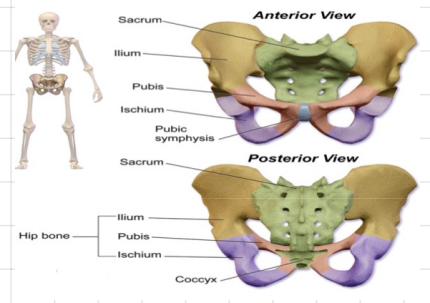


★ Topic 1 :- pelvis (Bones, Joints, Ligaments & muscles).

- **Bones (4)** Rt & Lt hip bones
 - Sacrum
 - Coccyx

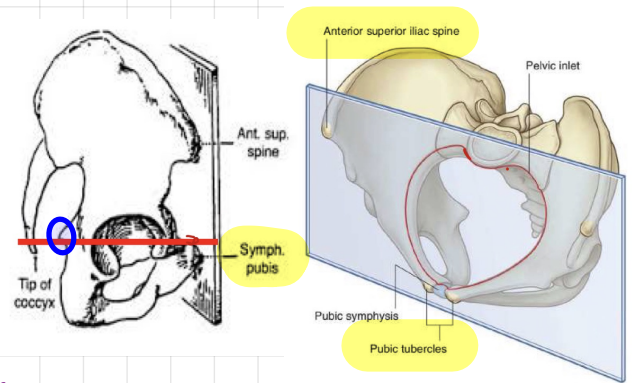
- **4 Joints**
 - 2 sacro-iliac Joints :- plane synovial.
 - Symphysis pubis Joint :- cartilaginous Joint.
 - Sacrococcygeal Joint :- cartilaginous Joint.



- **Normal position**
 - Same vertical plane :- anterior superior iliac spine & pubic tubercles
 - Same horizontal plane :- ischial spine & the upper border of symphysis pubis.

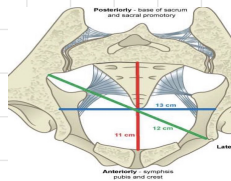
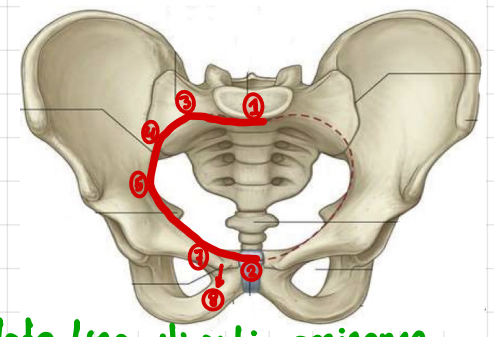
- **pelvic brim** :- oblique plane (sacral promontory → upper margin of symphysis pubis).

- **pelvis**
 - Greater pelvis (false) :- Anterosuperior to pelvic brim, part of the Abdomen.
 - Lesser pelvis (True) :- posteroinferior to pelvic brim, pelvis = Lesser pelvis
 - pelvis :- Above by pelvic diaphragm.
 - perineum :- Below by pelvic diaphragm.
 - parts :- inlet, outlet, cavity.



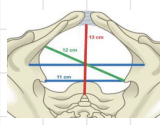
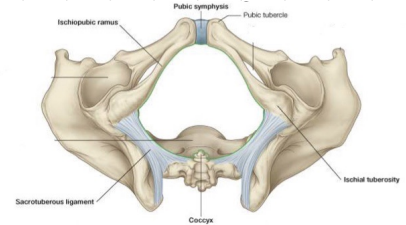
• Pelvic inlet (Brim)

- **Shape**
 - Male :- Triangular or Heart-shaped.
 - Female :- Transversely oval.
- **formation**
 - Anteriorly :- Symphysis pubis ①
 - Posteriorly :- Sacral promontory ②
 - other sides :- Ala of sacrum ③, sacro-iliac Joint ④, Arcuate Line, iliopubic eminence ⑤
 - ⑦ pectineal Line ⑥ pubic crest (tubercle).
- **Diameters**
 - Anteroposterior :- sacral promontory → upper border of symphysis pubis.
 - oblique :- Sacroiliac Joint → opposite iliopubic eminence.
 - Transverse :- Between 2 arcuate Lines ★ widest ★



