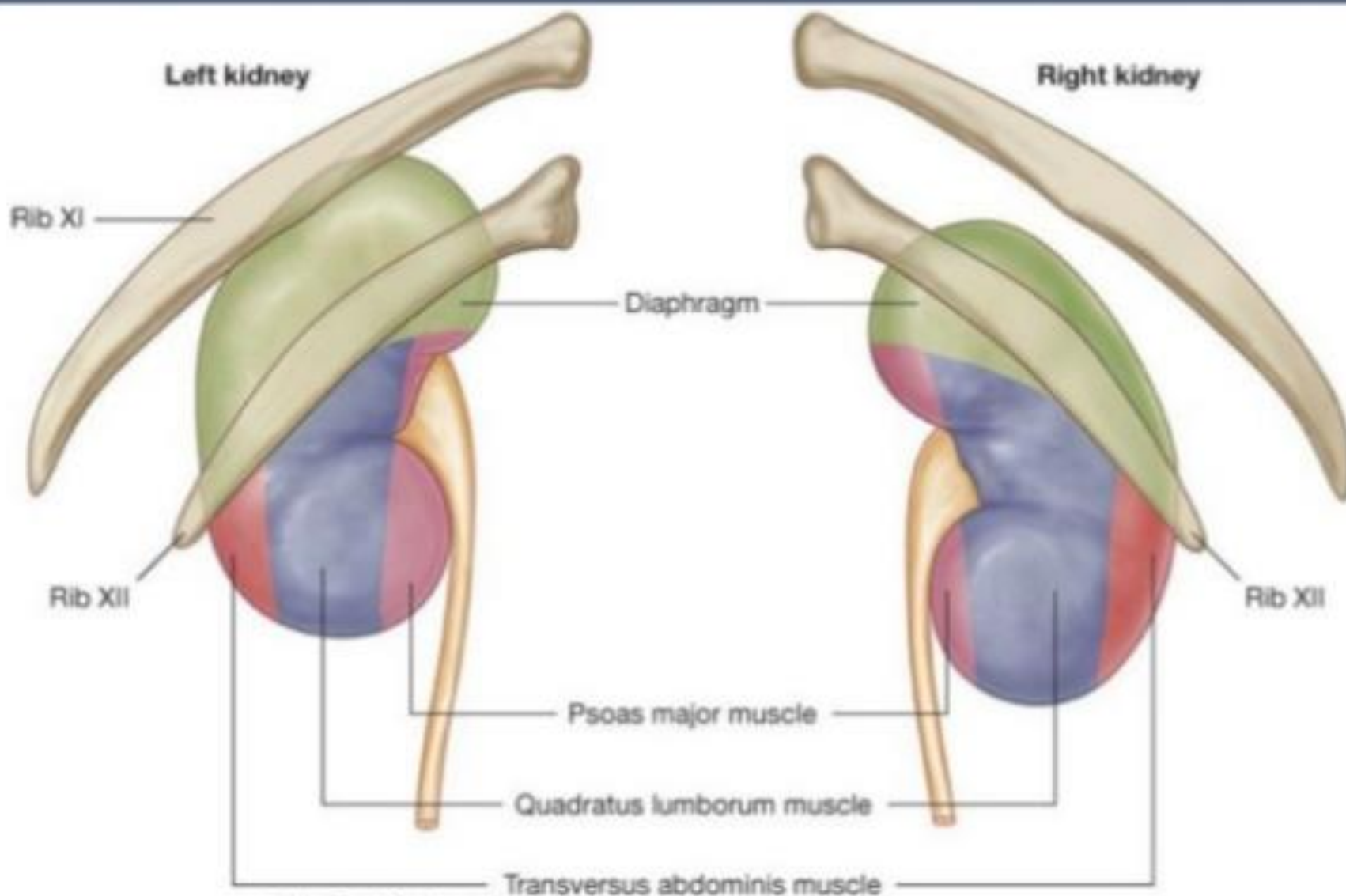


Radiology of Urinary system

Dr . Khush Bakht



Drake: Gray's Anatomy for Students, 2nd Edition.

Copyright © 2009 by Churchill Livingstone, an imprint of Elsevier, Inc. All rights reserved.

Figure 4.137 Structures related to the posterior surface of each kidney.

Modalities of Renal Imaging

- Plain Xray KUB
- Ultrasound KUB
- CT KUB
- IVU
- MCUG
- RUG
- MRI

Kidneys, Ureters and Urinary Bladder Tract

- ▣ Kidneys are retroperitoneal organs
- ▣ Their function is to maintain electrolyte homeostasis and waste excretion
- ▣ They empty medially into the ureters
- ▣ Ureters course inferiorly into the pelvis and enter the urinary bladder
- ▣ The urine is temporarily stored in the urinary bladder till it is cleared to the exterior through the urethra

Kidneys

- On either side of the lower thoracic and upper lumbar spine
- Usual location – between upper border of 12th thoracic vertebra and lower border of 3rd lumbar vertebra
- In upright position the kidneys descend by 2 or 3 cm
- Both kidneys move with respiration

Kidneys

▢ Features:

▢ Bean shaped

▢ Two poles –

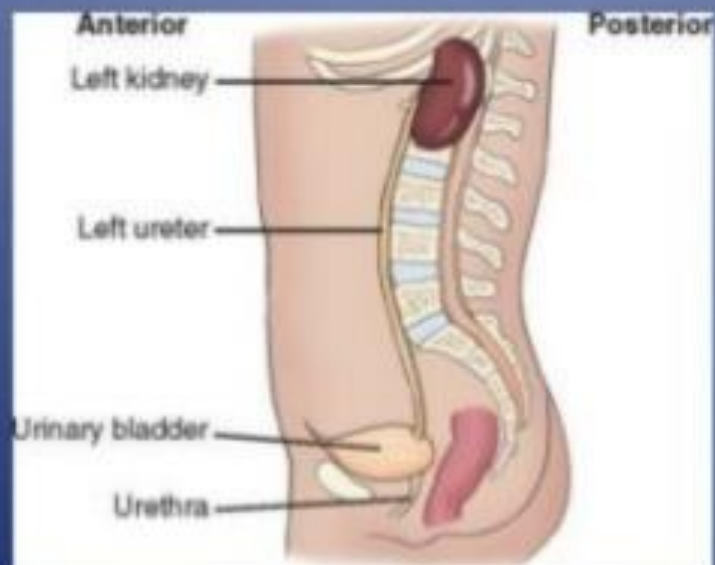
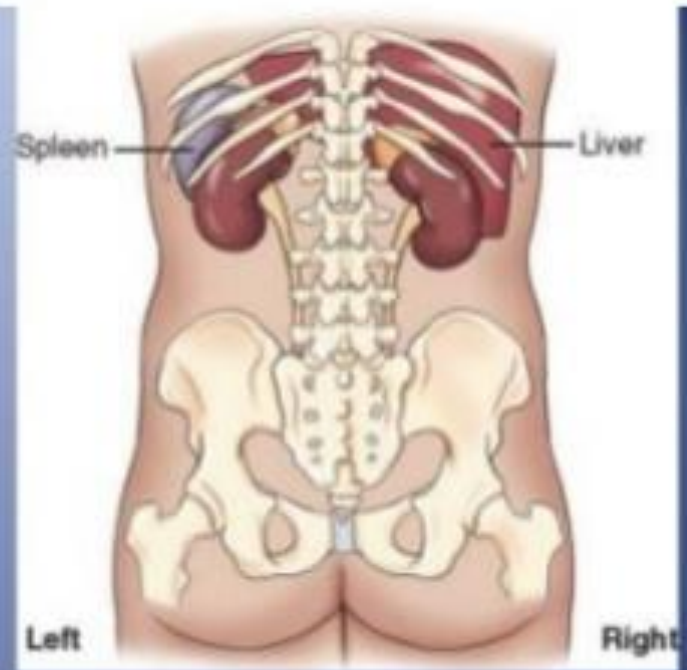
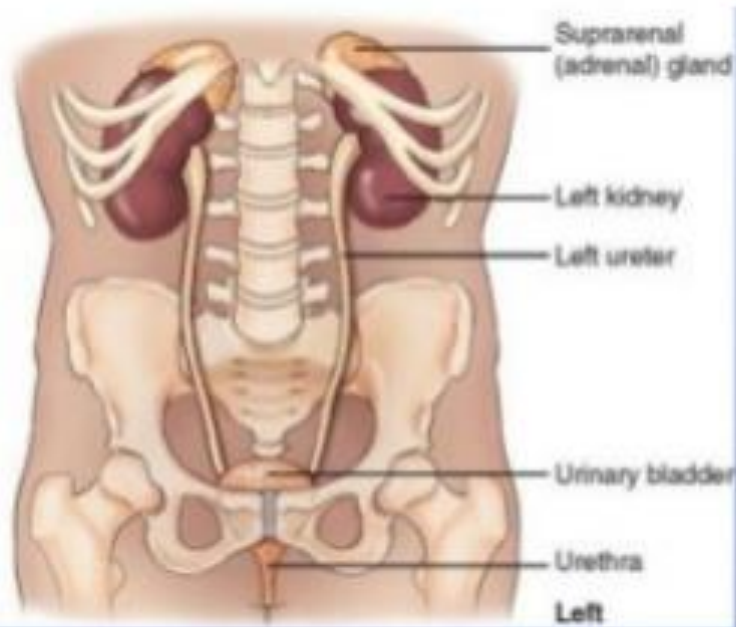
- Upper – broad due to presence of adrenal glands
- Lower – pointed

