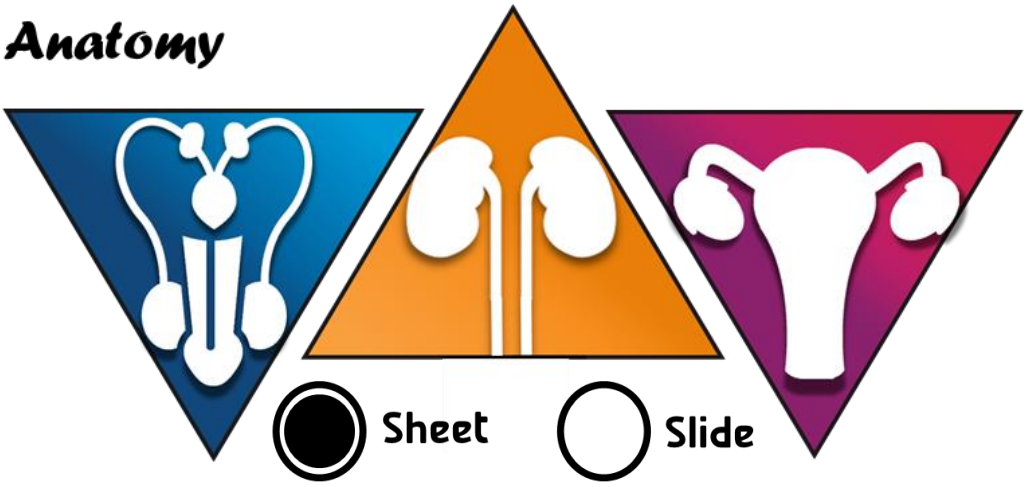
Urogenital system



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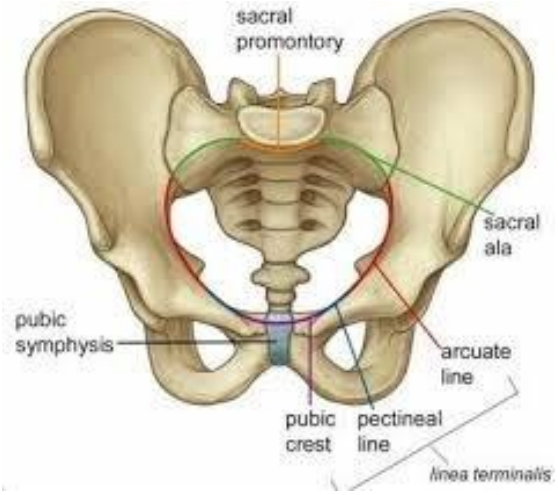
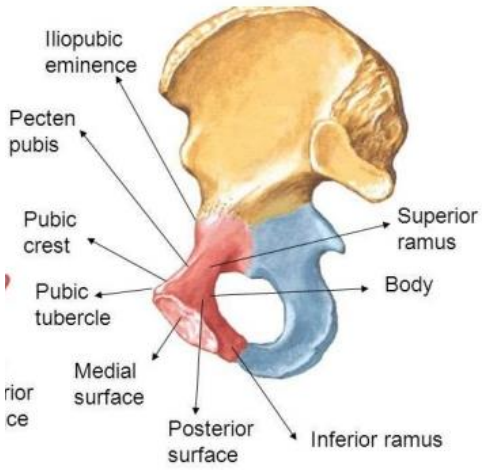
Introduction:

PELVIS غير مطلوب تعريفات

- Bones: The bones of the pelvis consist of right and left pelvic (hip) bones, the sacrum and the coccyx. Each pelvic bone is formed by three elements: the ilium, pubis and ischium.
- ** **Anterior superior iliac spine** is the prominence at the anterior projection of the iliac crest.
  ** **The arcuate line** is a rounded ridge extending from the ilium anteriorly to the superior pubic ramus.
  ****Iliopubic eminence** is a rounded elevation on the surface of the hip bone at the junction of the ilium
  and the superior ramus of the pubis.
  ** **The pectineal line** is superi.
  ****Ischiopubic ramus** (conjoint ramus); it is the inferior pubic ramus plus the ischial ramus
  ****ischial tuberosity and ischial spine.**