• pelvic outlet

- **formation**
 - Anteriorly :- pubic Arch
 - Posteriorly :- Coccyx
 - Lateral angle :- ischial tuberosities.
 - Anterolateral :- ischiopubic rami
 - posterolateral :- Sacrotuberous Ligament - Sacrum → ischial tuberosities.
- **Diameters**
 - Anteroposterior :- Coccyx → Lower border of symphysis pubis ★ wider ★
 - oblique :- midpoint sacrotuberous Lig → opposite pubic / ischial rami Junction.
 - Transverse :- between 2 ischial tuberosities

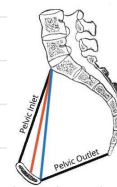


• pelvic cavity

- Anterior wall :- short (2 inch), Bodies of pubic bones & symphysis pubis.
- posterior wall :- Long (6 inch), Sacrum & Coccyx.
- Lateral wall :- part of pubic, ischium, ilium.
- subdivisions :- By pelvic diaphragm (Levator ani & coccygeus muscles)
 - pelvis above.
 - perineum below.

Conjugates

- Diagonal:- Prometry of sacrum → Lower Symphysis pubis.
- obstetric:- prometry of sacrum → bulging point in Back of Symphysis pubis.
- Diagonal - 1.5/2 cm (Vesinal examination).



■ Obstetric Conjugate
■ Diagonal Conjugate

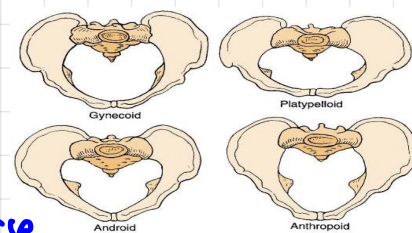
	Bony landmark
-2	Above ischial spines
-1	
0	At ischial spines
+1	
+2	Below ischial spines (head visible at the introitus).
+3	

		Female	Male
1	Inlet	Wider, transversely oval	Smaller, heart shaped
2	Cavity	Wider, shallower	Narrow, deeper
3	Outlet	Larger	Smaller
4	Subpubic angle	Wide Angle	Acute angle
5	Ischial tuberosities	Are everted externally	Are turned in
6	Sacrum	Wider, shorter	Narrower, longer
7	Side of pubic arch	everted externally	Not everted

- Rotation of Head during Labour:- inlet transverse diameter → outlet Anteroposterior diameter, To obtain best fit of fetal head, the longest diameter of the fetal head passes through the widest diameter of the pelvis → Head rotation.

Types of female pelvis

- Gynaecoid:- typical female pelvis.
- Android:- female pelvis + some male features.
- platypelloid:- inlet has larger transverse diameter.
- Anthropoid:- Long anteroposterior diameter, Like apes, small transverse.



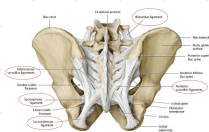
- Fracture pelvis:- 1 point → stable fracture (no displacement), 2 points → unstable (displacement).

- Coccydynia:- direct trauma to coccyx.
- Complications
 - injury to male urethra & urinary bladder.
 - rectum damage (rare)
 - Bleeding
 - injury in nerves (sciatic in fracture include greater sciatic notch).

Joints

- pubic symphysis:- 2ry cartilaginous joint between 2 pubic bones. Ligaments → Superior pubic arcuate pubic
- Sacrococcygeal:- 2ry cartilaginous joint between sacral apex & coccygeal base.
- Sacroiliac:- plane synovial between sacral & iliac auricular surfaces.
 - Ligaments
 - Ventral sacroiliac:- anteroinferior to the joint.
 - interosseous sacroiliac:- posterior to the joint, strongest.
 - Dorsal sacroiliac:- dorsal to interosseous ligament.
 - Movement & Function
 - Transmit body weight from lumbar spine to hip bones.
 - slight rotation around horizontal axis (trunk is flexed on hip joints).

Vetebropelvic Ligaments



- iliolumbar:- tip L5 transverse process → iliac crest → prevent anterior inferior displacement of L5
- Lumbosacral:- inferior L5 transverse process → lateral sacrum ala.
- Sacrospinous:- ischial spine → lateral margins of sacrum & coccyx.
- Sacrotuberous:- posterior iliac spines/lower sacrum & coccyx → ischial tuberosity

Relaxation of pelvis & ↑ Joint mobility in late pregnancy.

- Sex hormones + Relaxin → Relax the pelvic ligaments → ↑ movement of pelvis joint → (10-15% ↑ in diameter (transverse, inter-spinous distance), Coccyx also move posteriorly.
- Swayback posture:- Relaxation of sacro-iliac ligaments permitting greater rotation of the pelvis & contributing to this posture.