▢ Two borders

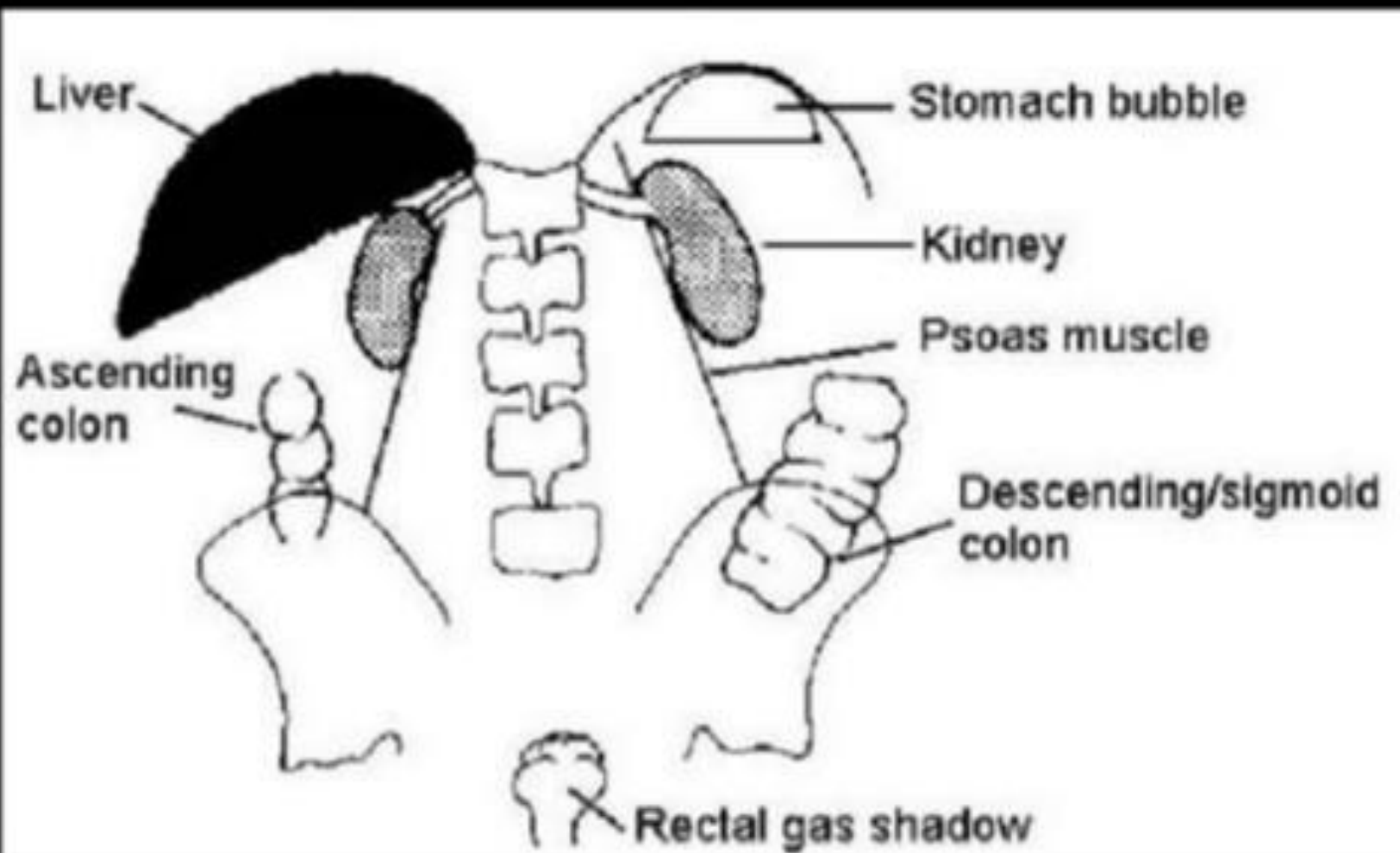
- Lateral – convex
- Medial – concave with hilum in the middle

