

Pelvis Fracture

→ Classification
Treatment.

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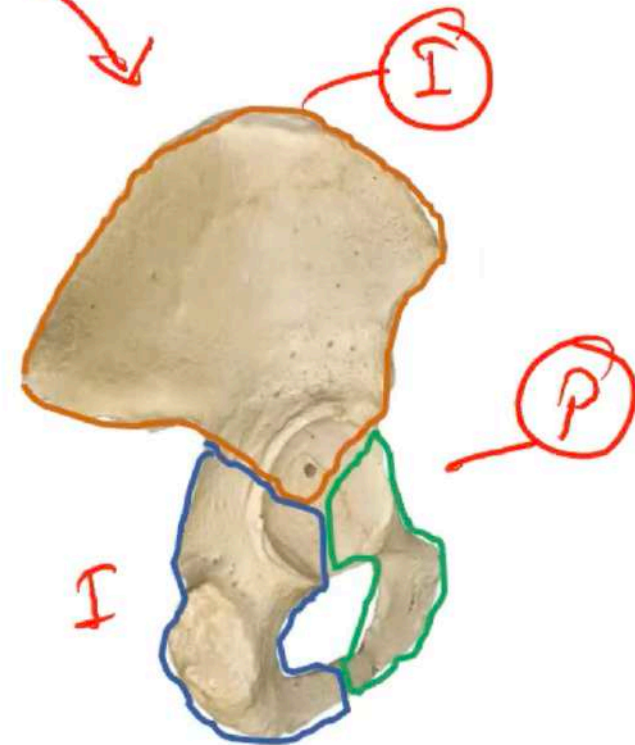
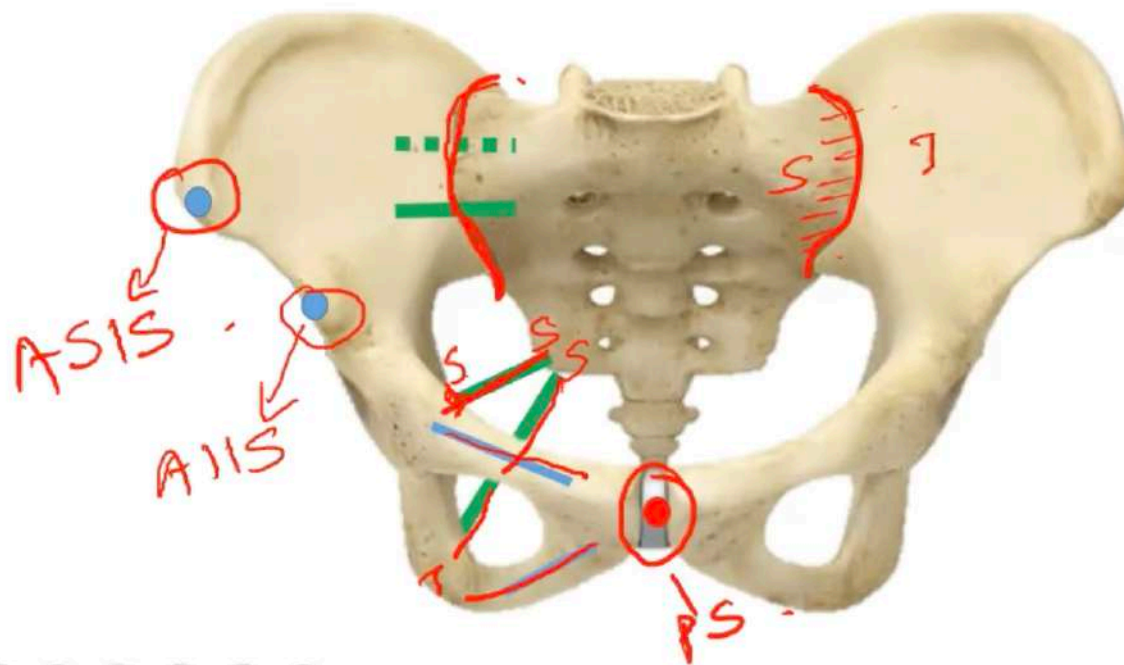
Faculty, TargetOrtho

Pelvis # -

- Associated with Polytrauma
- Associated with Mortality (40-70 %).
- One of the LIFE THREATENING emergency in Orthopaedics
- Decision making has to be fast – sometimes based on only clinical examination (without investigations)