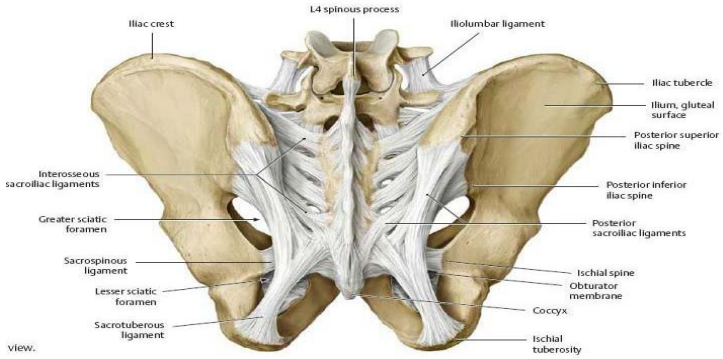


- Joints and ligaments:
  1- **Pubic symphysis** is a secondary cartilaginous joint (has minimal movement during labor) between the two pubic bones and is surrounded by interwoven layers of collagen fibers and the two major ligaments associated with it are:
     A- **Superior pubic ligamen**t located above the joint.
     B- **Inferior (arcuate) pubic ligament** located below the joint.
  2- **Sacro-iliac joint** is a plane synovial joint (gliding movement) between sacrum and ilium auricular surfaces, and is stabilized by three ligaments:
     A- **The ventral sacro-iliac ligament** which lies anteroinferior to the joint.
     B- **The interosseous ligament** which is the largest and the strongest of the three and it lies posterior to the joint.
     C- **The dorsal sacro-iliac ligament** which lies dorsal to the interosseous ligament.
     ** Movements and functions of this joint (the importance):
        - It transmits the body weight from lumbar spine to the hip bones.
        - It allows slight rotation around a horizontal axis when the trunk when the trunk is flexed on the hip joints.
  3- **Sacroccygeal joint** is a secondary cartilaginous joint between sacral apex and coccygeal base.

**Vertebropelvic ligaments:

- ✓ **Iliolumbar ligament;** extends from the tip of the L5 transverse process to iliac crest.
- ✓ **Lumbosacral ligament**; extends from the inferior aspect of L5 transverse process to the lateral part of the ala of sacrum.
- ✓ **Sacrotuberous ligament**; extends between the lower part of the sacrum, the coccyx and the ischial tuberosity.
- ✓ **Sacrospinous ligament**; extends from ischial spine to the lateral margins of sacrum and coccyx.

  **Functions of the Vertebropelvic Ligaments :(the importance)



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- The <u>iliolumbar and lumbosacral ligaments</u> prevent the anteroinferior displacement of L5 vertebra under effect of body weight.
- The <u>sacrotuberou sand sacrospinous ligaments</u> convert the greater and lesser sciatic notches into foramina.
- They also prevent the upward tilting of the lower part of sacrum under effect of body weight.

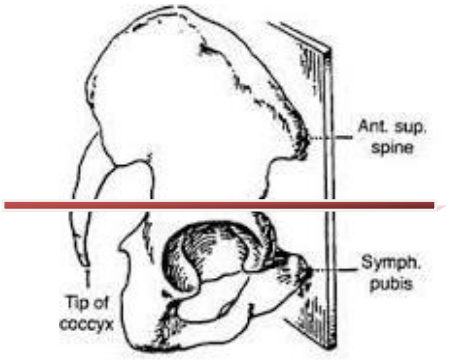
The elasticity of these ligaments changes during pregnancy, they become more relaxed to facilitate the passage of the fetus through birth canal, relaxation of these ligaments permits greater rotation of the pelvis and contributing to "swayback" posture, but how does this happen?

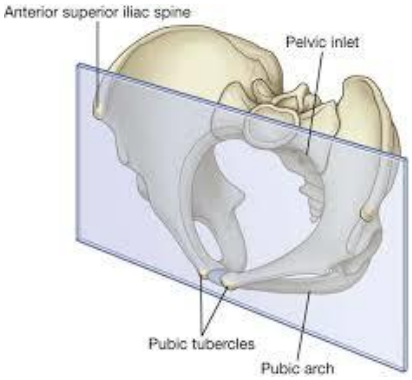
1- Increased levels of sex hormones and the presence of the hormone relaxin cause the pelvic ligaments to relax during the last half of pregnancy.
2- This allowing increased movement at the pelvic joints.
3- Relaxation of the sacro-iliac joints and pubic symphysis permits as much as a 10–15% increase in diameters (mostly transverse, including the interspinous distance), this point will become clearer as we move on in this sheet.
4- The coccyx is also able to move posteriorly.
5- This is facilitating passage of the fetus through the pelvic canal