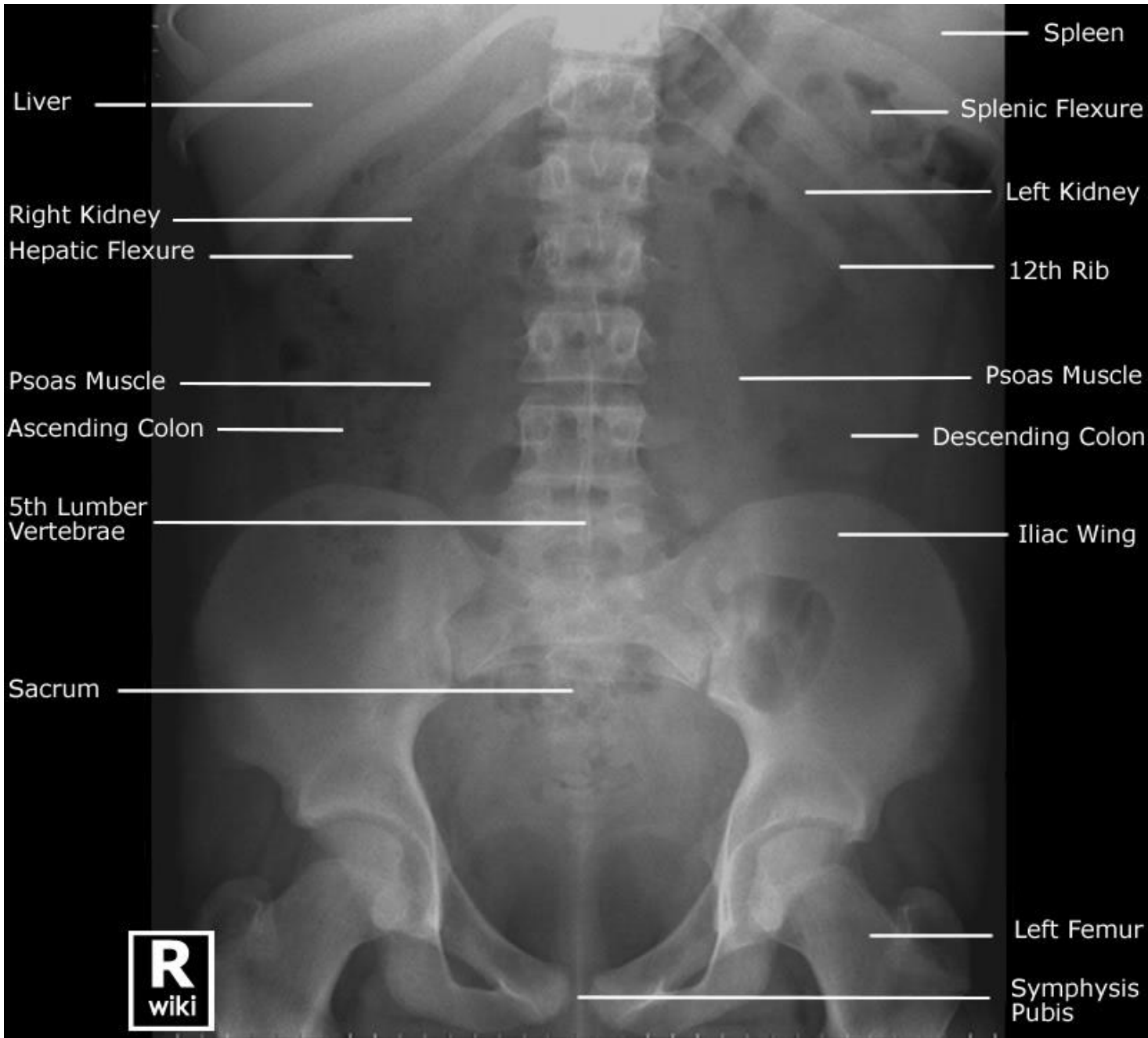
▢ Two surfaces

- Anterior – irregular
- Posterior - flat

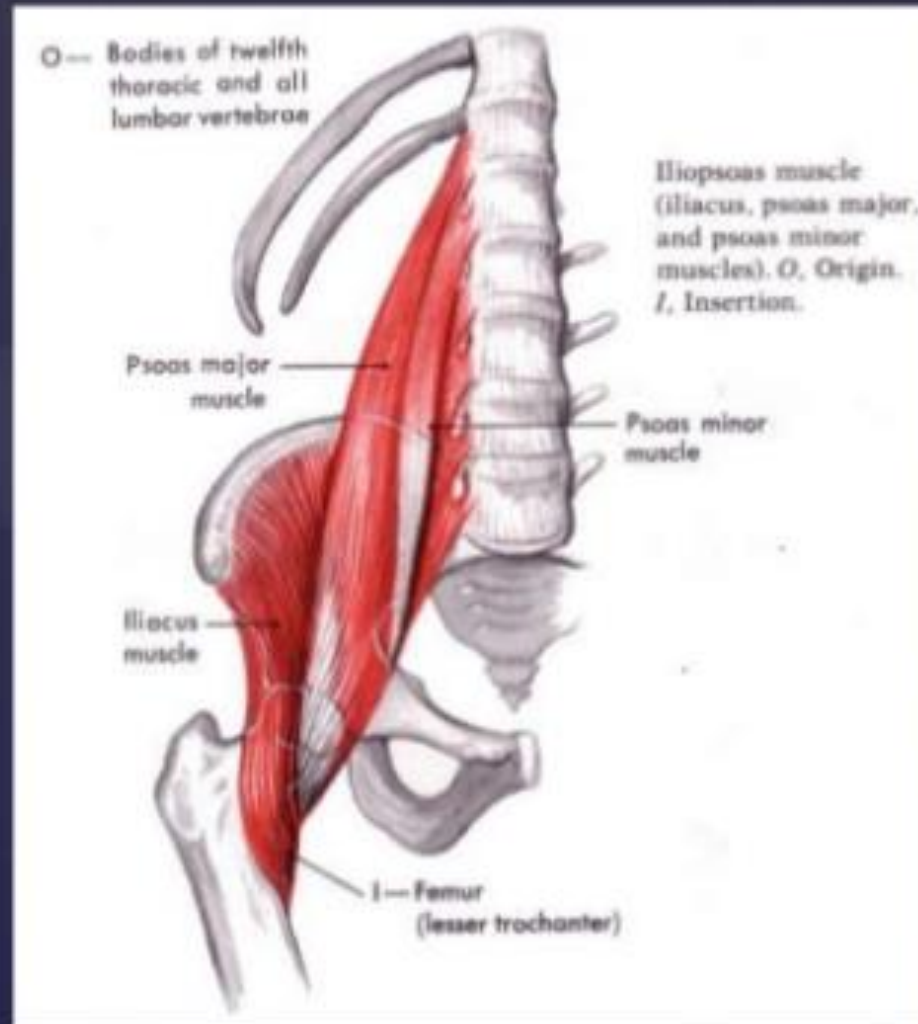


Anatomy, the basics





Psoas muscle



Anatomy on Abdominal X-Ray



Stomach Shadow

Spleen

Splenic flexure

Liver

Transverse colon

Hepatic flexure



valvulae conniventes



Splenic flexure

Haustra

Transverse colon

Faeces

F

VG



Kidneys are retroperitoneal organs and may be obscured by bowel loops



Kidneys

- Normal size – in adults 9-14 cm
- Right kidney is shorter than left kidney by not more than 1.5 cm
- As a rule – the length of the kidney is 3.7 ± 0.37 times the height of the 2nd lumbar vertebra measured on the same film using the posterior margin of the vertebral body

Intravenous Pyelogram shows Kidneys, Ureters and Urinary Bladder





Upper pole of left kidney is higher than the upper pole of right kidney.

Staghorn Calculus

- ▶ Stone occupying the renal pelvis and calyces
- ▶ Triple phosphate stone
- ▶ White in color, soft, smooth occurs in pre-existing infection.
- ▶ Unilateral/Bilateral



Internal Structure

- ▣ **Cortex** - two parts
 - Cortical arches – form caps over the bases of the pyramids
 - Renal columns of Bertin that dip between pyramids
- ▣ **Medulla** – about 27-30 conical masses called renal pyramids
 - Their apices form the renal papillae which indent the minor calyces
 - They discharge urine into the minor calyces
 - Bases are covered by cortical arches



