Abdomen: Kidneys, ureters and bladder

**KIDNEYS - GENERAL**

- 120g each, 11x6x4cm, 1200ml blood/minute
- Retroperitoneal, move 2.5cm on respiration
- Pelvis faces medially/anterior
- 1 million nephrons/kidney
- Lymphatics to para-aortics
- Sympathetic from T12-L1 for vasoconstriction & pain
- Parasympathetics from vagus. Function unknown
- Polar & capsular vessels give minimal collateral supply

**Order of structures at hilum from anterior to posterior V-A-U (vein, artery, ureter)**
- Left renal vein is longer making left nephrectomy easier

**Segmental blood supply**
KIDNEY - RELATIONS

Cross (axial) section of left side looking up

Note: The perinephric fascia is attached around the renal pelvis but is open inferiorly so that pus or extravasated urine can track down alongside the ureter.
Kidneys move 3-4cm on respiration

ANTERIOR RELATIONS OF KIDNEYS

Suprarenal glands
Spleen & its vessels
Stomach
Pancreas
2nd part duodenum
Hepatic flexure
Small bowel
Splenic flexure

= peritoneal covering

POSTERIOR RENAL RELATIONS (BOTH SIDES)

Diaphragm & costodiaphragmatic recess
Rib 12, subcostal neurovascular bundle - vein, artery, nerve
Iliohypogastric, ilio-inguinal nerves
Quadratus lumbarum

Psoas

TPP = Transpyloric plane (L1)
Kidney lies obliquely along line of psoas
URETER

25cm long. From kidney to bladder
**Posterior relations:** Psoas, genitofemoral nerve, sacroiliac joint, common iliac artery bifurcation

**Anterior relations:** Right- Duodenum, right gonadal artery, right colic artery, ileal mesentery, superior mesenteric artery. Left- Left gonadal artery, left colic artery, sigmoid mesentery

**Passes under:** Vas, uterine artery

**Related to:** Lateral fornix of vagina in females

**Blood supply:** Renal, gonadal, vesical. Smaller branches from aorta, common iliac & vaginal arteries

**Nerves:** General visceral afferents for pain & sympathetics probably for vasoconstriction only

**Points of potential hold up:** Pelviureteric junction, pelvic brim, ureterovesical junction

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It is recognisable as it:
- Is the most superficial structure in the pelvis
- Shows peristalsis
- Sticks to the posterior surface of the peritoneum
- Passes around the pelvic brim to 1 cm short of the ischial spine then swings medially.
- Enters the bladder at the level of the pubic tubercle on a plain abdominal X-ray
- Right ureter may be irritated by an inflamed appendix
- Pain is referred to loin, groin & tip of penis
BLADDER - GENERAL

- **Epithelium:** Transitional - Rubbery, watertight, lax, stretchy, no glands
- **Muscle:** Whorls of smooth muscle - detrusor
  3 layers - Inner & outer longitudinal, middle circular
- **Arteries:** Superior/inferior vesical, obturator, inferior gluteal, uterine, vaginal
- **Veins:** Converge to vescicoprostatic plexus in males
  Converge to plexus at base of broad ligament in female
  Then to internal iliac
- **Lymphatics:** Internal & external nodes
- **Nerves:** Sympathetic (male only at bladder neck) closes bladder neck at ejaculation. Inhibitory, vasomotor, pain in both sexes
  Parasympathetic - motor to detrusor, sensory for full bladder, some pain, autonomic stretch reflex in infants, later modified by cortical inhibition

URETEROVESICAL JUNCTION

- Submucosal tunnel
- Ureteric orifice
- Bladder wall
- Oblique passage through bladder wall

The ureter passes obliquely through the bladder wall then runs sub-mucosally for a distance that is 5 times the diameter of the ureter. This prevents vesico-ureteric reflux of urine
SUPRARENAL (ADRENAL) GLANDS

- Medulla: Neural ectoderm
- Cortex: Mesoderm
- Lie: Outside Gerota's fascia
- Colour: Yellowy/brown
- Arteries: Suprarenal direct from aorta, Branches of inferior phrenic and renal
- Veins: Right short to inferior vena cava, left to renal
- Shape: Right pyramidal (hat-shaped)
  Left crescentic (cap-shaped)

RELATIONS

Anterior: Right lobe of liver
  Inferior vena cava
Posterior: Right crus of diaphragm

Anterior: Lesser sac
  Stomach
Left gland

Stomach &
its vessels

Medial: Coeliac ganglia
  Inferior phrenic arteries

Note: The short length of the right suprarenal vein can make it difficult to ligate it at surgery. The right gland is tucked up posterior to the inferior vena cava (see above)