Anatomy

- Bones — 2 Innominate + Sacrum
- Ligaments
- Joints

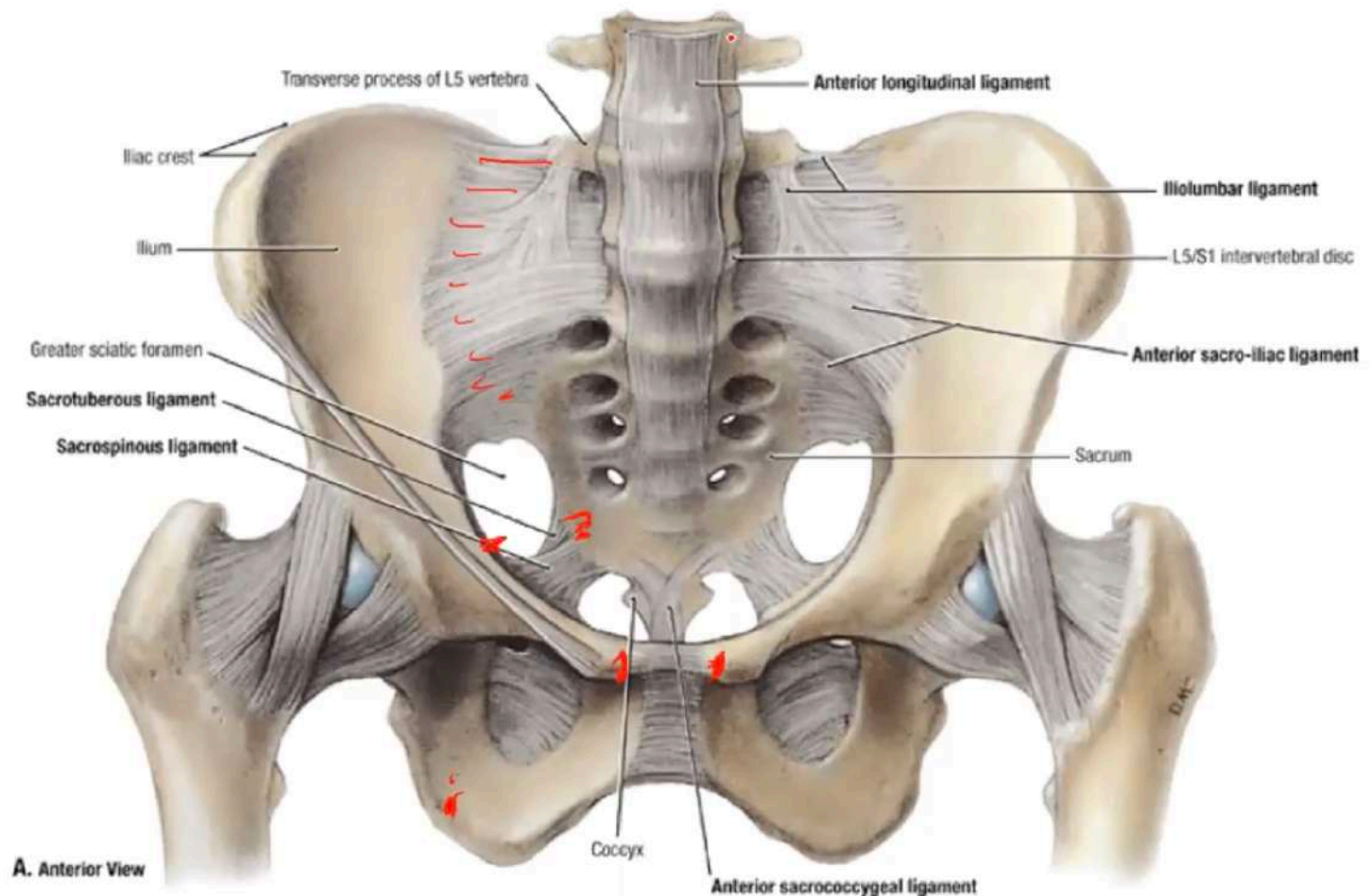


Ligaments of Pelvis

- ✓ Sacroiliac ligaments

- Anterior
- Posterior
- Interosseous

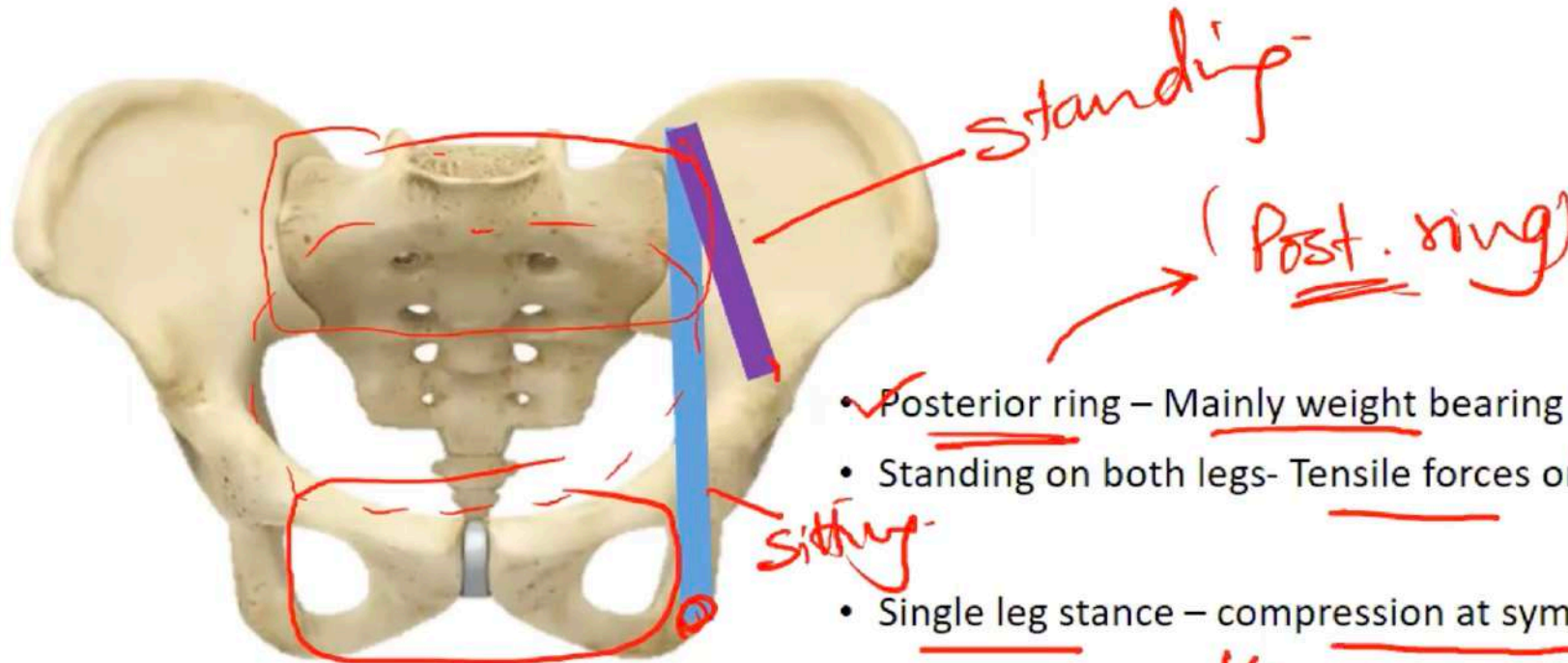
- Sacrotuberous
- Sacrospinous
- Pubic symphysis
- Iliolumbar



A. Anterior View

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Biomechanics



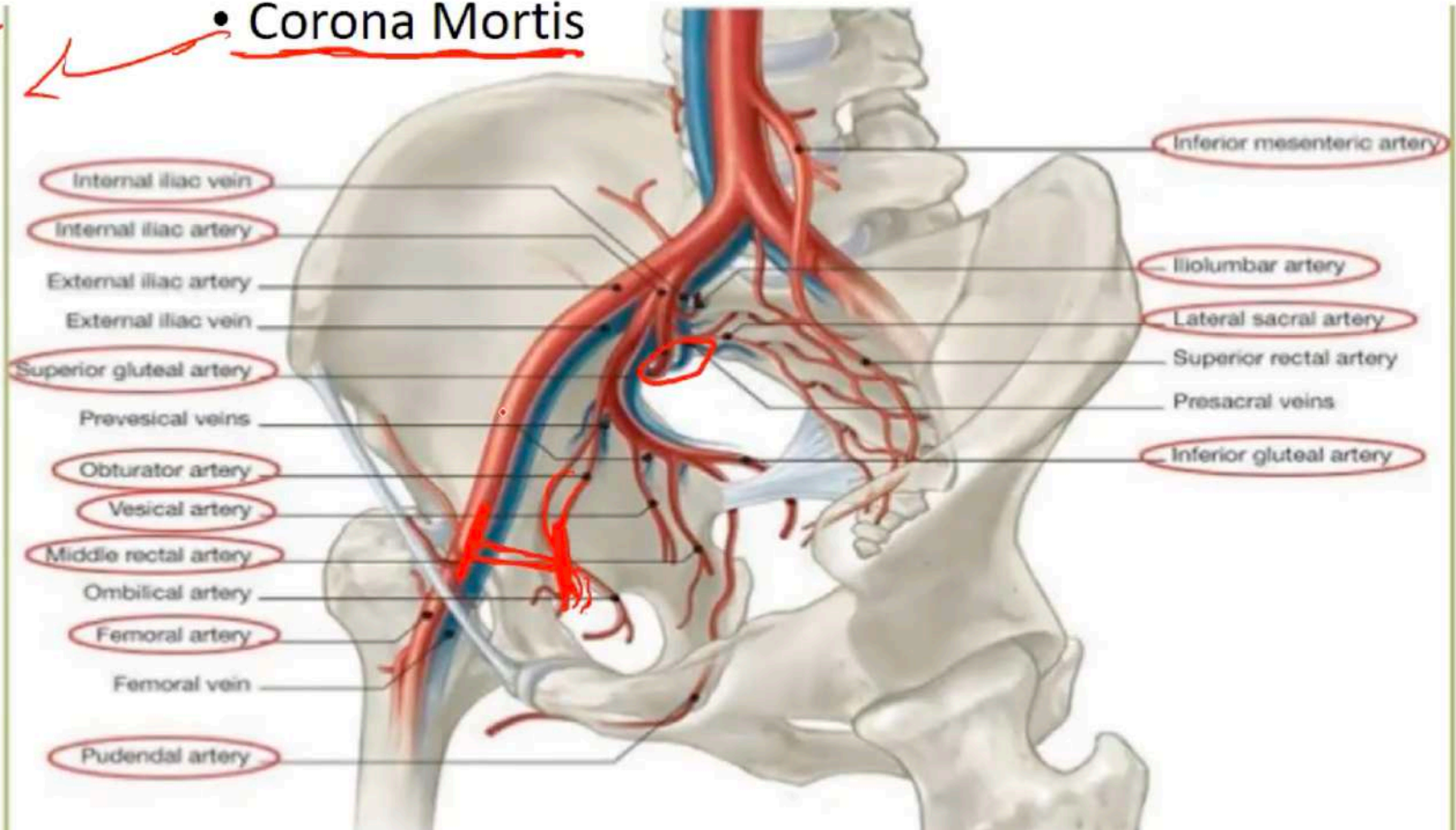
Weight transmission while standing
Weight transmission while sitting

- Posterior ring – Mainly weight bearing (85%)
- Standing on both legs- Tensile forces on symphysis and SI joints
- Single leg stance – compression at symphysis.
- APC I injury – isolated pubic diastasis- weight bearing will cause compression- managed non operatively
- APC II and III- SI joint is also disrupted- further tension occurs further widening- managed by surgery

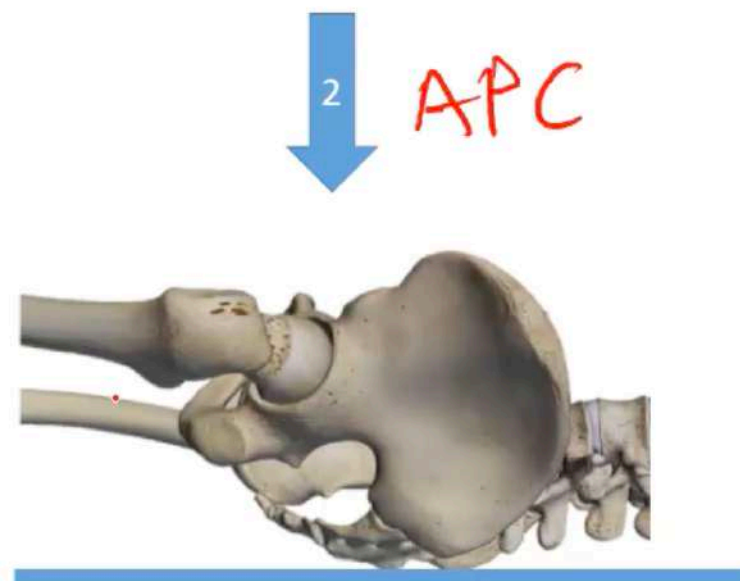
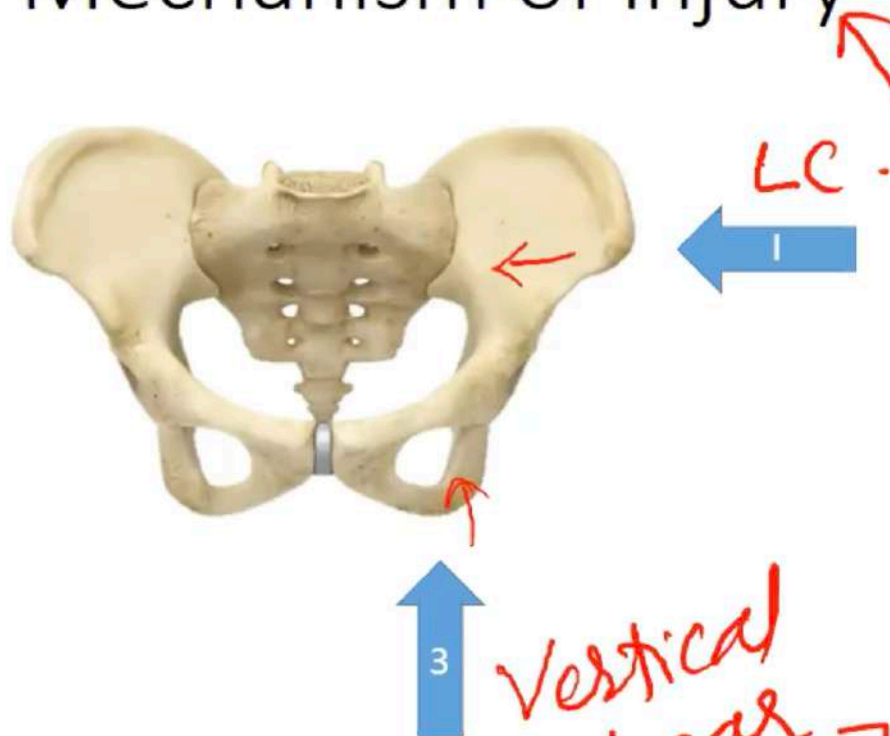
Blood vessels