Ultrasound is the best method to measure the size of the Kidney

Normal kidney

Longitudinal section



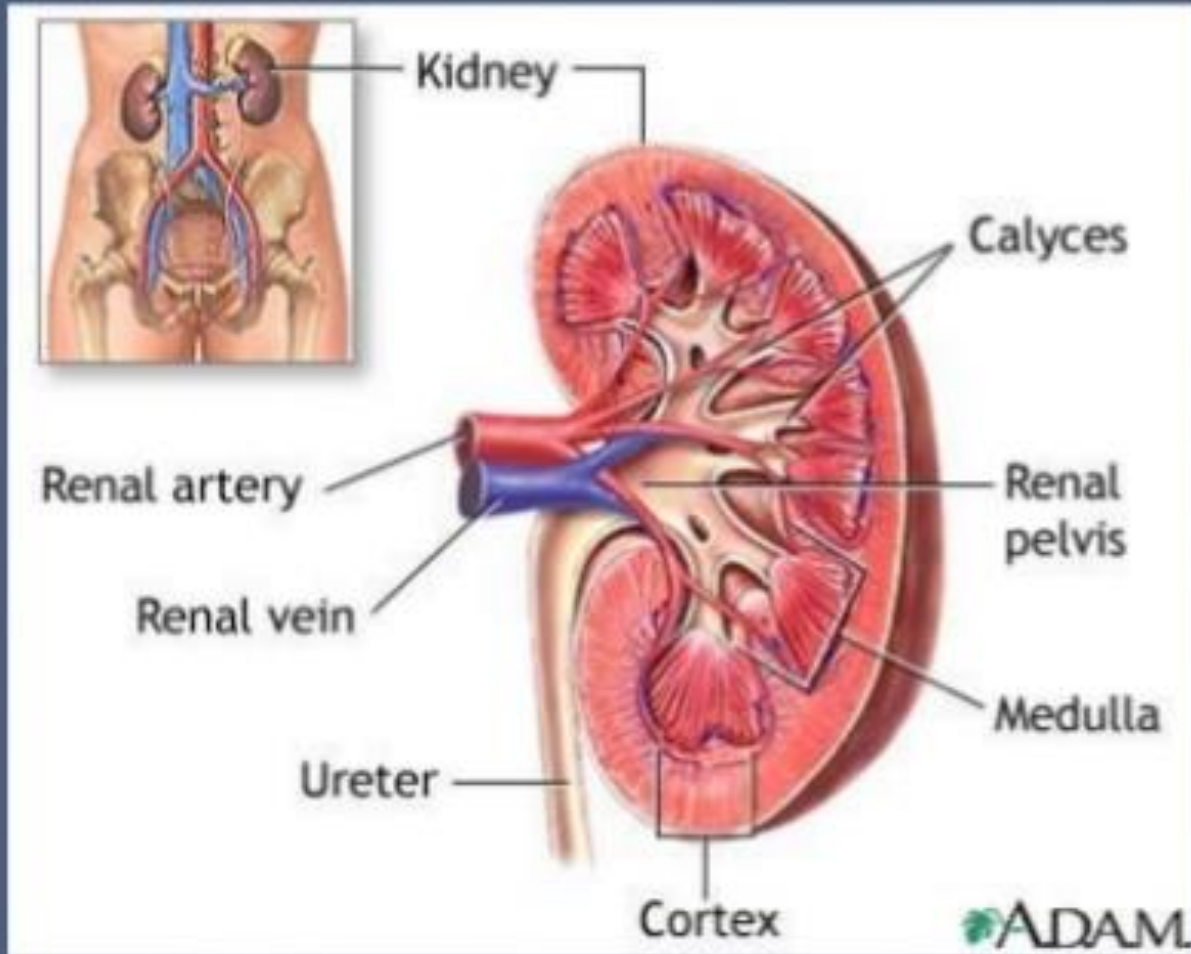
Cross section



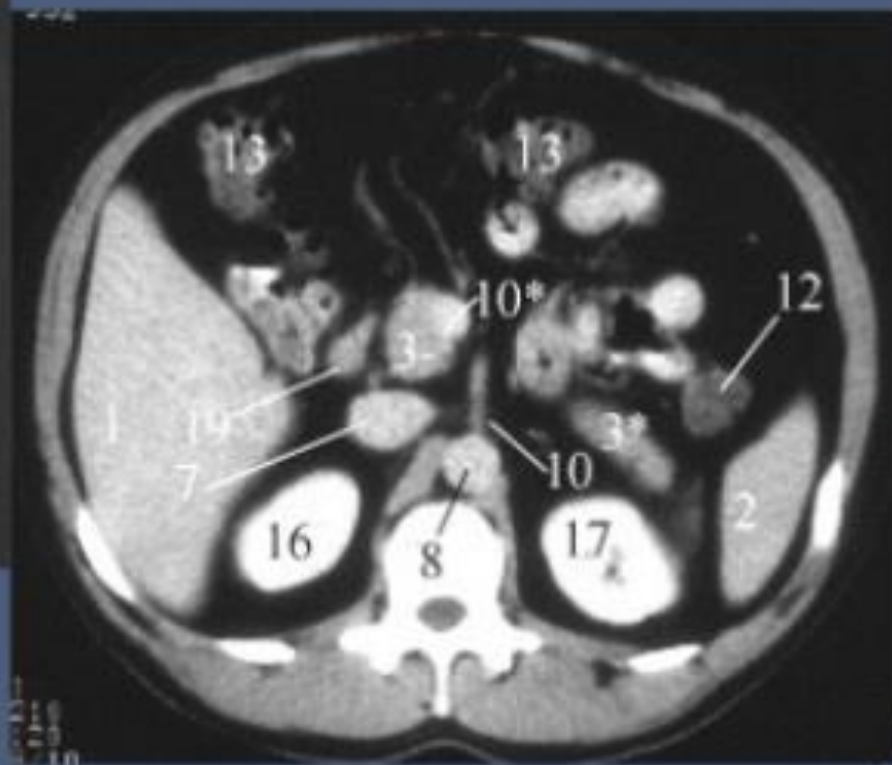
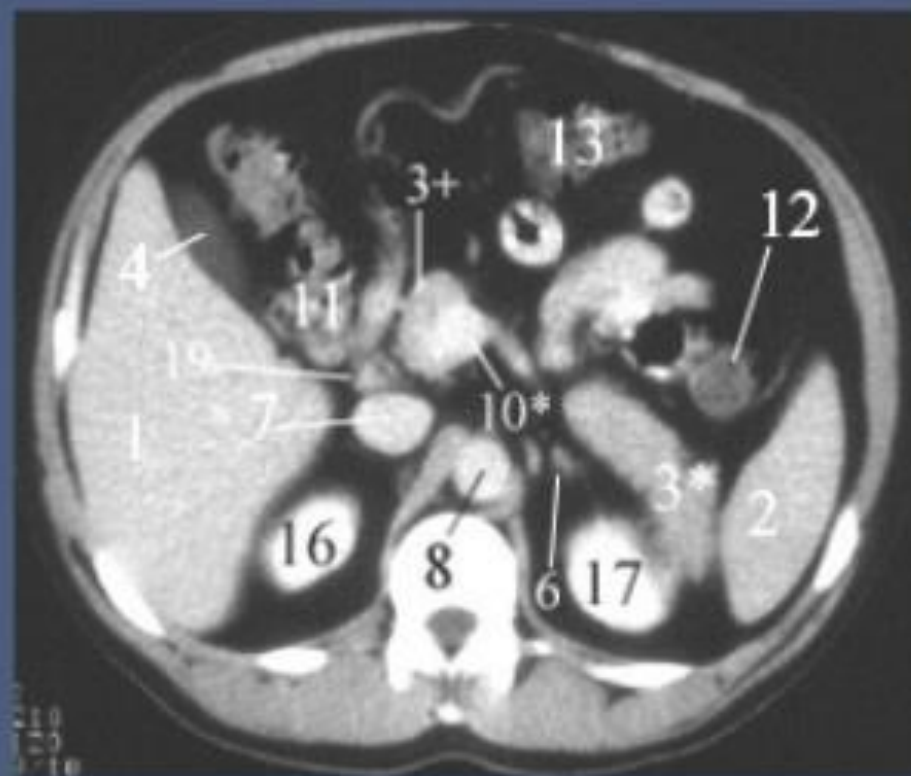
Renal capsule: echogenic line

Renal parenchyma: outer cortex & inner medulla pyramid

Central sinus complex: high echogenicity (vessels, fat, fibrous tissue)



CT Scan of the Kidneys



Capsules

Fibrous capsule –

- Covers the kidneys, may be separated from them

Perirenal fat –

- Layer of fat surrounding the fibrous capsule and also filling up area in the renal sinus

Renal fascia of Gerota-

- Fibroareolar sheath surrounding the kidney and perirenal fat

Pararenal fat –

- Fat that surrounds the renal fascia, more abundant posteriorly and at lower pole
- Fills up paravertebral gutter and forms a cushion for kidney

At this level the superior pole of the left kidney is seen.



Left kidney

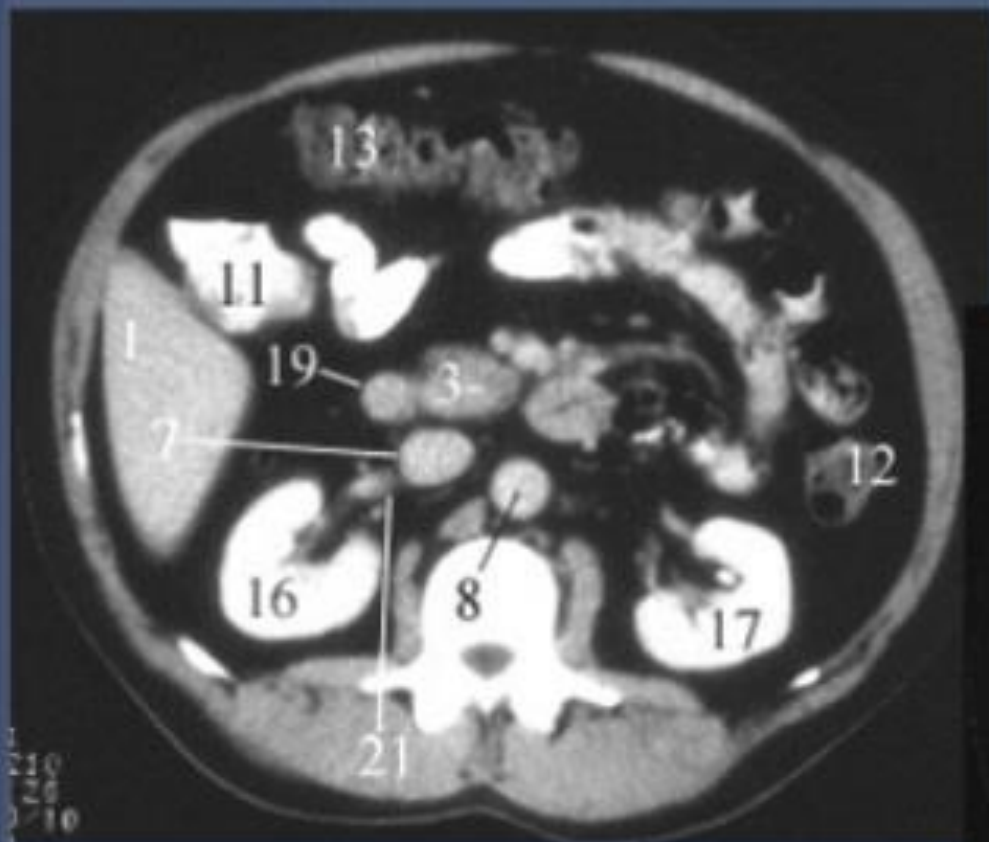
CT Scan showing
left kidney higher
than right



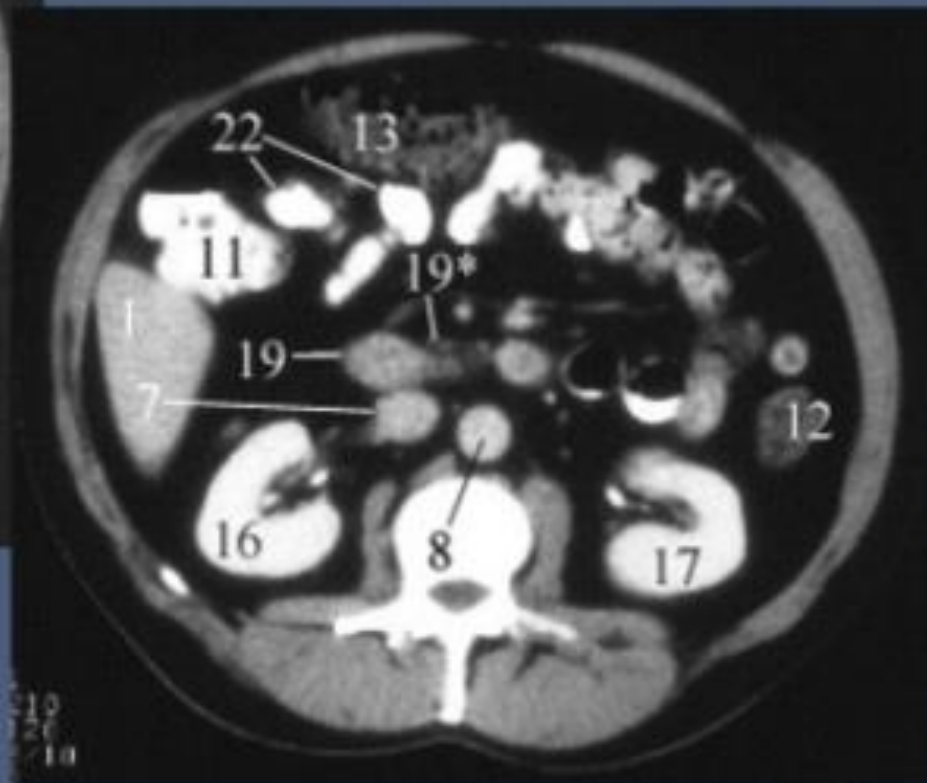
Kidneys are surrounded by perinephric fat. Fat appears dark in CT.