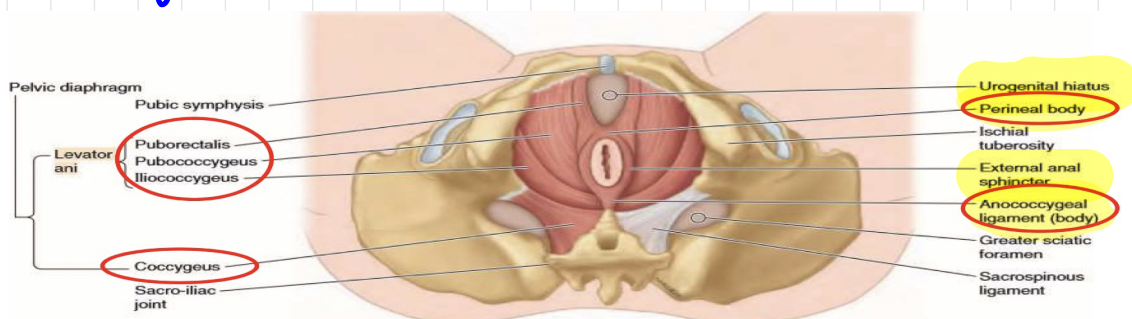
- **Muscles of the pelvis**
 - pelvic wall:- piriformis & obturator internus. origin of Levator ani → above:- wall of pelvis. below:- wall of perineum.
 - pelvic floor:- Levator ani & coccygeus. (Both side → pelvic diaphragm)
 - Anterior border of 2 Levator ani
 - males:- puboprostatic ligament.
 - females:- pubovesical ligament.
 - pelvic fascia
 - piriformis fascia:- part of parietal pelvic fascia
 - Anteriorly:- internal iliac vessels.
 - posteriorly:- Sacral nerves.
 - obturator fascia:- covers obturator internus (except obturator groove).
 - white line:- fascia thickens → ^{Tend. innat} arch, Between the lower pubic body & ischial spine
 - pudendal canal:- Below Lvl of Levator ani, the fascia lies in the lateral wall of ischiorectal, around the internal pudendal Artery & nerve.

- Levator ani
 - origin:- Lower back pubis, white line, Ischial spine.
 - Nerve:- perineal branch (From S4 & pudendal N).
 - Action:- support position, resist ↑ intra pelvic pressure, sphincter to ano-rectal & vagina.
 - parts
 - pubococcygeus:- Body of pubis → Anterior 1/2 of white line. (3 parts)
 - Ant. Intern.
 - post.
 - Iliococcygeus:- posterior 1/2 of white line & ischial spine.

- Levator prostatae / sphincter vaginae (Anterior fibers).
 - pass horizontally & backward around prostate (males) vagina (females) → perineal body.
 - Support prostate, constrict the vagina, stabilize the perineal body.
 - perineal body:- mass of fibrous tissue
 - M:- Between anal canal / bulb of penis.
 - F:- Between anal canal / Lower vagina.
 - * don't attach to anococcygeal body *
- Puborectalis (Intermediste):- passes inferomedially → become continuous with the opposite ones (U-shape) behind the ano-rectal Junction → inserted into Anococcygeal body.
- Pubococcygeus proper (posterior fibers):- pass medially → coccyx & anococcygeal body.
 - Anococcygeal body:- small fibrous mass between tip of coccyx / anal canal.
- Iliococcygeus:- pass medially inferior to pubococcygeus proper (same insertion).

- coccygeus muscle
 - origin:- ischial spine
 - insertion:- Lower end of the sacrum & into the coccyx.
 - Nerve:- 4th & 5th Sacral nerve.
 - Action:- assist the Levatore ani in supporting pelvic viscera.

- **Functional significance of pelvic floor in females:-** Helps in head rotation in 2nd stage of Labour.
 - injury - difficult childbirth → ↓ support for pelvic viscera
 - uterine & vaginal prolapse.
 - Herniation of bladder (cystocele).
 - prolapse of the rectum.
- **Stress incontinence:-** ↑ intra-abdominal pressure (cough)
 - Lead to dribbling urine (weakness in muscle, short ureter).



★ Topic 2 :- Artries & Nerves of pelvis.

• **Artries** → others:- superior rectal (I. Mesentric), Median sacral, 2 ovarian (Aorta).

Internal iliac Artery

Beginning:- opposite to Lumbo-sacral disc.
Termination:- upper margin of GSF
it divide to Anterior & posterior.