- Internal iliac vessels - *Bleeding veins*
- Superior Gluteal vessels - *GSN*
- Obturator vessels
- Corona Mortis

Coron of Death



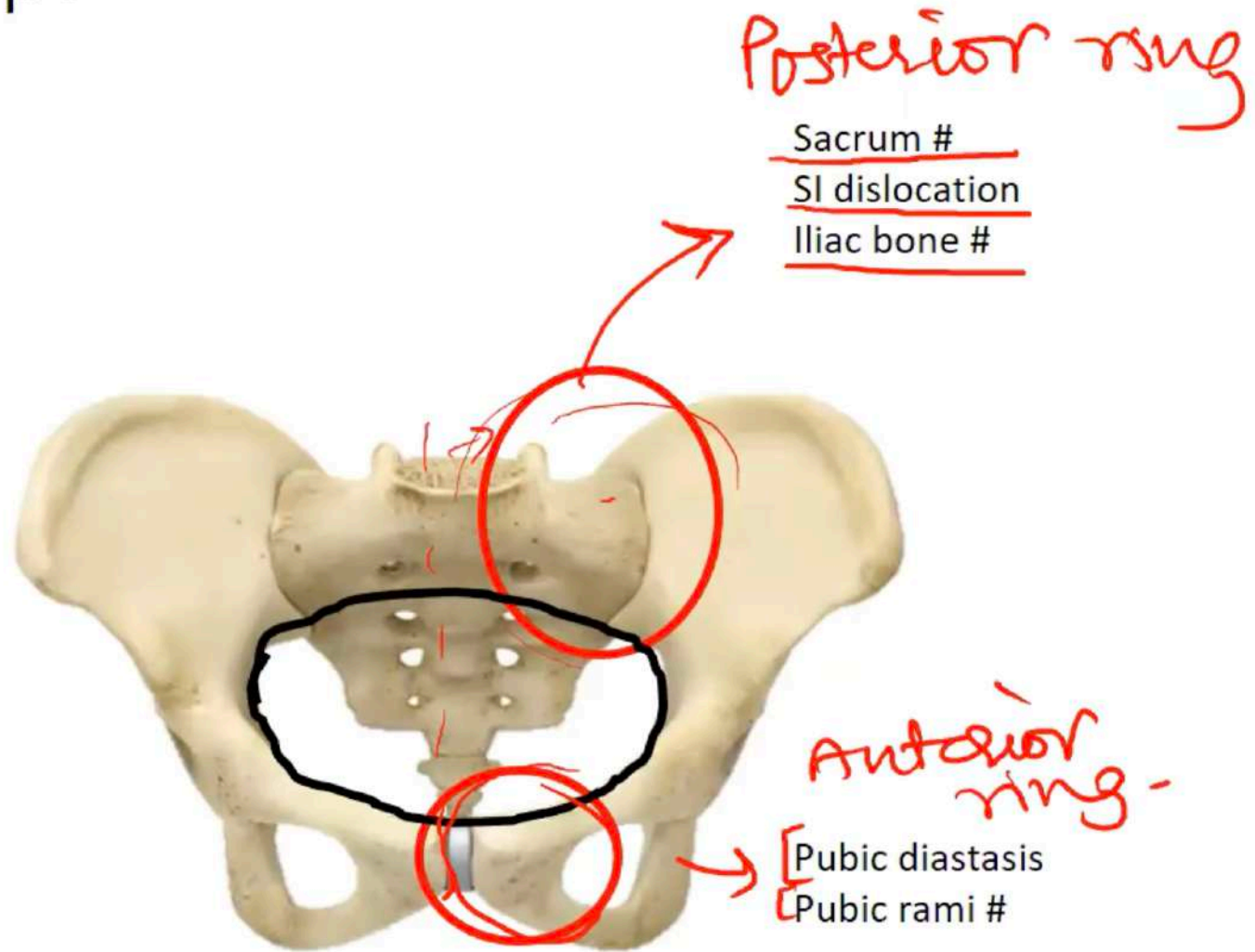
Mechanism of injury



- 1- Lateral compression
- 2- Anteroposterior compression
- 3- Vertical
- ✓ 4- Combined