<u>Normal position of the pelvis</u>

- In erect posture, the pelvis lies with the anterior superior iliac spine and pubic tubercles in the same vertical plane. As a consequence, the pelvic inlet is titled to face anteriorly, and the

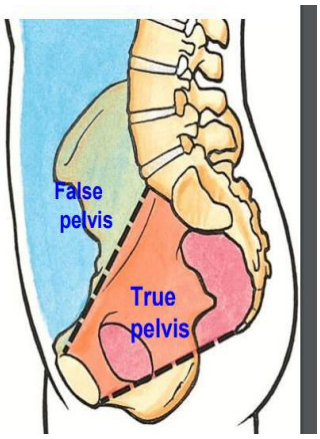
ischial spine and upper border of symphysis pubis in the same horizontal plan (Transverse plan).





The pelvic brim

An oblique plane extends from the sacral promontory to the upper margin of symphysis pubis passing over the margin of Ala, arcuate line and pectineal line. <u>This brim divides the pelvis into two parts</u>:



Greater pelvis also known as **false pelvis** (above it); Extends from iliac crest down to the pelvic brim.

** It's part of the abdomen.

Lesser pelvis also known as **true pelvis** (below it): It's further divided by the ***<u>pelvic diaphragm</u>*** (levator ani and coccygeus muscles) into: Pelvis (above) and perineum (below).

The true pelvis has an inlet, an outlet and a cavity.

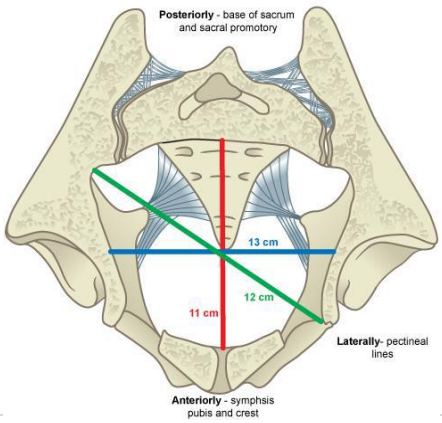
Pelvic inlet (brim):

Boundaries:

- Anteriorly: symphysis pubis
- Posteriorly: Sacral promontory
- On either side: Ala of sacrum, arcuate line, pectineal line, pubic crests.

Diameters (you don't have to memorize the numbers):

- Anteroposterior diameter: From sacral promontory to upper border of symphysis pubis (4 niches).
- Oblique diameter: From the sacro-iliac joint to the opposite iliopubic eminence (4.5 inches).
- Transverse diameter**:** Between the 2 arcuate lines (5 inches).
  <u>It is the widest diameter</u>



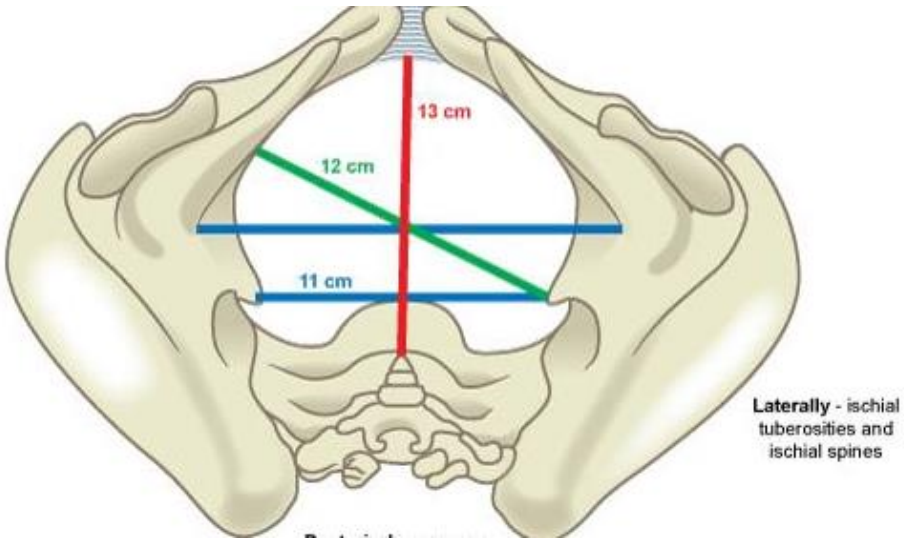
Pelvic Outlet:

