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~ More Than Skin Deep ~



# SurgSoc Anatomy Tutorials 2020/21

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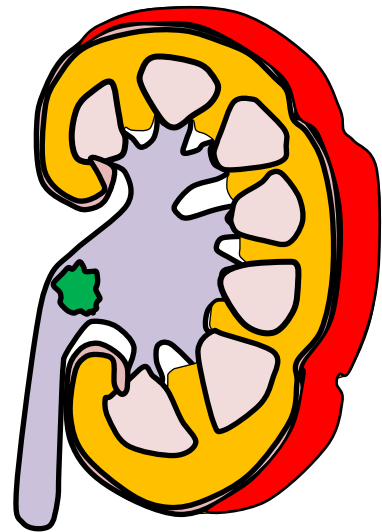
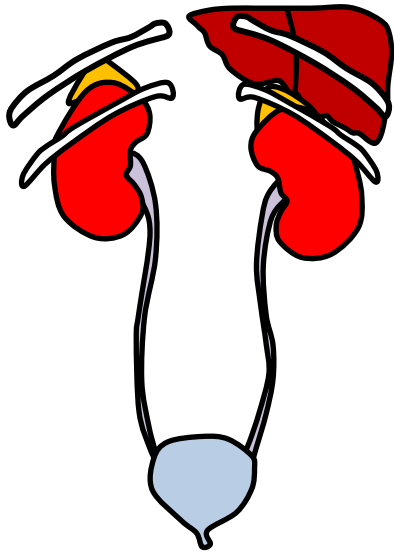
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# Musculoskeletal Anatomy: The Larynx

By John Ong

## Introduction

There are 2 kidneys which sit bilaterally between the spinal levels of T12 to L3. Renal calculi are a common condition affecting patients aged between 20 to 50, hence a confident grasp of the relevant anatomy will prove useful on a regular basis.



## Surface Anatomy

The kidneys lie retroperitoneally between the vertebral levels T12 to L3.

The right kidney sits slightly inferior compared to the left kidney due to the presence of the liver superiorly on the right side.



- Zuckermandl's fascia (Posterior)
- **Transversalis fascia** (Posterior)

**Gerota's fascia** in particular acts to maintain the kidneys in a retroperitoneal position. It is also used for TNM classification in renal cell carcinoma.

Laterally, **Gerota's fascia** & Zuckermandl's fascia fuse to form the *lateroconal fascia*.

The kidney is divided into 2 layers:

- Cortex
- Medulla

Within the medulla sit the medullary pyramids. All waste products drain from the medulla into the minor calyces, then major calyces and finally the renal pelvis. Waste products then leave the kidney via the ureters to travel to the bladder.

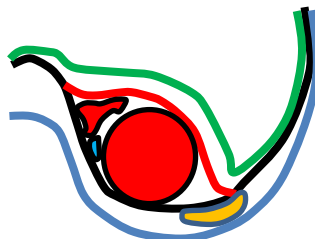
Renal calculi are likely to be lodged in 3 locations along the ureter:

1. Ureteropelvic junction - where the renal pelvis meets the ureter
2. Where the ureter **crosses iliac vessels**
3. Ureterovesical junction - where the ureter meets the bladder

## Fascial layers

There are 4 layers of fascia which envelop the kidney, not including the renal capsule. These layers are:

- **Parietal peritoneum** (Anterior)
- **Gerota's fascia** (Anterior)



## Kidney cross -section

The diagram above depicts a sagittal cross-section of the kidney.

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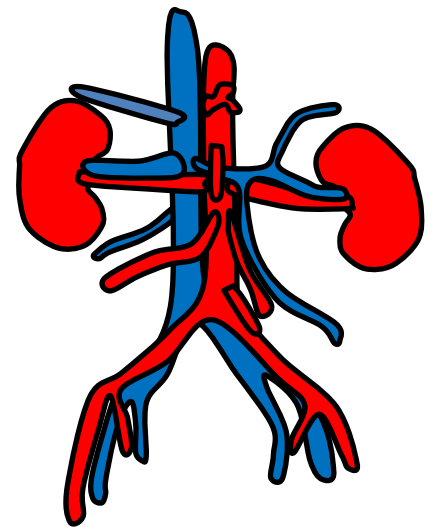
The ureter gets progressively narrower as it travels inferiorly, increasing the likelihood of a renal calculi obstructing the pathway as it travels down the ureter.