• Young & Burgess classification

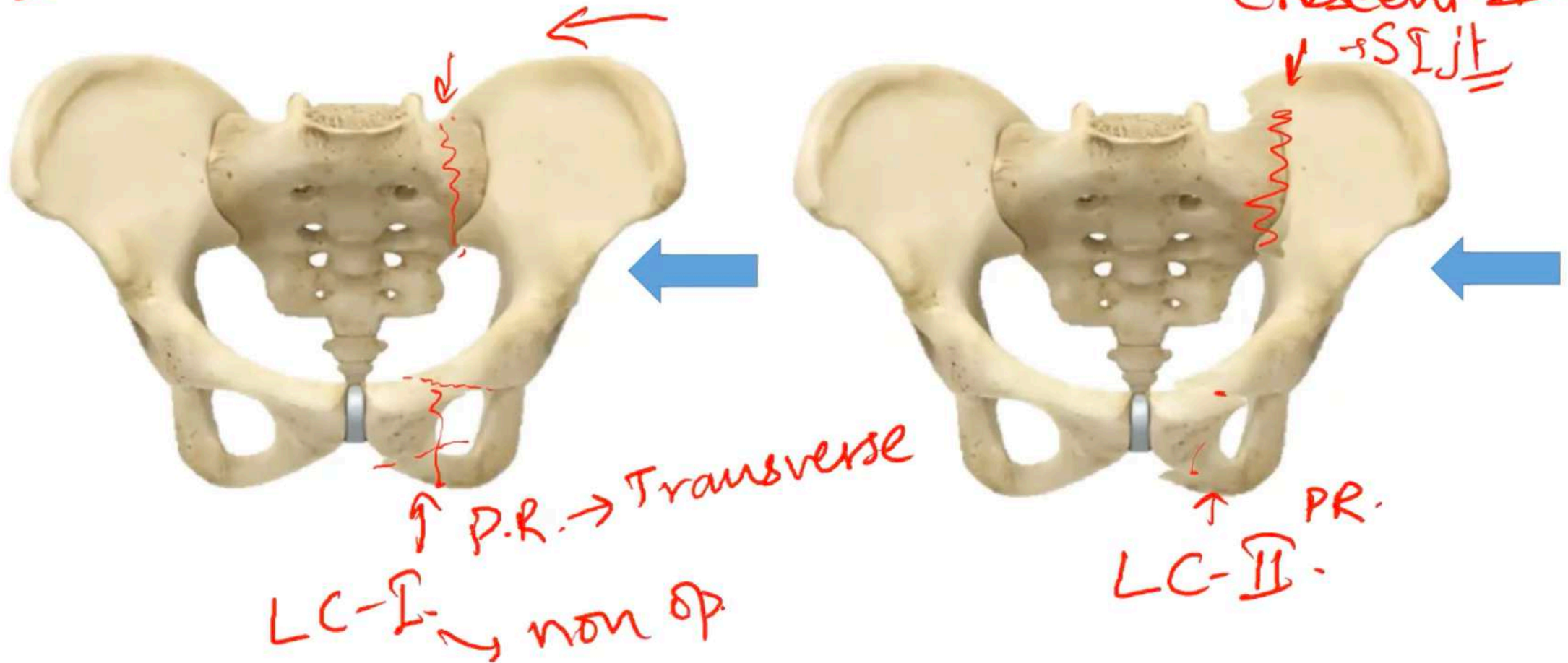
The Ring Concept



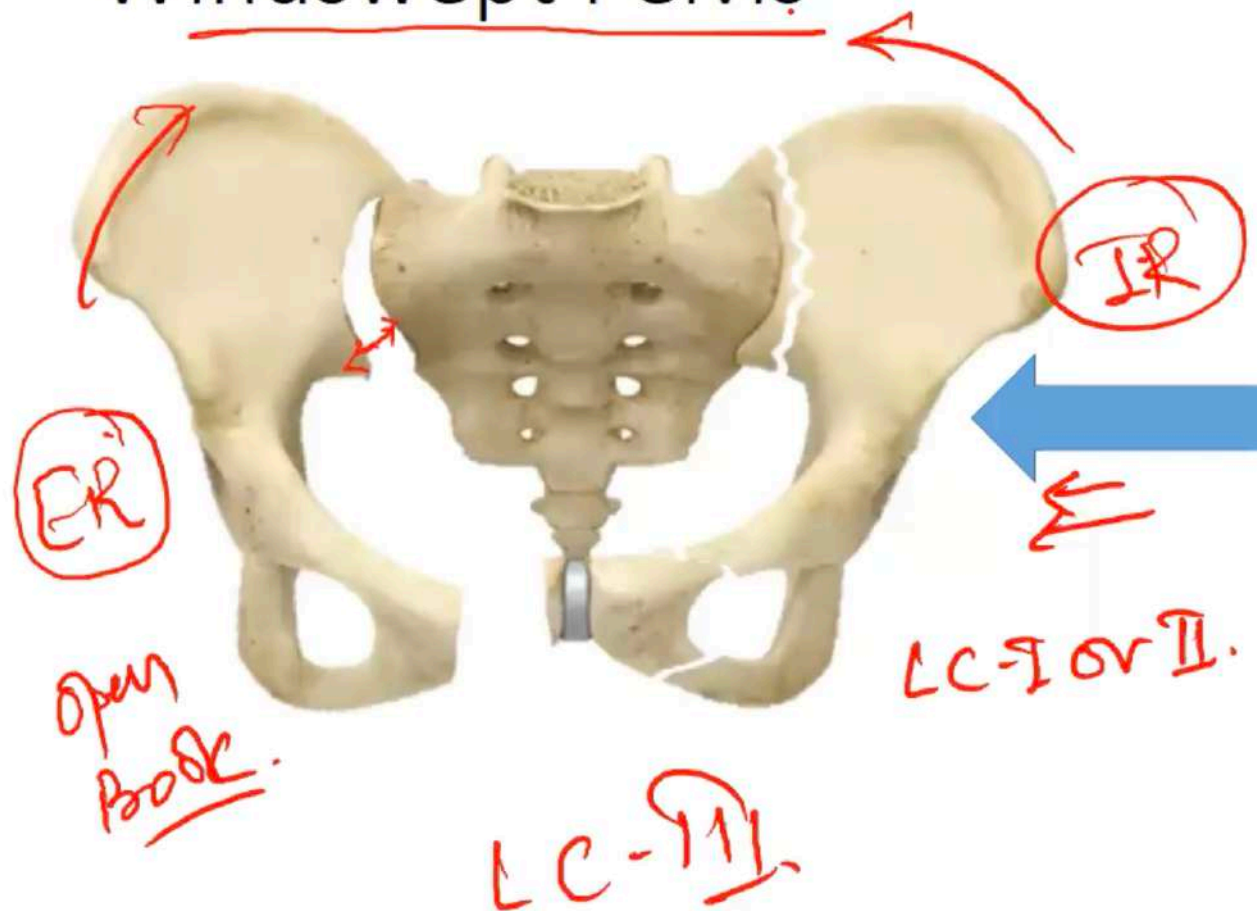
Young & Burgess classification

- Lateral Compression
- AP Compression
- Vertical Shear
- Combined Mechanism

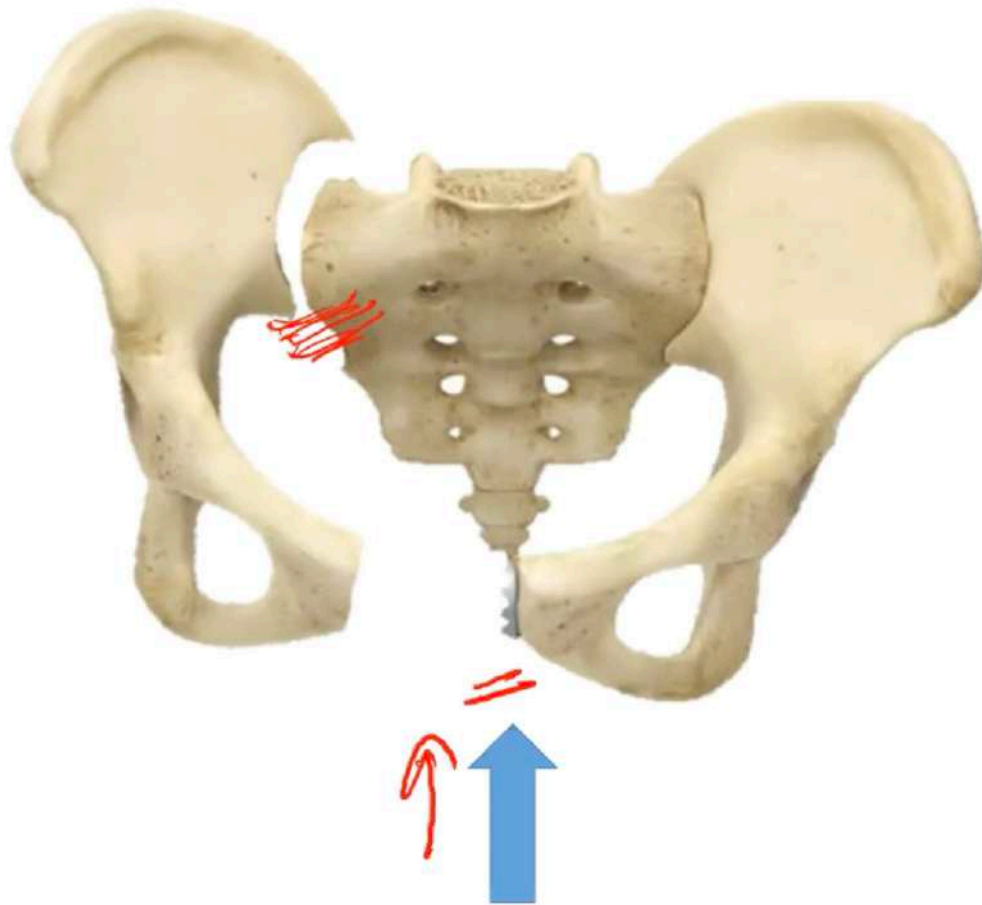
LC injuries



Windswept Pelvis

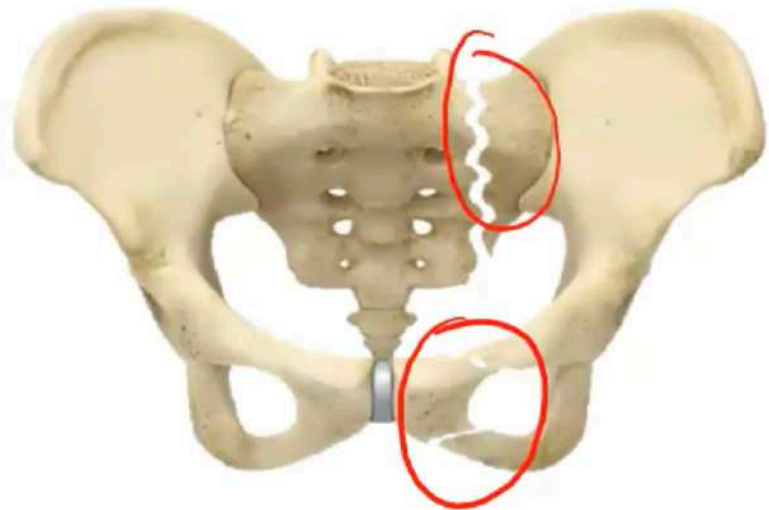


Anteroposterior compression Injury (APC)

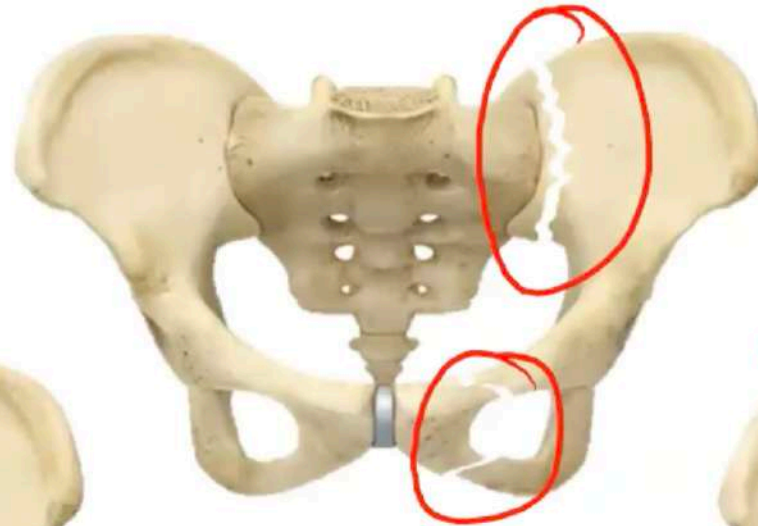


- APC I — Pubic diastasis.
 |
 — II —
 + SIJ + Ant lig rupture.
- APC II → PD + Complete, SIJ h inj.
- APC III →