CT Scan of the Kidneys



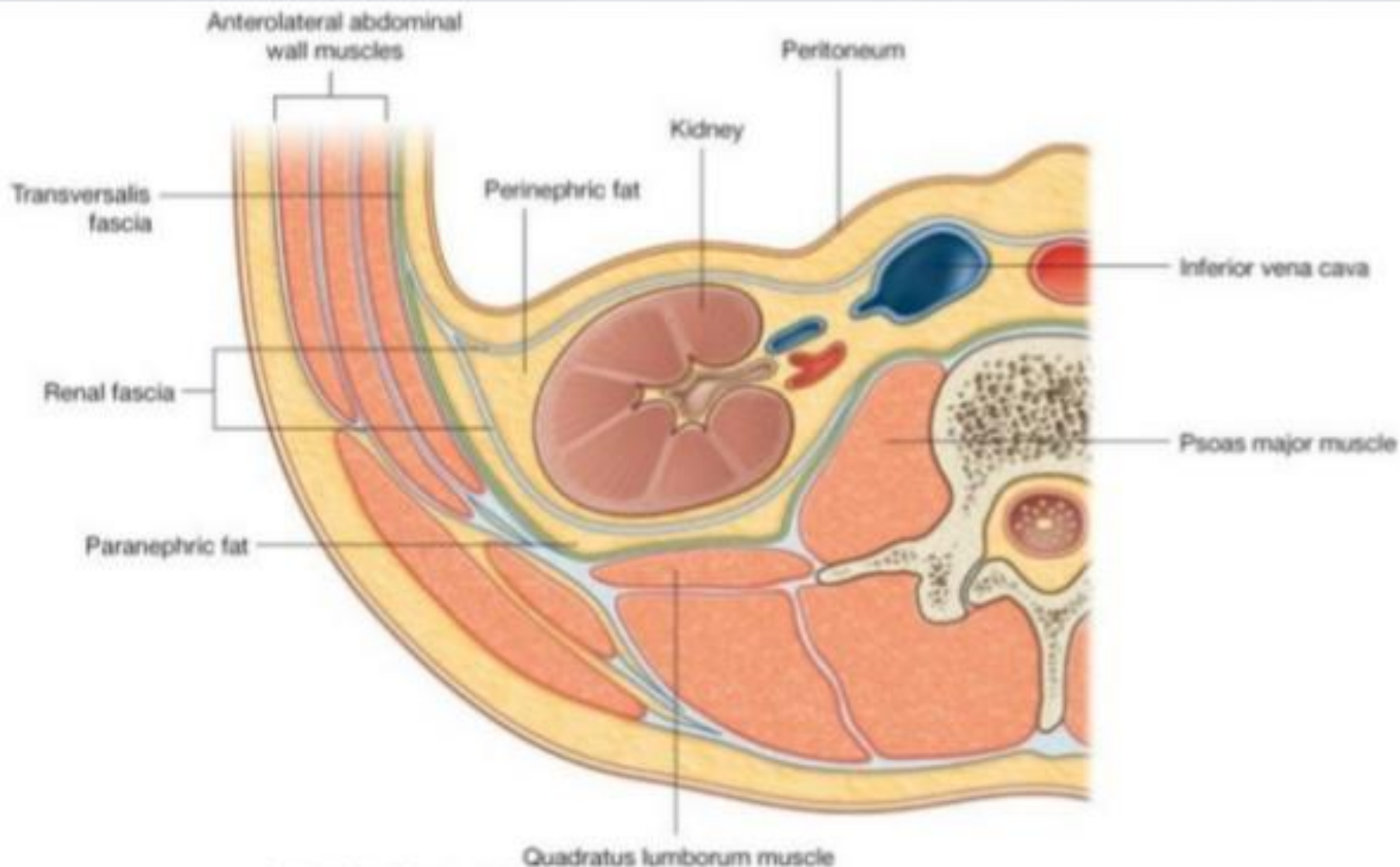
Corticomedullary- after 25 to 70 Sec
Nephrographic phase- 80 to 180 sec
Excretory phase – after 180 sec.



Spaces Around the Kidney

Perirenal Space – bounded by the leaves of the Gerota's fascia (fascia of Toldt + Zuckerkandl's fascia)

- The leaves fuse superiorly, laterally and medially
- It encloses the kidneys, adrenal glands, renal vasculature and proximal ureter
- The fascial envelope is functionally open caudally just above the pelvic brim
- Ureter emerges from the perirenal space and traverses caudad in anterior pararenal space
- Divided into multiple compartments by fibrous lamellae, the bridging septa. (posterior reno-renal bridging septum is one of the more constant of these.) Determine the distribution of blood, pus or urine collection.



Drake: Gray's Anatomy for Students, 2nd Edition.
 Copyright © 2009 by Churchill Livingstone, an imprint of Elsevier, Inc. All rights reserved.
Figure 4.138 Organization of fat and fascia surrounding the kidney.

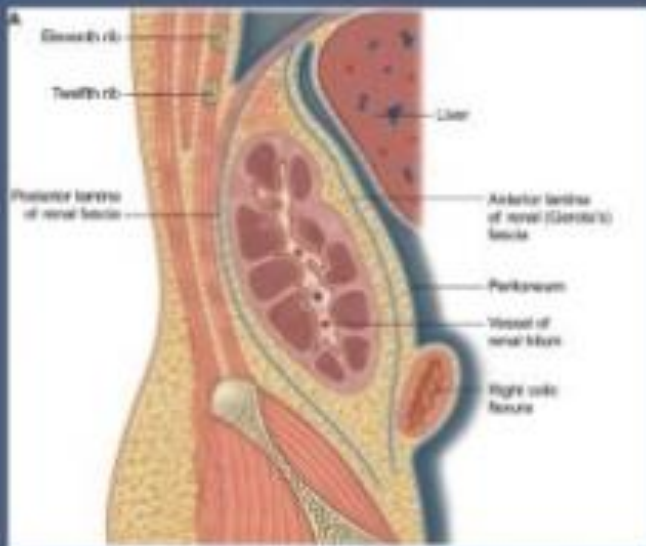
Spaces Around the Kidney

Anterior Pararenal Space- bounded

- Posteriorly by the anterior portion of the renal fascia,
- Anteriorly by the posterior parietal peritoneum
- Laterally by the lateral conal fascia
- Contains – pancreas, 2nd, 3rd and 4th portions of the duodenum, ascending and descending colon, vascular supply to the spleen, liver, pancreas and duodenum

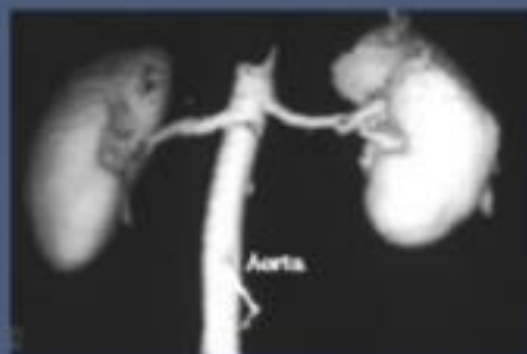
Spaces Around the Kidney

- **Posterior Pararenal Space** – bounded
 - Posteriorly by the transversalis fascia
 - Anteriorly by the posterior portion of Gerota's fascia
 - Contains only fat, scattered vessels and nerves
- **All three spaces potentially communicate at the pelvic brim**

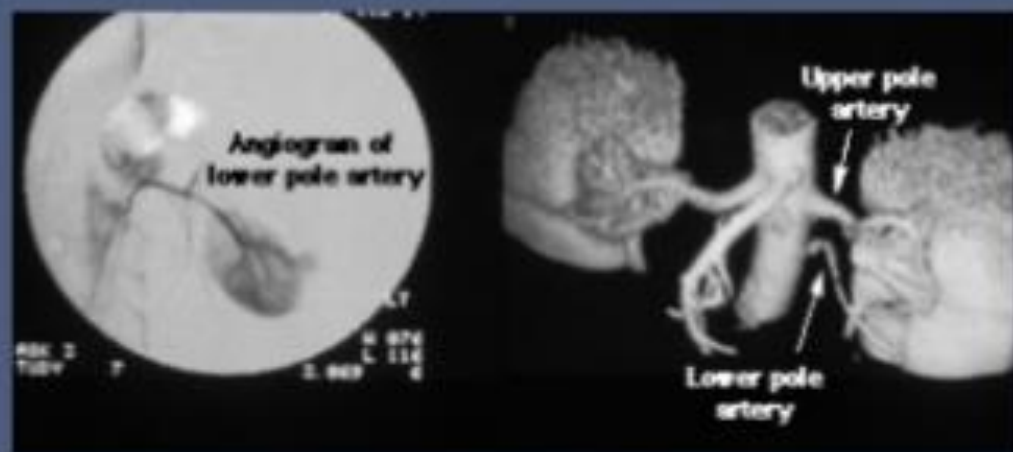


- The anterior and posterior layers fuse and adhere firmly to the diaphragmatic fascia above the adrenal gland.
- Laterally the layers fuse behind the ascending or descending colon to form the **LATEROCOCONAL FASCIA**.