Branches

Anterior

Visceral

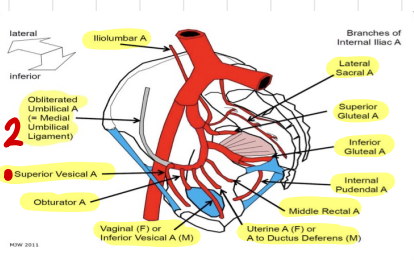
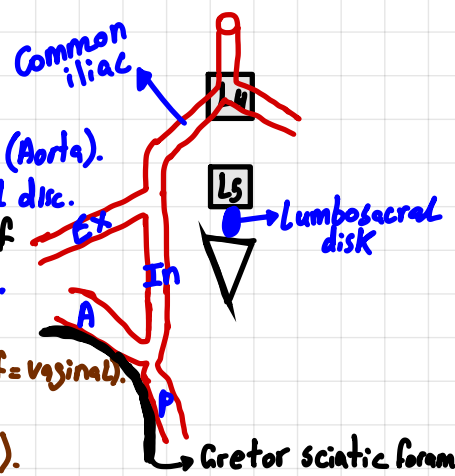
- Superior vesical.
- Inferior vesical (f= vaginal).
- Middle rectal.
- uterine (in female).

parietal

- obturator.
- Internal pudendal.
- Inferior gluteal.

posterior (parietal)

- superior gluteal.
- Iliolumbar:- muscular (iliacus, psoas major, ^{quadratus} Lumborum)
- superior & inferior lateral sacral Artries:- enter sacral foramina → supply contents of sacral canal → dorsal sacral foramina → supply overlying muscle.

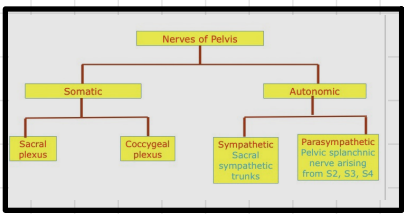


• **Venous drainage** → others:- internal iliac, superior rectal.

Median sacral:- → Lt. Common iliac vein.

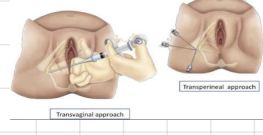
Internal iliac vein:- opposite to artery → Begins opposite the upper GSF → ends at pelvic brim (external → common).

- receives veins similar to branches of internal iliac artery except the iliolumbar vein → Common iliac vein.
- Drain blood from pelvic viscera by means of visceral veins.
- Drain blood from Internal vertebral venous plexus by means of valveless lateral sacral v. → pelvic pressure → reflux blood backwards up to the plexus.
- primary tumors in pelvic viscera give rise to secondaries in L vertebrae.



• **Nerves** → **Sacral plexus** → Formation:- Lumbosacral (L4 & L5) + S1, S2, S3 + S4 (ventral Rami).

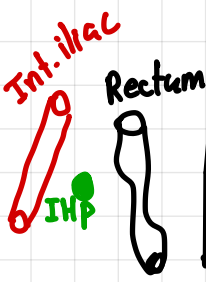
- Location:- between piriformes & parietal pelvic fascia.
- Related vessels → Superior gluteal A:- Lumbosacral (L4, L5, S1) ventral.
- Inferior gluteal A:- Between S1 & S2 ventral rami.



- Branches → Levator ani & Coccyges.
- pudendal N (S2, S3, S4):- Somatic
- pelvic splanchnic N (S2, S3, S4):- parasympathetic → hypogastric plexus.
- perforating cutaneous N.

- pudendal nerve block in vaginal operation or Episiotomy → near ischial spine by local anesthetic.

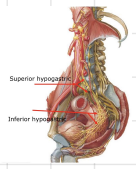
pregnancy (fetal head) → Compress sacral plexus → Sciatica (pain).



- Coccygeal plexus:- part of S4 & S5 & Coccygeal ventral Rami → Anococcygeal nerves (skin)
- Sacral sympathetic trunk:- form ganglion impar → Gray rami Communication:- BV, sweat, gland
- visceral branches:- Join inferior hypogastric p
- parasympathetic splanchnic N:- S2-4 → inferior hypogastric plexus (IHP) or walls of viscera.

• pelvic Autonomic plexuses

- superior hypogastric plexus (SHP) → parasympathetic:- pelvic splanchnic nerves.
- Inferior hypogastric plexus → Sympathetic:- SHP & Sacral sympathetic chain.