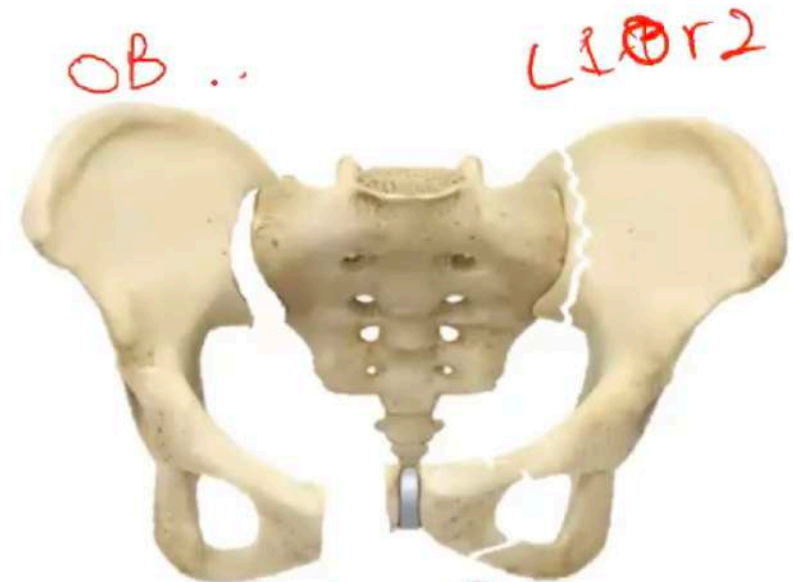
LC



LC1

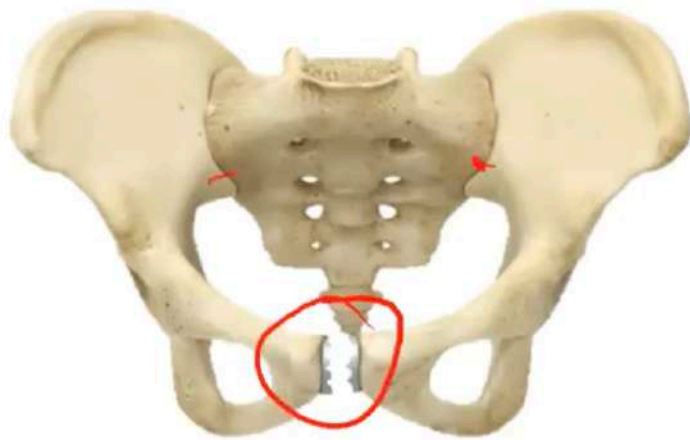


LC-2

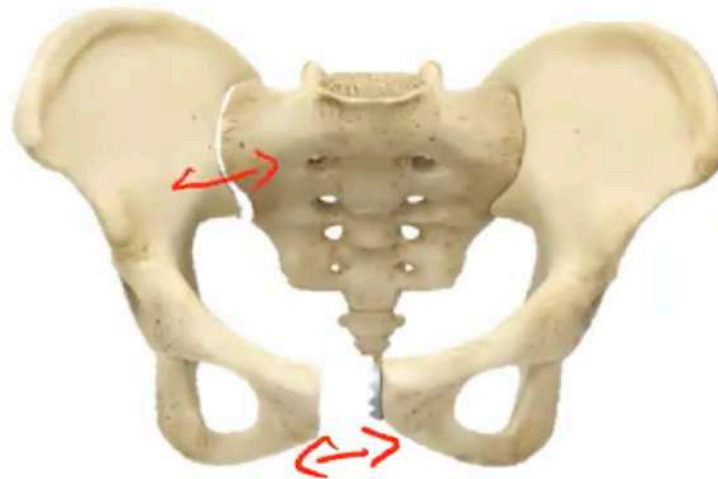


LC-3

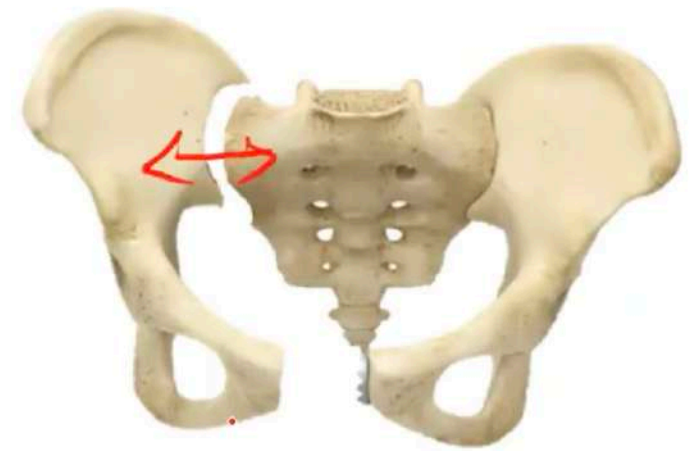
APC injuries



APC I

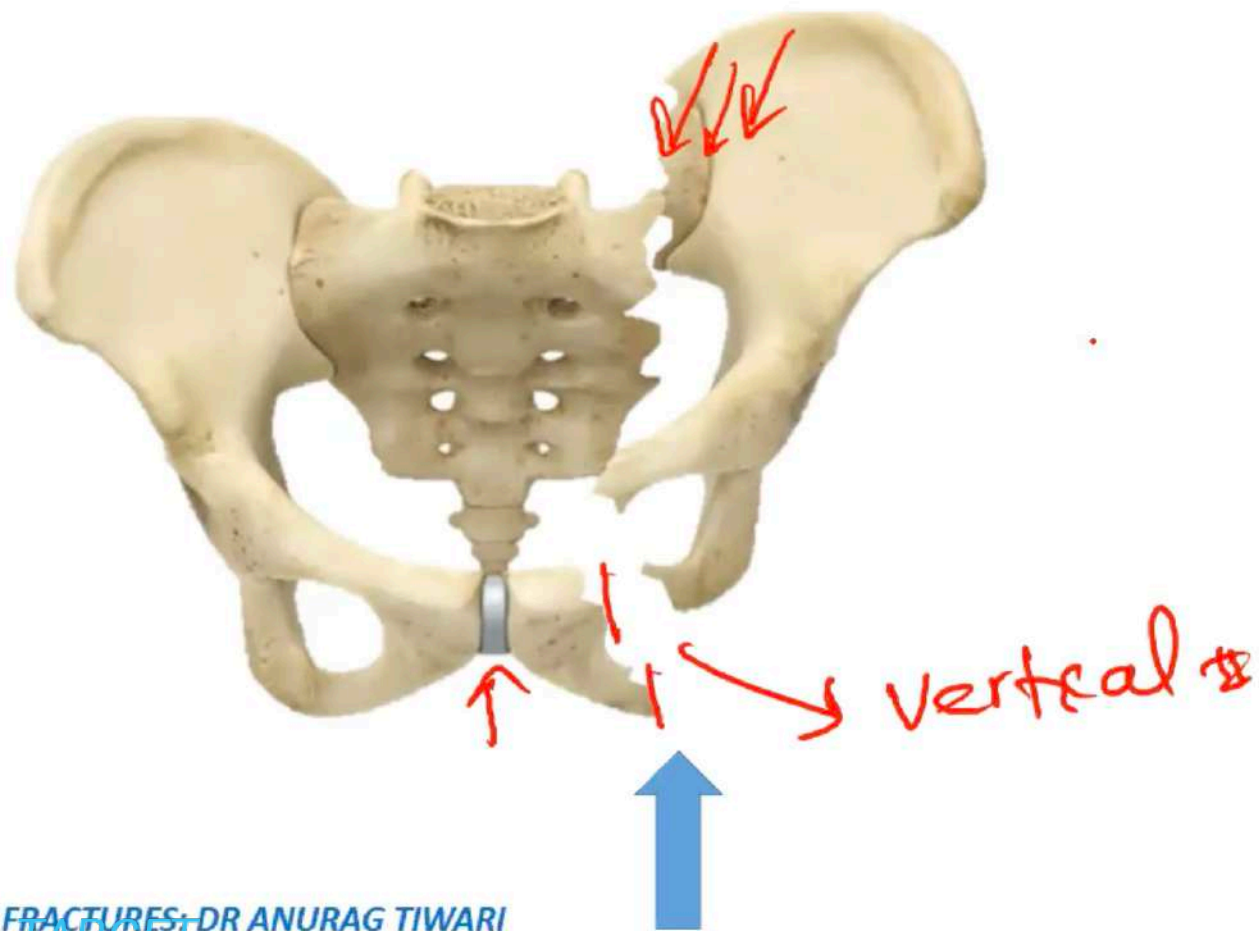


APC II