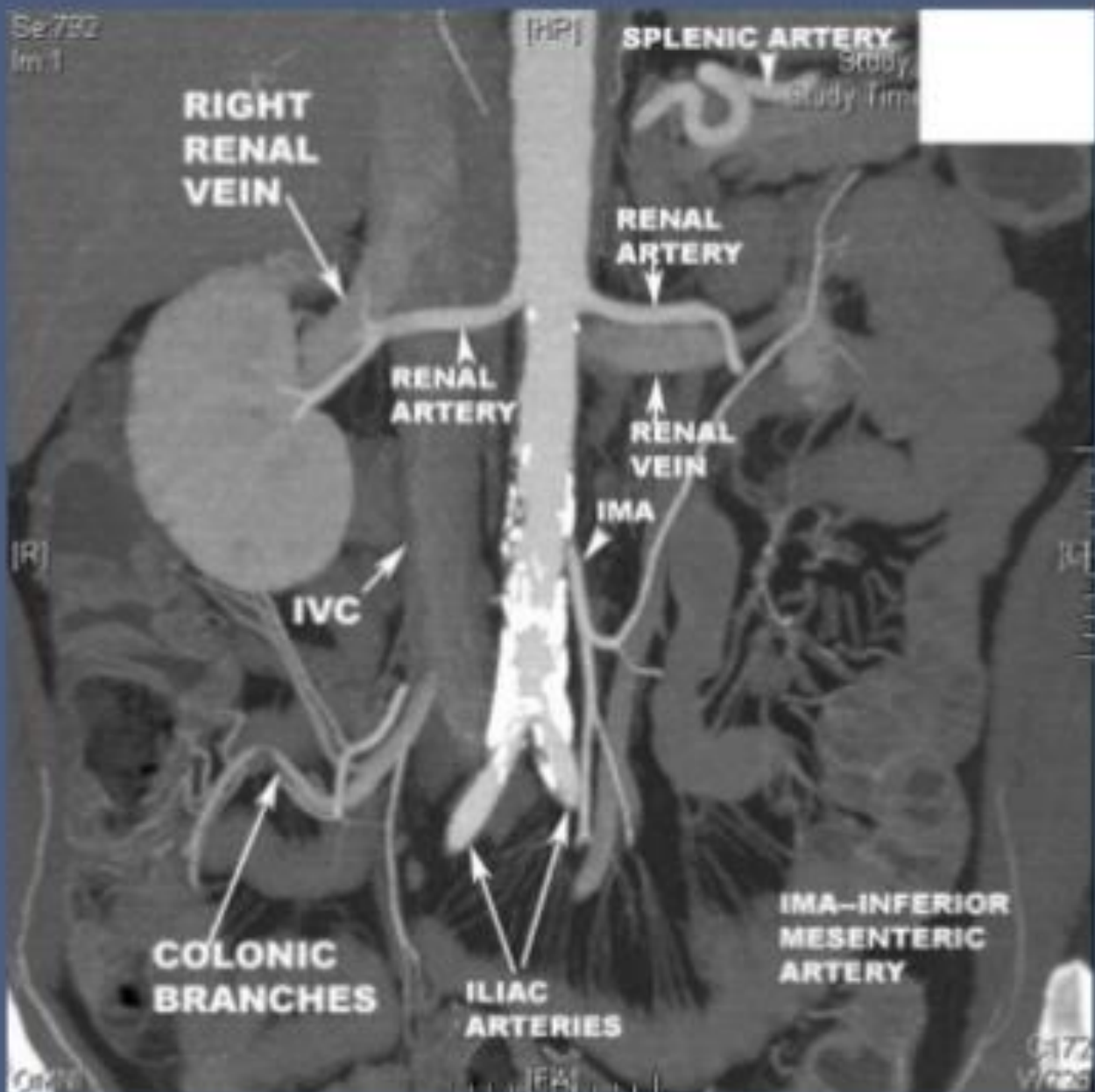
RENAL ANGIOGRAPHY



NORMAL
SUPPLY OF
BOTH KIDNEYS
BY SINGLE
RENAL ARTERY



LEFT
KIDNEY
SUPPLIED
BY TWO
RENAL
ARTERIES



Areas of Narrowing

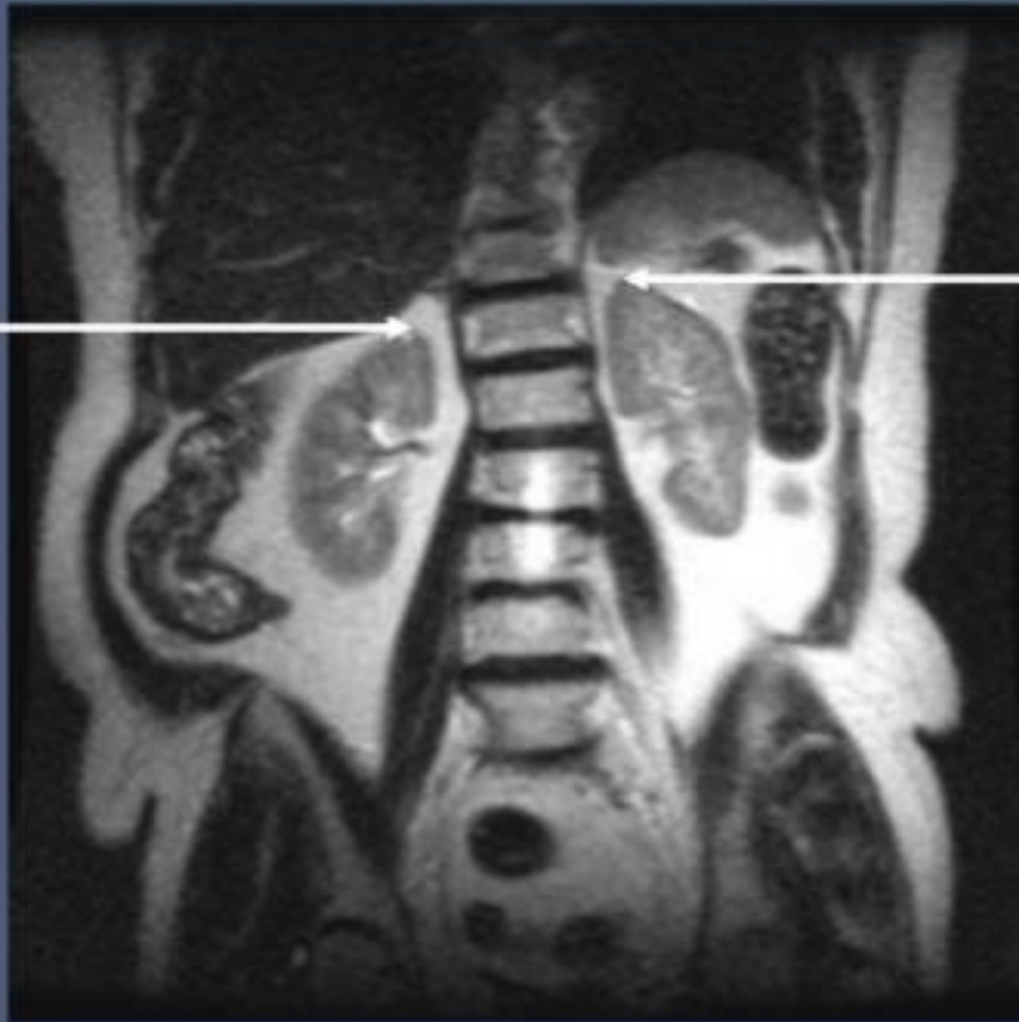
Three areas of normal narrowing:

- Ureteropelvic Junction
- Bifurcation of the iliac vessels
- Ureterovesicle Junction