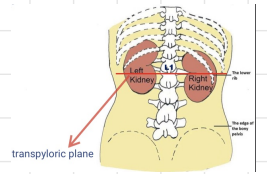


- Superior to pelvic pain line → Contact peritoneum → sympathetic.
- Inferior to pelvic pain line → don't contact → parasympathetic.

- peritoneum → M:- Rectovesical pouch
- F:- Rectovaginal pouch (Douglas) & uterovesical pouch.

★ Topic 3 :- Urinary system (Kidneys).

- **Location** :- Retroperitoneal organ (peritoneum on their anterior side only) on posterior abdominal wall. they are located at paraventral gutters opposite T₁₂, L₁, L₂, L₃ vertebrae.
- The Rt. Kidney is 1.25 cm lower than Lt (Liver).
- upper pole of Rt. - 12 Rib, upper pole of Lt. - 11th Rib.
- Hilum :- Rt. - Below Transpyloric plane, Lt. - above transpyloric plane.
- palpation :- Between 11th & 12th Rib & iliac crest posteriorly & below costal margin anteriorly.

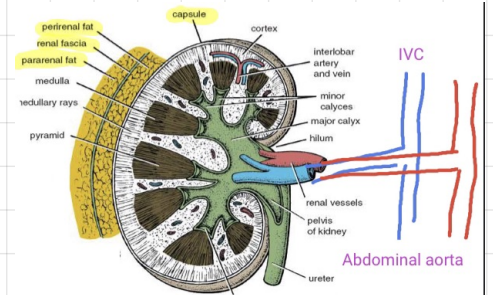


• General features

- 2 poles
 - ↳ upper pole :- nearer to midline
 - ↳ inferior pole :- Rt. - 1 finger breadth above iliac crest.
- 2 borders
 - ↳ Lateral border :- smooth & convex.
 - ↳ Medial border :- hilum at midline (sinus) :- Renal vein anteriorly (IvC) → Renal Artery → Renal pelvis post.
- 2 surface :- Anterior & posterior.

• Covering of the Kidney

- Fibrous capsule :- all around the Kidney.
- perirenal fat :- all around the Kidney.
- Renal fascia :- 2 Layers covers the front & Back.
 - ↳ Laterally :- fascia transversalis.
 - ↳ Medially :- fascia around Renal vessels, aorta, IVC.
 - ↳ Superiorly :- diaphragmatic fascia & suprarenal gland (pneumothorax).
 - ↳ Inferiorly :- Remains separate in front & back of the ureter (open) :- spread of pus & hematoma.
- pararenal fat :- outside Renal fascia, most condensed posterior to the Kidney.



• Supporting factors of the Kidneys (Keep in situ):-

- ↳ Adjoined organs & vessels & ureter
- ↳ Abdominal pressure.
- ↳ perirenal & pararenal fat :- fat absorbed (Rapid weight) → Nephroptosis.
- ↳ Renal fascia.

• Clinical notes

- ↳ Nephroptosis :- pain in Renal region, Relieved by lying down, by traction on the Renal vessels.
- ↳ Transplantation :- in iliac fossa, due to lack of inferior support in the lumbar region.
- ↳ perinephric Abscess (pus Around Kidney) :- spread into pelvis between loosely attached Renal fascia.

• Relations of the Kidney

- posterior
 - ↳ 4 Muscles
 - ↳ Diaphragm (superiorly).
 - ↳ psoas major.
 - ↳ quadratus Lumborum.
 - ↳ Transversus abdominis.
 - ↳ 4 Neurovascular
 - ↳ Subcostal vessels.
 - ↳ Subcostal N.
 - ↳ iliohypogastric N.
 - ↳ ilioinguinal N.
 - ↳ pleura & Ribs :- Consto-dia phramatic recess & Rib 12th Rt, Rib 11th & 12th Lt (pneumot.)

Anterior

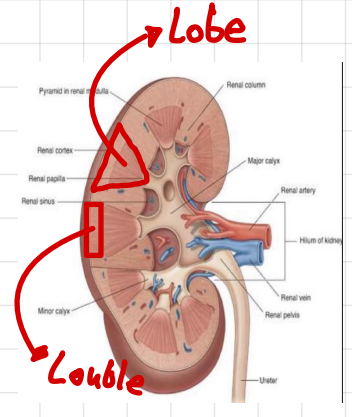
Right Kidney	Left Kidney
Right suprarenal gland	Left suprarenal gland
Second part of duodenum	Spleen with lienorenal ligament, Body of pancreas with splenic vessels
Right lobe of liver (with hepatorenal pouch in between)	Posterior surface of stomach (with lesser sac in between)
Right colic flexure (hepatic flexure)	Descending colon
Coils of the small intestine Ascending branch of right colic artery	Coils of the small intestine ascending branch of left colic artery

- peritoneal covering of the kidney:- Retroperitoneal, each kidney has 3 bare area (no peritoneum) are interposed between front of kidneys & parital peritonum of posterior abdominal wall.