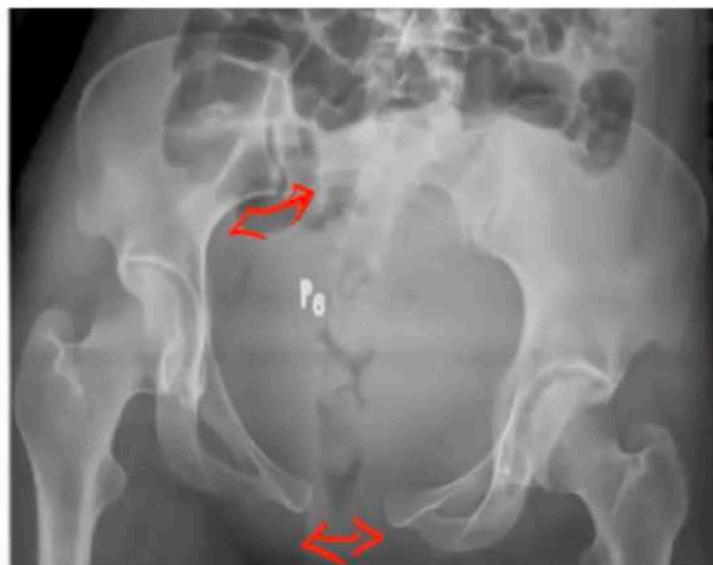
APC III

Vertical shear injury





LC-



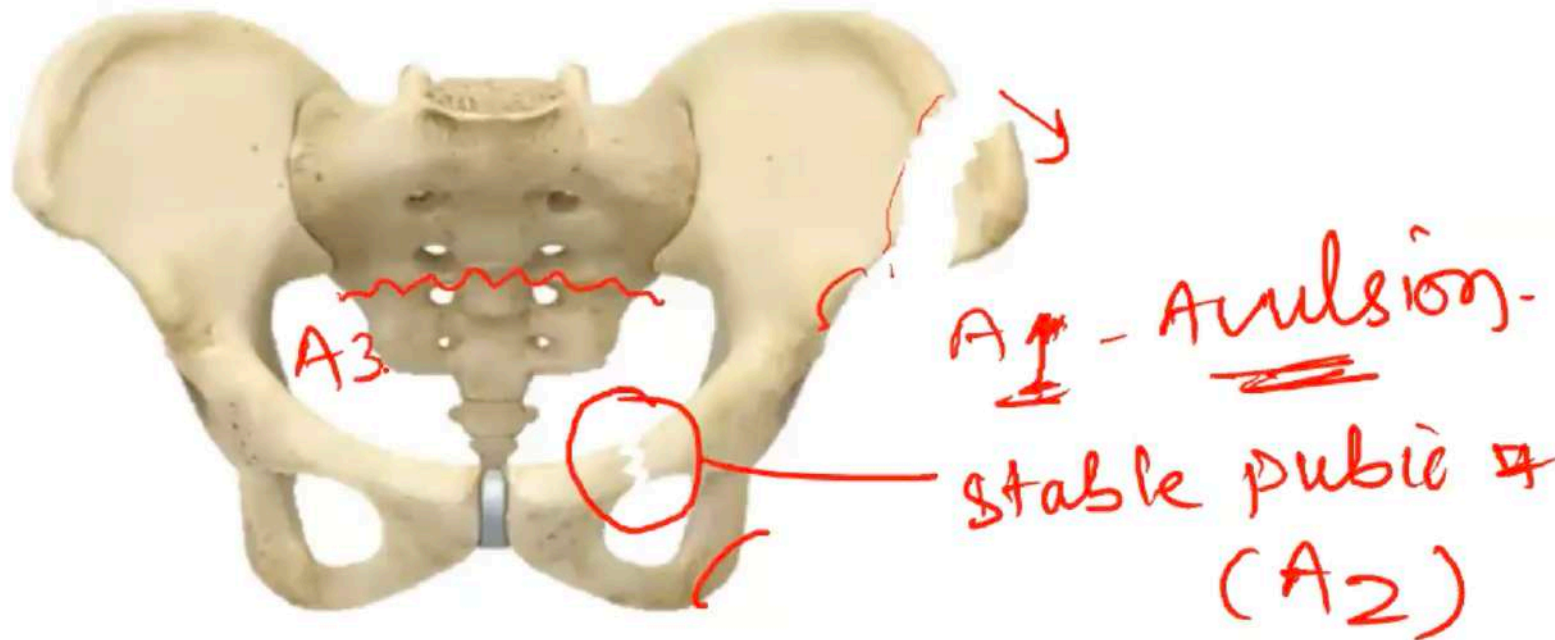
APC



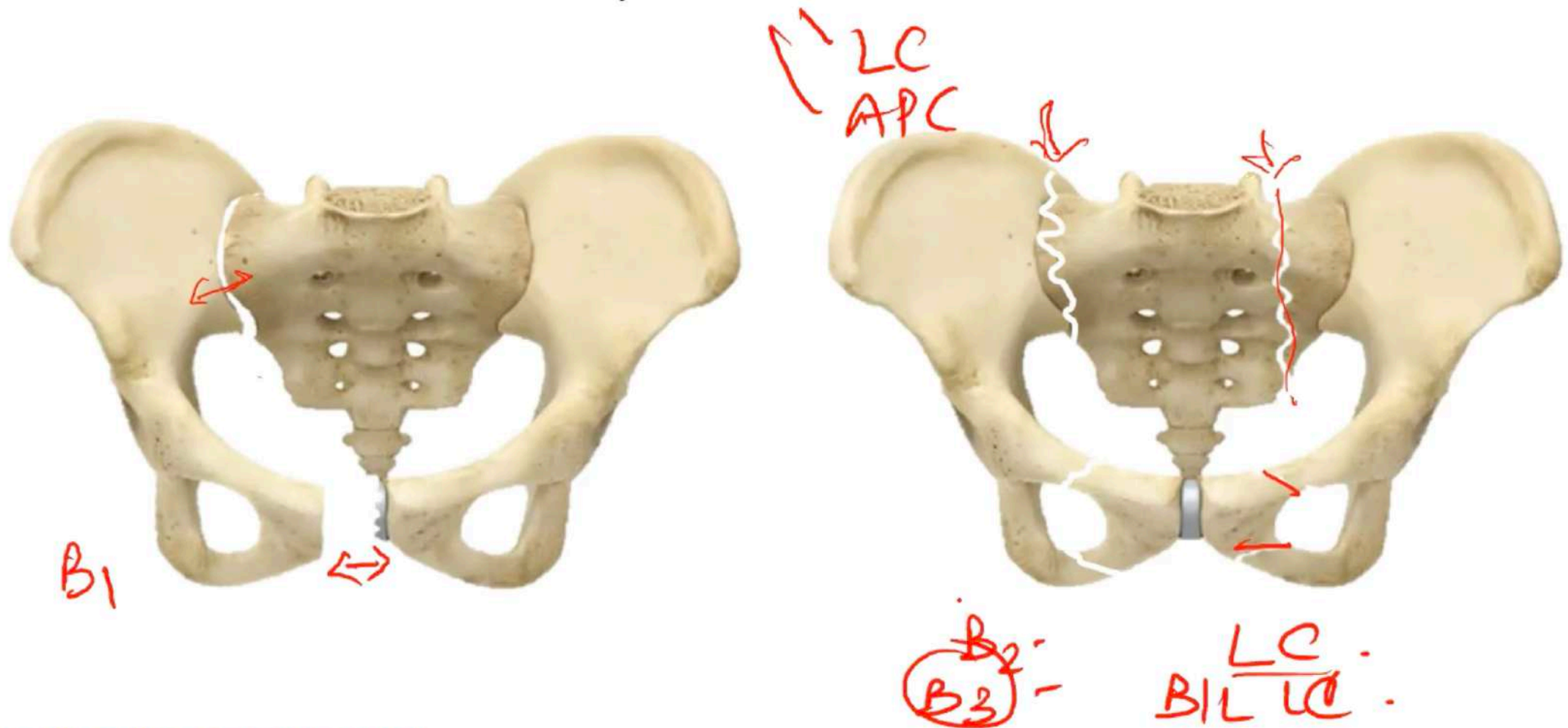
Tile classification

- Pelvic instability 
- A- Stable
- B- Rotationally unstable
- C- Vertically unstable