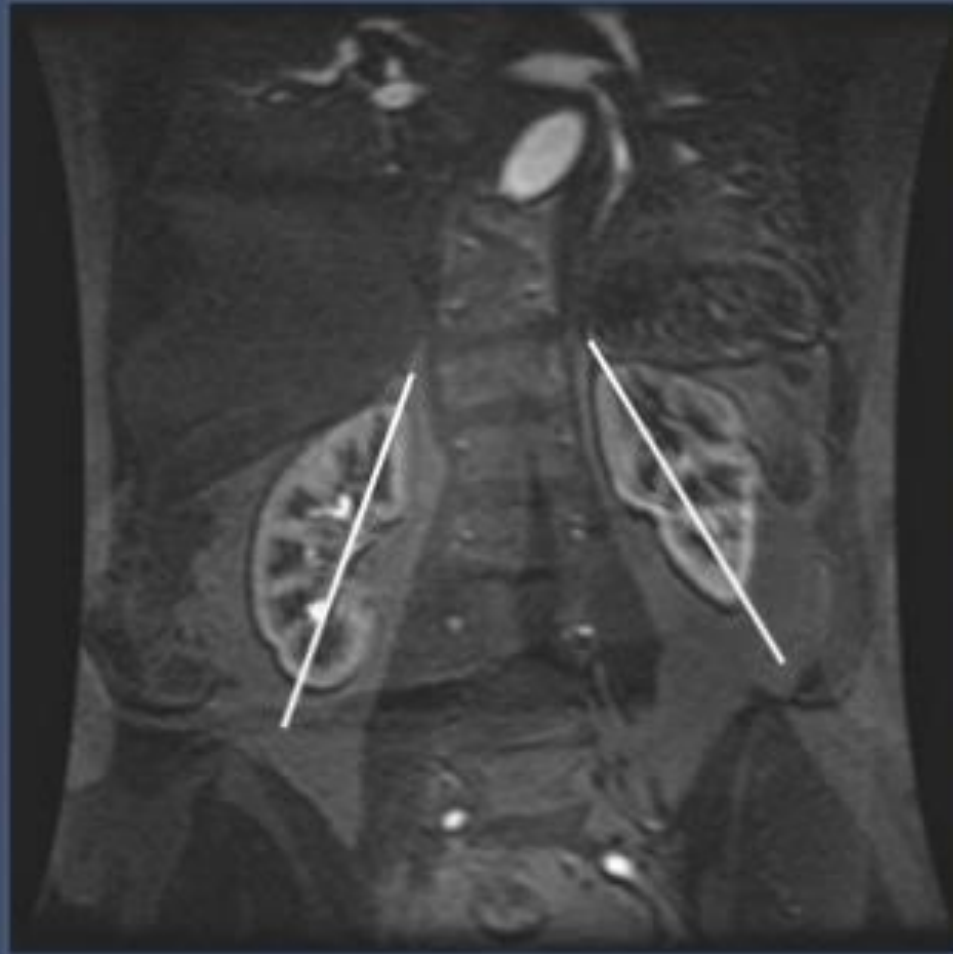
NOTE RELATIONSHIP OF URETERS TO PSOAS AND THE TRANSVERSE PROCESSES.



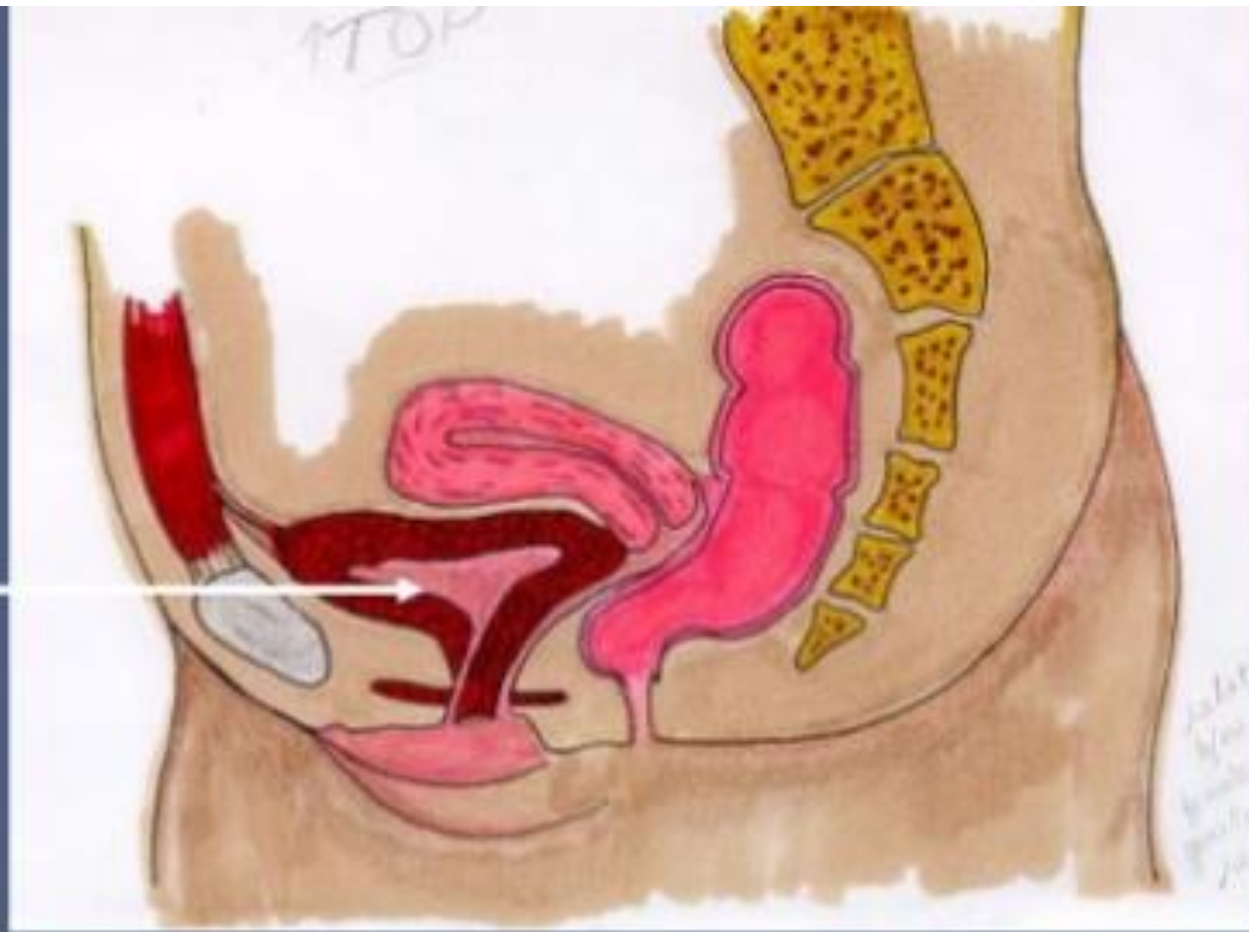




MRI showing Left Kidney is
higher than Right Kidney



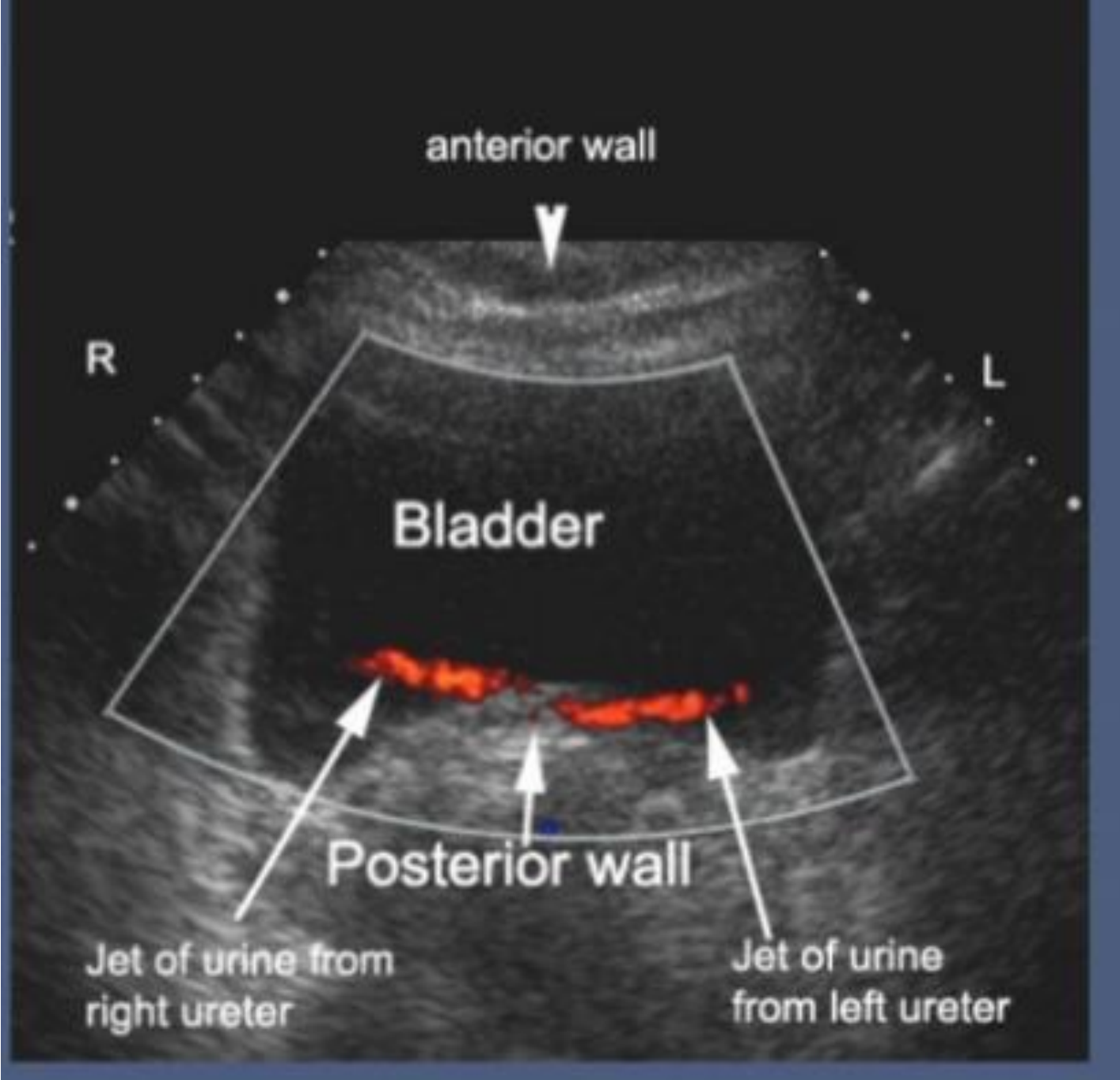
Long axis of the kidneys is directed downward and outward, parallel to the lateral border of the psoas muscles