Boundaries:

- Anteriorly: Pubic Arch (lower border of symphysis pubis).
- Posteriorly: Coccyx.
- Lateral angles: Ischial tuberosities.
- Anterolateral sides: Ischiopubic rami
- Posterolateral sides: Sacrotuberous ligaments

Diameters:

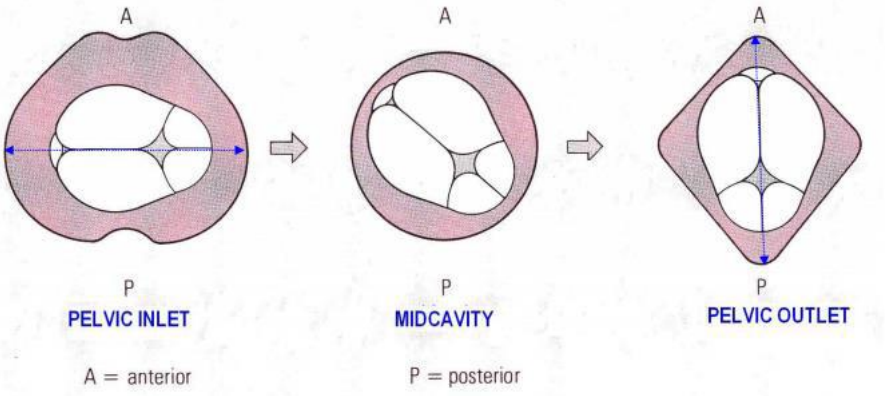
- Anteroposterior diameter: Between the coccyx and lower border symphysis pubis (5 inches).
  It is the widest diameter at the outlet.
- Oblique diameter: From the midpoint of the sacrotuberous ligament to junction of the pubic and ischial rami (ischiopubic ramus) of the opposite side (4.5 inches).
- Transverse diameter: Between the 2 ischial tuberosities (4 inches).
  →**Note**: You don't have to memorize these measurements, but you have to know that in pelvic inlet, the widest diameter is the transverse. And in pelvic outlet the widest diameter is the anteroposterior.



➔ Since the **transverse diameter** is **greater than** the **antero-posterior** (AP) **diameter** in the **pelvic inlet**, the widest circumference of the **fetal head** descends in a **transverse position**. However, when it gets closer to the **pelvic outlet**, the nature of

the pelvic floor muscles encourages the fetal head to **rotate** from a **transverse position** to an **anterior-posterior position**, as the **AP diameter** is **greater than** the **transverse diameter**.

➔ So, during the second stage of labor, as the baby is being pushed out, the baby's head will rotate to face the mother's back and body will stay in position with one shoulder down toward the mother's spine and one shoulder up toward the belly. And as maternal contractions continue, the baby's head eventually exits the birth and rotates a quarter turn to be in line with body and to help the shoulders to pass through the canal. The baby's shoulders are delivered one after the other to fit into the pelvis and the rest of the body slides out easily! **** You don't have to memorize this, just understand how the fetus rotates to fit into the pelvis and birth canal.**