## The Vascular supply

The Kidneys are supported by the major abdominal vessels, the IVC & the abdominal aorta. On both sides, arterial supply is from the renal arteries whilst venous supply is from the renal veins.

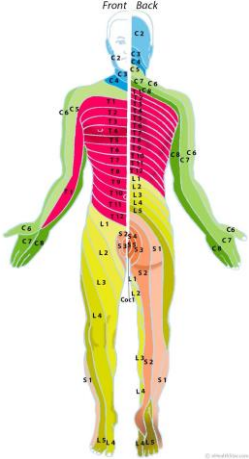
**IMPORTANT** - The left renal vein is longer than the right & passes under the superior mesenteric artery (SMA). Distension of the SMA can compress the left renal vein leading to **Nutcracker syndrome** - Patients may complain of flank pain & haematuria.

Note that on the **left** side, the suprarenal & gonadal veins originate from the renal veins whilst on the **right** side they originate from the IVC.



## The Nervous supply

### Dermatomes



The sensory & sympathetic innervation of the ureter originates from the spinal levels of T10 to L2. The preganglionic nerves originating from these are the lesser splanchnic nerve (T10 to T11), least splanchnic nerve (T12) & the lumbar splanchnic nerve (L1 to L2). They each synapse in a ganglion close to the ureters prior to reaching the ureters

Hence as the renal calculi passes down the ureter, patients experience a “loin to groin” distribution of pain due to the peristaltic nature of the ureter.

## Case Vignette

Renal colic is a condition commonly affecting males aged 20 to 50, with peak incidence in those 30 years old. Patients tend to experience a sharp sudden onset flank pain with a “loin to groin” distribution.



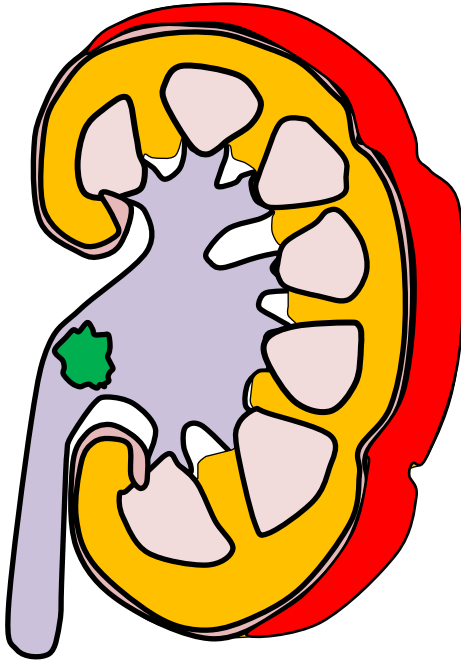
A thorough history followed by KUD X-ray scans should confirm the diagnosis. Treatment depends on the dimensions of the renal calculi. Some may be passed with minimal assistance, however larger calculi will require shock-wave therapy (lithotripsy) to break them down into smaller fragments.

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## Test Yourself!

**Question 1:** Label the following structures on the diagram.



- a. Medulla & Cortex
- b. Renal capsule
- c. Medullary pyramid
- d. Renal papilla
- e. Minor calyx
- f. Major calyx
- g. Renal pelvis

**Question 2:** True/False. - Kidney stones are most likely to be lodged in 2 locations, the ureteropelvic junction & the medullary to minor calyx transition point.

**Question 3:** True/False. - The kidneys are often located between the vertebral levels of L2 to L4.

**Question 4:** True/False. – The suprarenal & gonadal veins on the left side originate from the renal vein.

**Question 5:** Explain why the distribution of pain from kidney stones often presents as a “loin to groin” progression?

**Answers:** 1. See page 10 of powerpoint. 2. False, See page 15 of power point 3. False the kidneys are located between T12 to L3 4. True 5. The ureter is supplied by the spinal nerves from T10 to L2 via the preganglionic lesser, least & lumbar splanchnic nerves. Hence peristaltic action from the ureter pushes against the renal caliculi as it passes through resting in the painful sensation. This is further evident when superimposed over the T10 to L2 dermatomes.