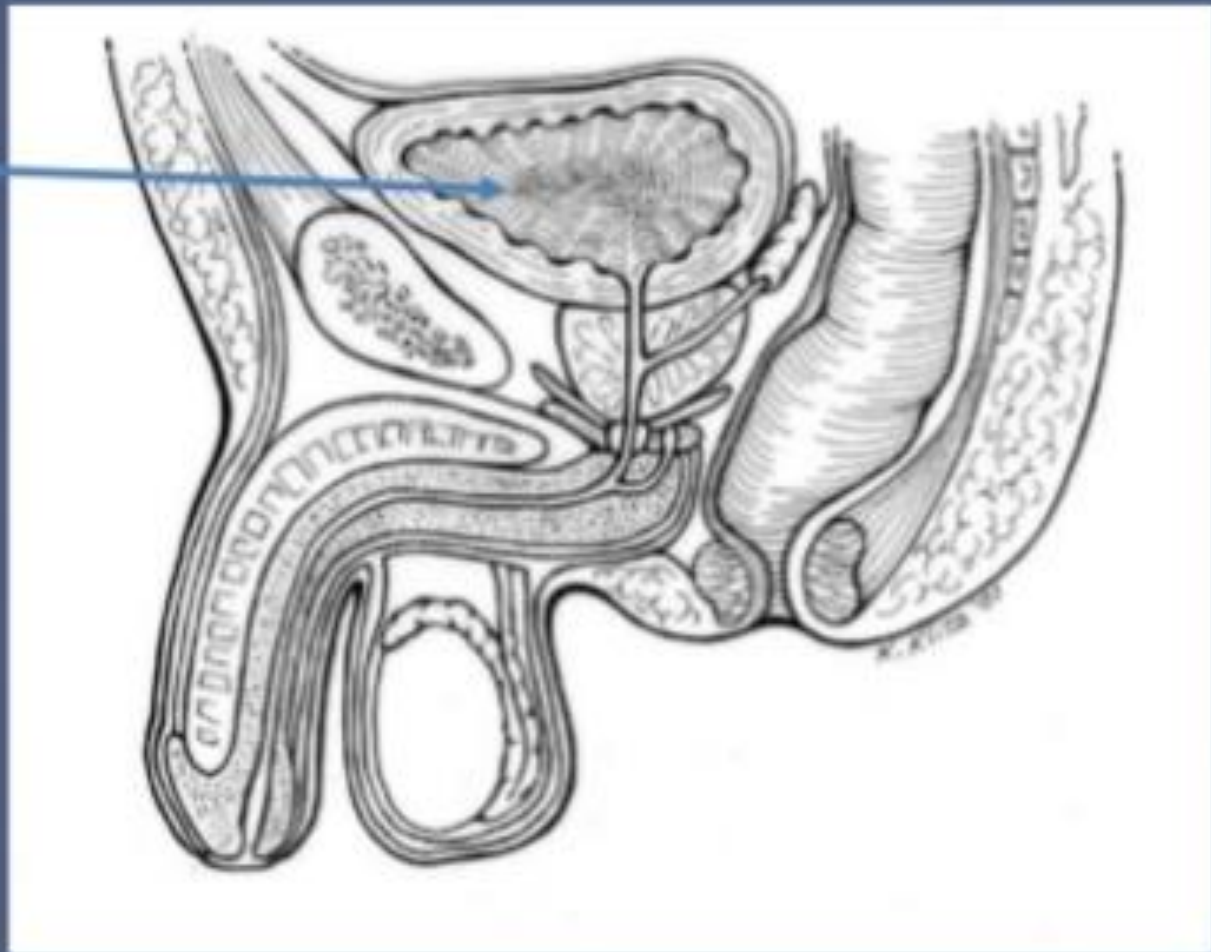


Anatomy of Female Pelvis
showing the Urinary Bladder



MRI of Female Pelvis





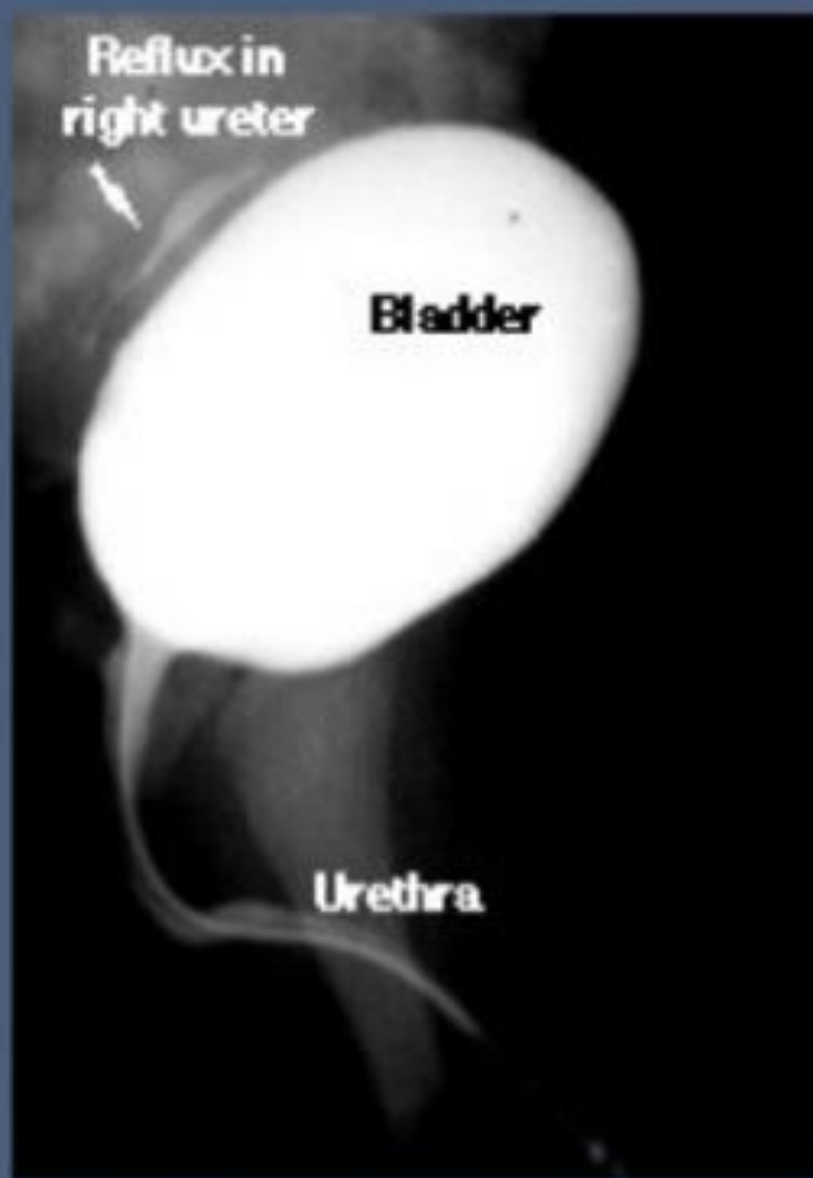
Anatomy of Male Pelvis showing the Urinary Bladder

Urinary Bladder

Unenhanced CT scan through a normal bladder (B) shows a normal fluid density structure (less than 10 Hounsfield units on CT density scale)



Voiding Cystourethrogram



I'm very young
for my wisdom but
old enough to share
my knowledge.