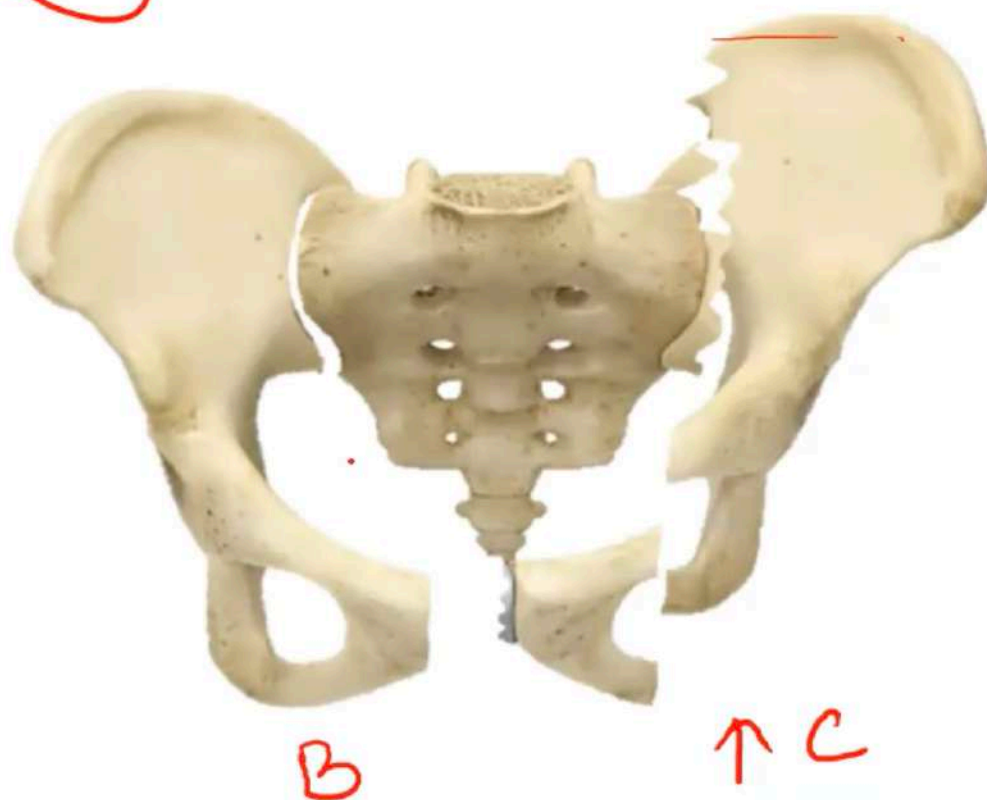
Tile A- stable Ring



Tile B- Rotationally Unstable



C2 - C + B



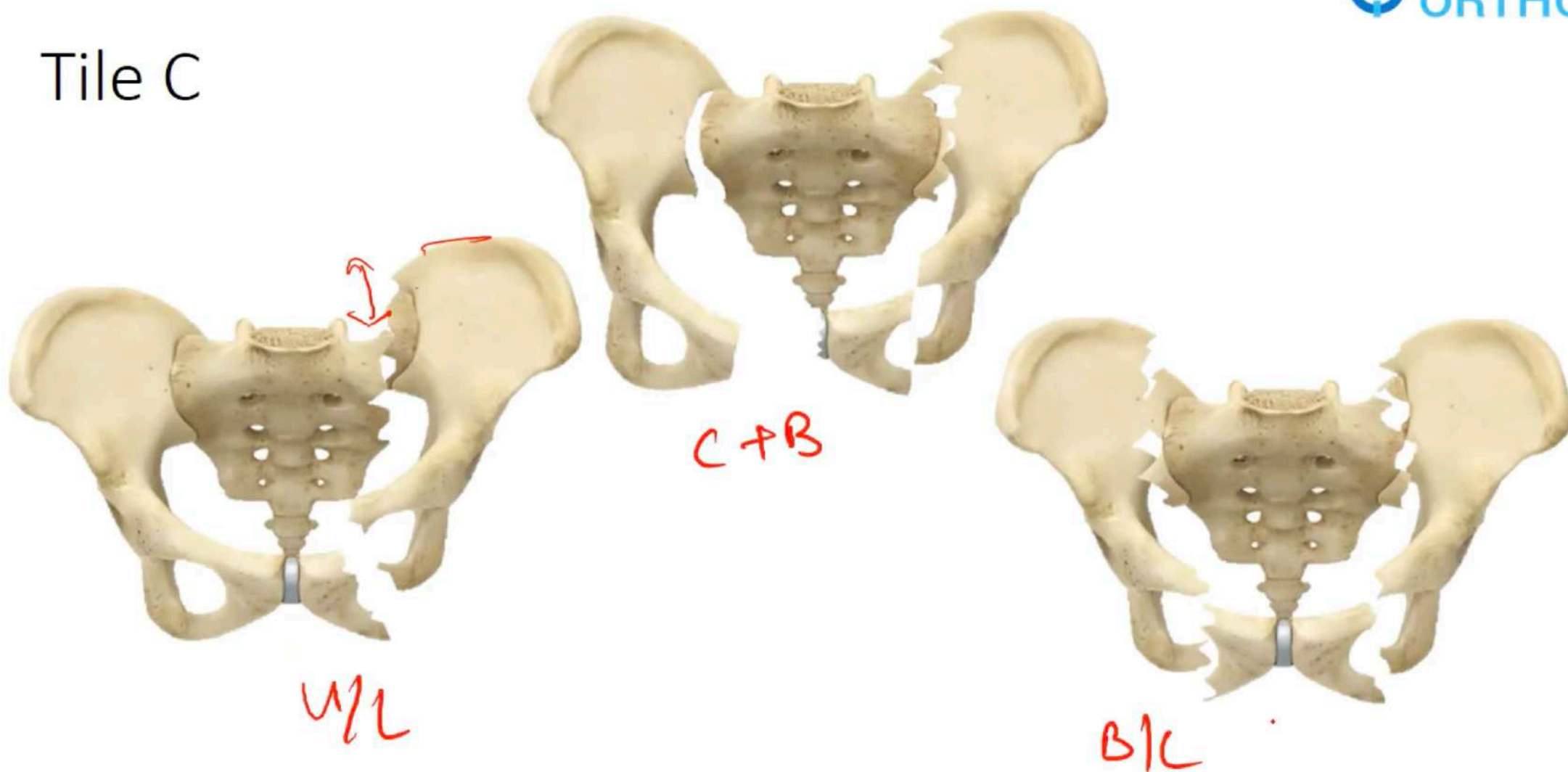
Tile A



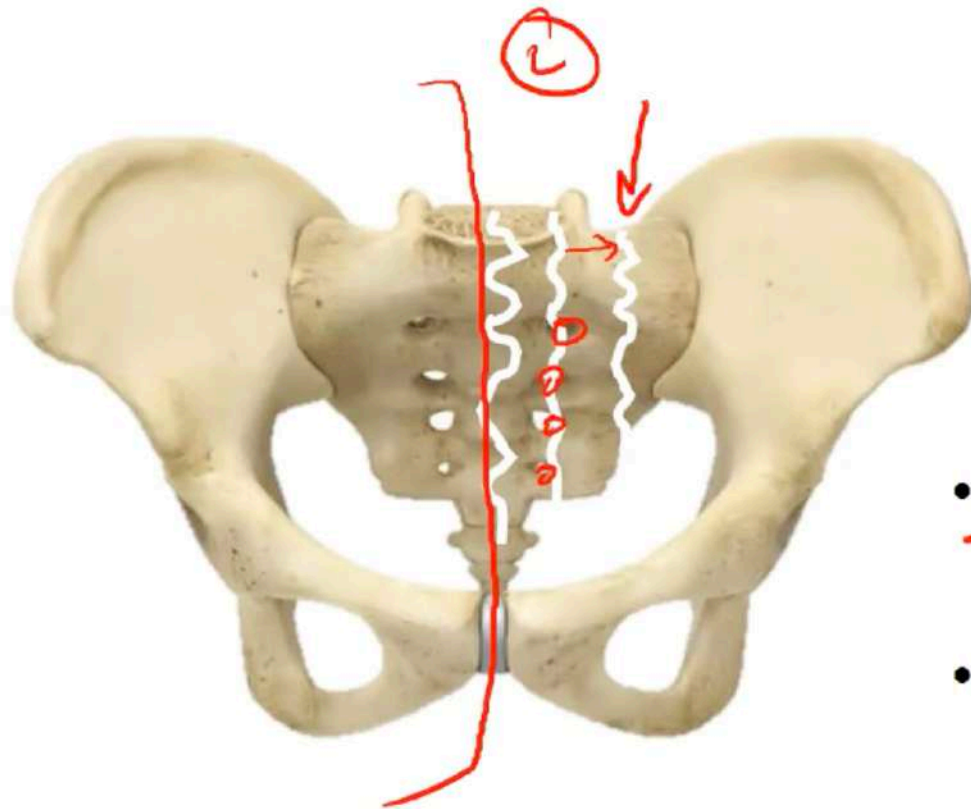
Tile B



Tile C



Denis classification for sacral



→ less.

- 1 → Lat to N.F
- 2 - thr. N.F - mod (30-40%)
- 3 - Medial - more.

Clinical presentation

- ATLS protocol

- Primary survey-

ABCDE

A- Airway

B- Breathing

C- Circulation

D- Disability - GCS

E- Exposure

- Secondary survey-



Head to toe examination

- Definitive care

Signs Specific to Pelvis

- Limb shortening – Vertical Shear
 - Internal rotation – Lateral compression injury
 - Check for palpable hematoma / Bruise
 - Check for Morel Lavallee lesion
 - Check for bleed through orifices- Blood at meatus , vagina or anus – Open pelvis → More mortality
 - P/R examination- High riding prostate – Urethral injury
- Central hip dislocation
- Sacral # fragments

Clinical test for Pelvic Instability

- AP compression
- Pelvic Lateral compression
- Push-pull test → *rotational*
vest
- Performed with caution.
- Only once and by senior surgeon

Blood loss in pelvic

- 2-2.5 Litre
- Source-
- Rupture of retroperitoneal plexus of veins- ✓

Fractured bone

Arterial injuries — rare.

↓
✓ Tamponade

Imaging

- AP, Inlet and outlet views
- CT scan
- L5 transverse #- Sentinel sign for VS- Avulsion of Iliolumbar ligaments

AP view

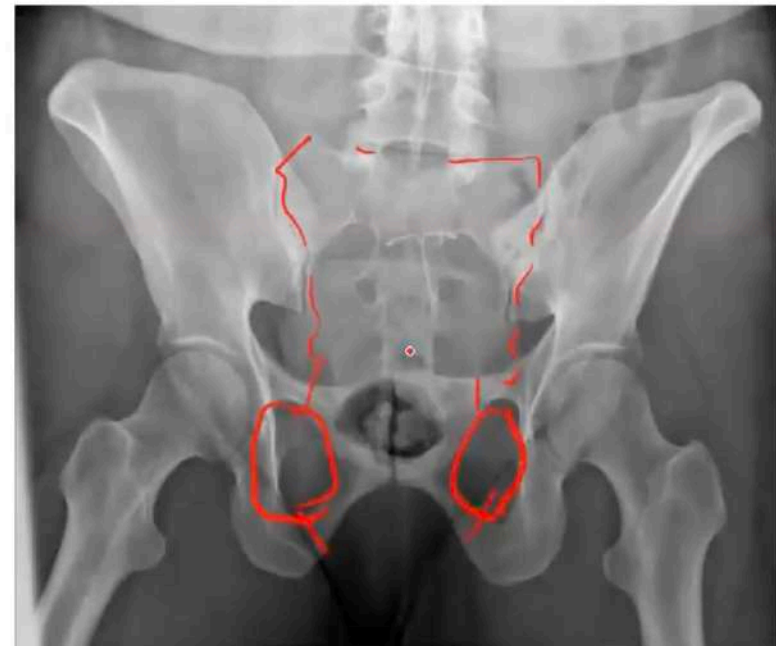
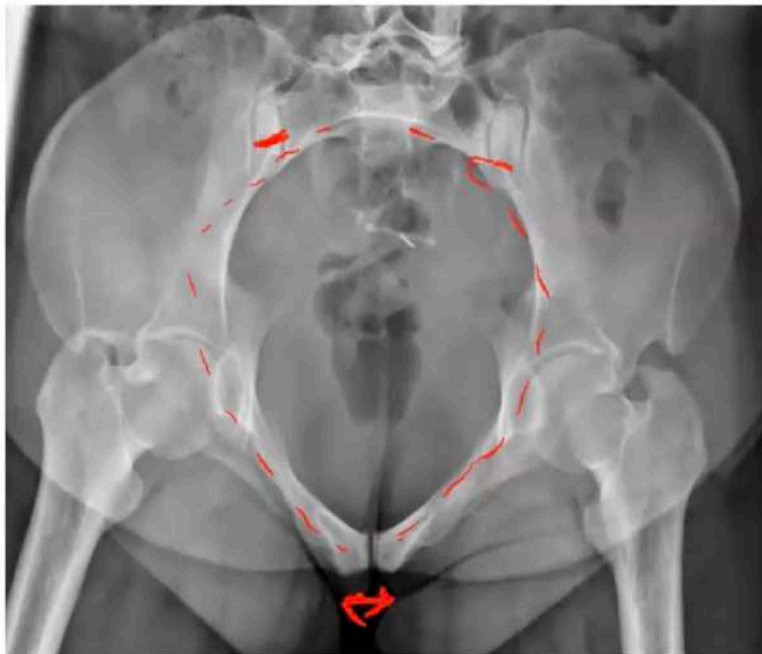
- Check for Ring integrity
- Check for diastasis
- Pubic rami
- SI joint opening
- Sacral #
- L5 transverse process