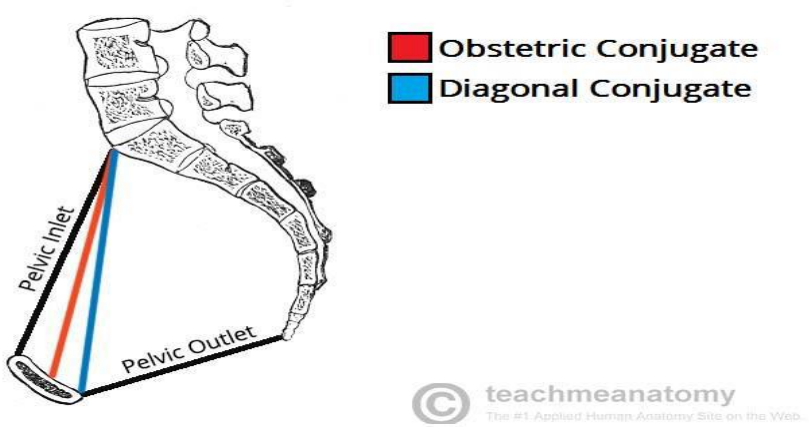


Pelvic Cavity

- **Anterior wall**; is short (2 inches) and formed by bodies of pubic bones and symphysis pubis.
- **Posterior wall**; is long (6 inches) and formed of the sacrum and coccyx.
- **Lateral walls:** formed by pelvic surface of parts of pubis, ischium and ilium.
  There is no significant change in the diameters of the pelvic cavity

- **Diagonal and obstetric conjugates** are used to determine the likelihood of a successful vaginal delivery; if the pelvis is narrow then she will undergo Caesarean section, while if these diameters are normal she will undergo vaginal delivery. Both are **NON** radiographic measurements and extend from the promontory, but each one ends at a different point. For the diagonal conjugate; it

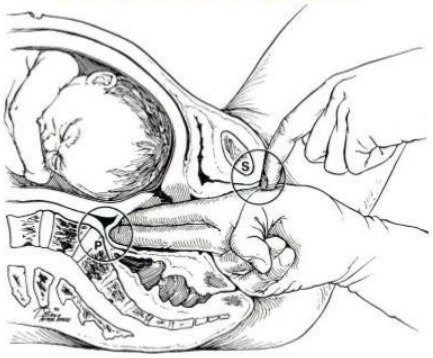
ends at the lower border of symphysis pubis. And the obstetric ends at the most bulging point of symphysis pubis.



How to measure these diameters?

- The pelvic diameters are measured using MRI. However, this is theoretically taught.
- The practical method is: Vaginal examination to determine diagonal conjugate: In order to reach the sacral promontory, the examiner's elbow must be flexed, and the perineum forcibly indented by the knuckles of the third and fourth fingers. The index and the second fingers are carried up and over the anterior surface of the sacrum. By deeply inserting the wrist, the promontory may be felt by the tip of the second finger as a projecting bony margin. With the finger closely applied to the most prominent portion of the upper sacrum, the vaginal hand is elevated until it contacts the pubic arch. The immediately adjacent point on the index finger is marked, as shown in the figure below. The distance between the mark and the tip of the second finger (sacral promontory) is the diagonal conjugate.(Read only the above paragraph)
- **The obstetrical conjugate is computed by subtracting 1.5 to 2.0 cm.**

Vaginal Examination to Determine Diagonal Conjugate



Obstetric Conjugate = Subtracts 1.5 – 2.0 cm from Diagonal Conjugate

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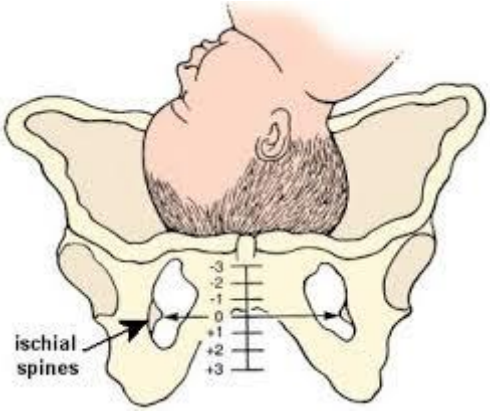
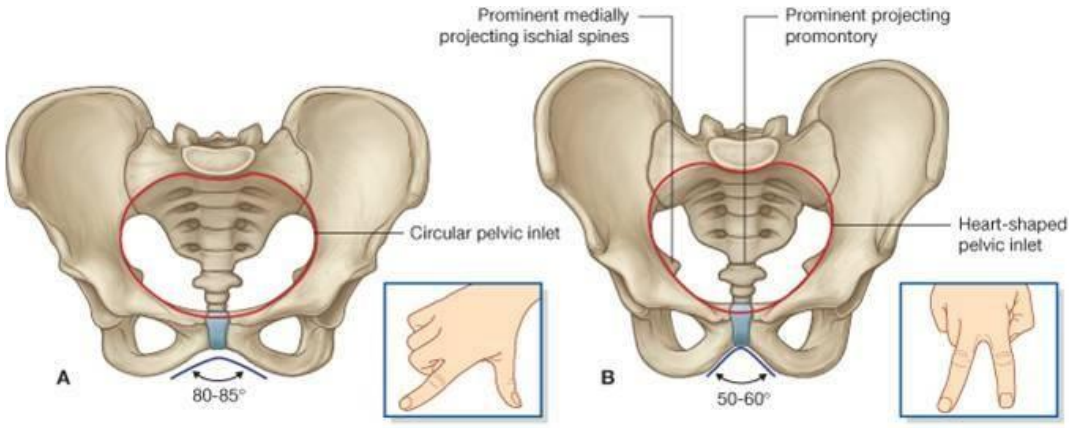
- In vaginal labor what doctors care about are; the cervix dilatation, whether it's one finger dilatation, 2 finger dilatation and so on so forth (5 fingers indicate full dilation and labor), the effacement which indicates cervical thinning as the fetus descends, the cervix will gradually soften, shorten and become thinner, and the position of the baby's head. (REED ONLY)
- **Fetal station** (slide20); it describes how far down the baby's head has descended into the pelvis. The doctor determines the fetal station by examining the cervix and finding where the lowest part of the baby is in relation to the pelvis. The doctor will then assign a number from -5 to +5 to describe where the baby's presenting part (usually the head) is located. A baby is at –3 **station** when the **head** is above the ischial spine and at 0 **station** when the **head** is at the ischial spine (fully engaged). The baby is at +3 **station** when the **head** is below to the ischial spine beginning to emerge from the birth canal.