Rt	Lt
Suprarenal area	Suprarenal area
Duodenal area	Pancreatic area
Colic area (hepatic flexure)	Colic area (descending colon)

Structure of the kidney

- Cortex :- outer, adjacent to capsule → cortical arches:- caps over pyramids.
- Medulla:- inner, 7-14 pyramids, Base (cortex) & apex (Renal papilla)
- Renal Column:- part of cortex between medullary pyramids.
- Renal Lobule:- the space between to cortex & the base of pyramids.
- Renal papillae → 5-12 minor calyces → 2-3 major calyces → Renal pelvis → Ureter.



Arterial blood supply

abdominal aorta → Renal A → 5 segmental A → Lobar → interLobar → arcuate → interlobular → glomerular Arterioles

↳ one for pyramid
 ↳ ascends to cortex
 ↳ Rt longer, posterior to IVC
 ↳ Cortex 10>medulla
 ↳ to cortex
 ↳ arch of base of pyramids

venous drainage → IVC.

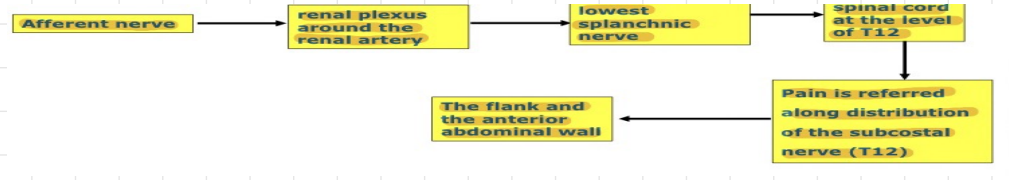
Lt is longer → anterior to aorta, posterior to superior mesenteric A, receive Lt. suprarenal & Lt. gonadal V

↳ Renal vein Entrapment syndrome (Nutcracker syndrome):- Compression of Lt. Renal v between SMA Arter & Aorta posteriorly → Hematuria due to Renal venous HTN & Rupture.

Lymphatic drainage:- Lateral aortic lymph nodes.

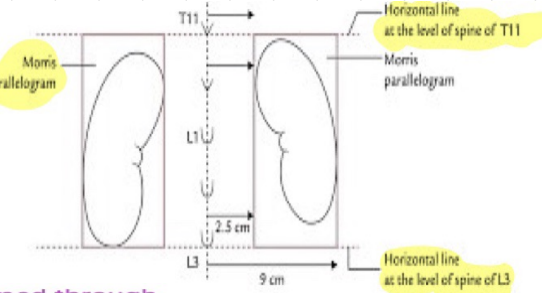
Nerve supply:- Lowest splanchnic nerve (T12, sympathetic).

Renal pain:- varies from a dull ache to a severe pain in the flank. can Result From stretching of the kidney capsule or spasm of the SM in Renal pelvis.



Surface Anatomy of the Kidney (Morris rectangle)

- Lines → 2 vertical:- one inch, 3 inch from middle line.
- 2 Horizontal:- opposite the spines T11 & L3.
- upper pole:- 1 inch, from midline opposite to T12.
- Hilum:- 2 inch, from midline at transyltoric plane (L1).
- Lower pole:- 3 inch, from midline opposite to L3.



1- firstly, you need to know that the operation will be performed through the posterior abdominal wall. So, some of the structures that are posteriorly related to the kidneys will be cut off, such as psoas major and quadratus lumborum muscles. The transversus abdominis muscle is far lateral so unlikely to be cut.

2- you need to know that the operation will be performed within the retroperitoneal space (away from the peritoneum) so paralytic ileus is unlikely to happen. So, once she recovers from the anaesthesia (to avoid vomiting and aspiration of food particles) she can eat and drink (after 2-6 hrs).

-Paralytic ileus: A temporary paralysis of a portion of the intestines occurs typically after abdominal surgery due to the incision of peritoneum. Since the intestinal content of this portion is unable to move forward, food or drink should be avoided until peristaltic sound is heard or when defecation occurs.