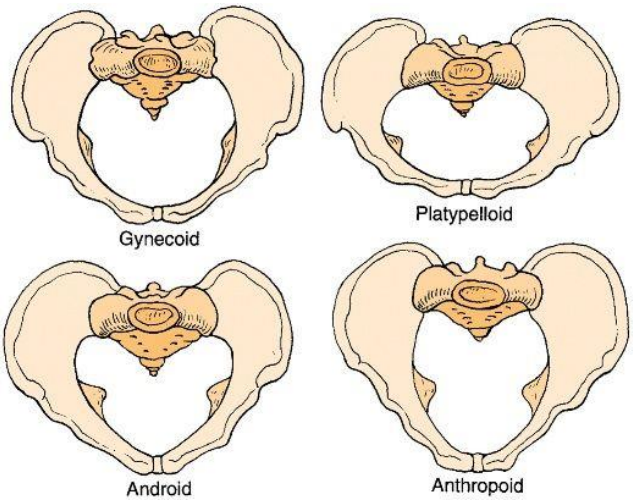
Sex Differentiation in the Pelvis

	Female	**Male**
Inlet	Wider, transversely oval.	Smaller, heart shaped.
Cavity	Wider, shallower; to allow the baby to slide out easily during labor.	Narrow, deeper.
Outlet	Larger.	Smaller.
Subpubic angle	Wide angle.	Acute angle.
Ischial tuborosity	Are everted externally.	Are turned in.
Sacrum	Wider, shorter.	Narrower, longer.
Side of pubic arch	everted externally.	Not everted.



Types of Female pelvis (slide 24&25- check the figures)

- Gynaecoid pelvis: it is the typical female pelvis previously described.
- Android pelvis: it is the female pelvis with some male features.
- **A**nthropoid pelvis: it simulates the pelvis of apes. It has small transverse diameter and long **a**nteroposterior diameter.
- Platypelloid pelvis: it is a flat pelvis in which the inlet has larger transverse diameter much than the anteroposterior diameter.



Pelvic Fracture

If the pelvis breaks at any one point, the fracture will be stable, and no displacement will occur.

If two breaks occur in the pelvis the fracture will be unstable and displacement will occur.

→**Coccydynia**: is common and is usually caused by direct trauma to the coccyx, as in falling down a flight of concrete steps.**Complications of Pelvic Fractures** (slide26)

- Injury to Male urethra and urinary bladder.
- Rectum rarely damaged.
- The rectum lies posteriorly within the sacrum (it's somewhat protected), but the bladder is located anteriorly behind the pubic bones. So, in pelvic fractures the bladder is more prone to be injured than the rectum.
- Bleeding from blood vessels injury.
- Injury to nerves especially sciatic nerve in fracture include greater sciatic notch.