Inlet / Outlet view

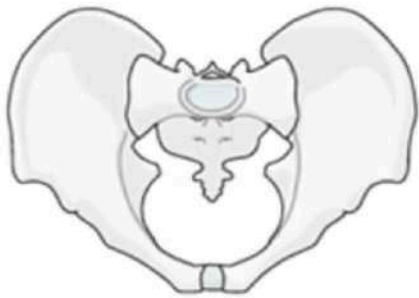
Rotational

Vertical

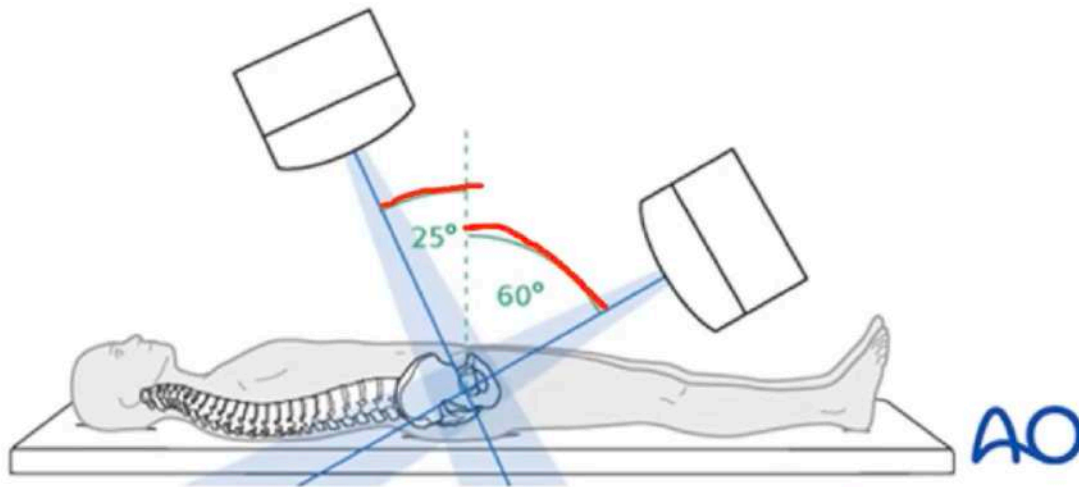
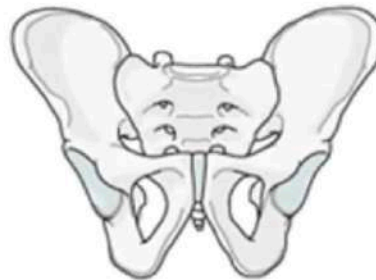


- Appropriate angle of tilt for obtaining inlet and outlet view, respectively?
- A. 20-40 caudal tilt, 20-40 cephalic tilt
- B. 20-40 caudal tilt, 40-60 cephalic tilt
- C. 40-60 caudal tilt, 20-40 cephalic tilt
- D. 40-60 caudal tilt, 40-60 cephalic tilt

Inlet view



Outlet view



25° / 42° ..



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PMID: [30449981](https://pubmed.ncbi.nlm.nih.gov/30449981/)

Radiological evaluation of pelvic inlet and outlet radiographic view in Indian population

[Yugal Karkhur](#),^{a,*} [Anurag Tiwari](#),^b [Lalit Maini](#),^c [Vivek Bansal](#),^d and [Abhimanyu Kakralia](#)^e

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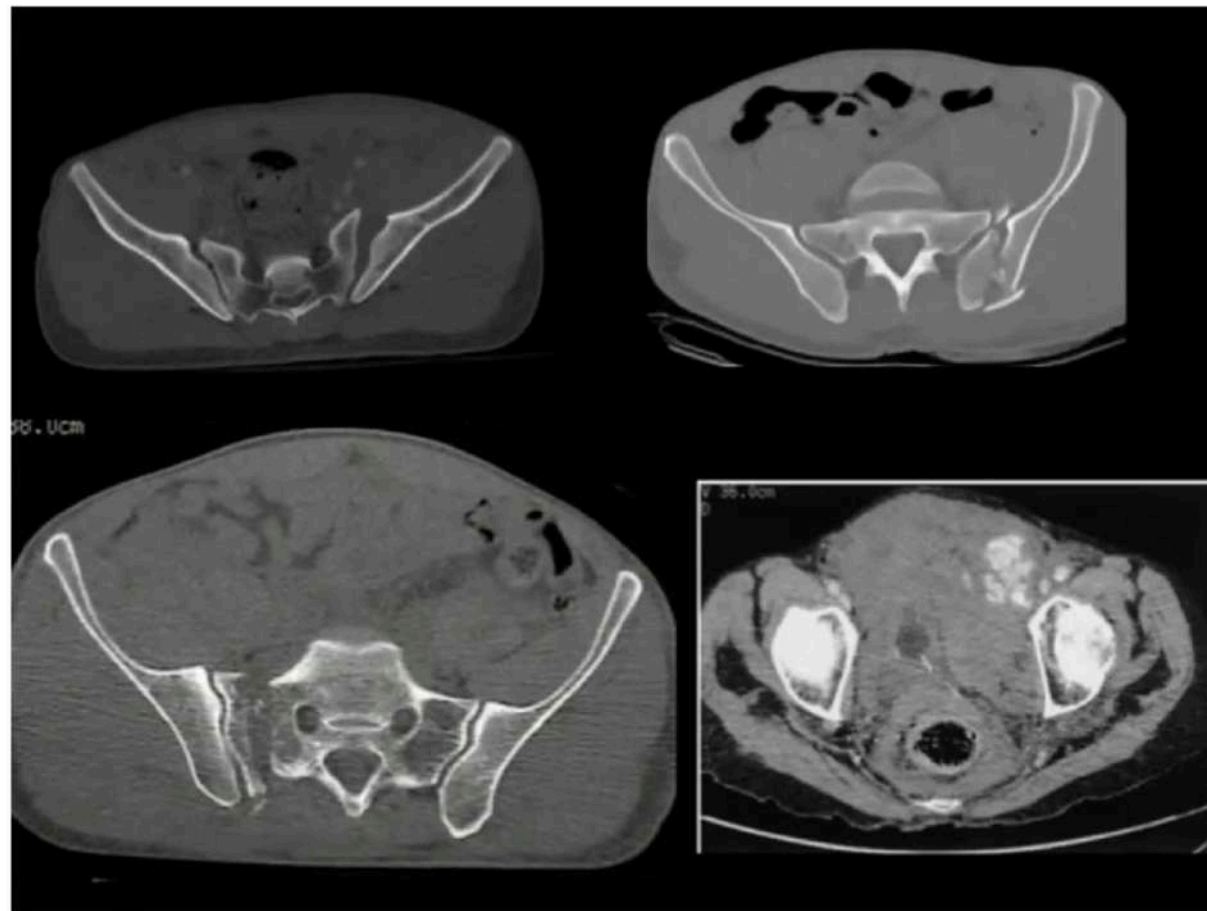
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- Indian population:

Inlet view = 33°
Outlet view = 56° } 90°

- Inlet – AP displacement
Rotational instability- opening of SI joint
- Outlet- Vertical displacement
Vertical instability
Sacral #

Role of CT



Role of MRI

- MRI- No added advantage
- Can be performed in — spinopelvic dissociations and
— sacral # with neural deficit

Treatment

- Follow ATLS- Primary Survey- Secondary survey

- Decision making- 4 possibilities

- Patient Stable

- Patient unstable

- Aim of Emergency treatment- Convert **4,3,2** → **1**

Pelvis Stable

1

3

Pelvis Unstable

2

4

Def.

Stabilize

other Head Chest

4

- Patient is unstable because of pelvic instability- Pelvic haemorrhage- We need to do Immediate pelvic stabilization

Options –

① External compression devices

Ex fix
Binder
Bed sheet

✓ Exploration
✓ Pelvic packing

✓ Angiography → Embolization

(Arterial)

External Compression Devices

- ✓ PASG / MAST- Pneumatic Antishock Garment/ Military Antishock Trousers
 - ✓ Pelvic Binder
 - ✓ Bed sheet as Binder
 - ✓ External Fixator
 - ✓ C Clamp (Ganz Fixator)
- Comp. Syndrome

MAST/ PASG



PELVIC FRACTURES- DR ANURAG TIWARI

External Fixator

- Indications

- ✓ Emergency stabilization of pelvic ring
- ✓ Definitive in LC-II and APC-II (Rot.)
- ✓ Adjunct to posterior fixation

- Contraindications-

iliac wing
Acetabular #

- Which Frame configuration?

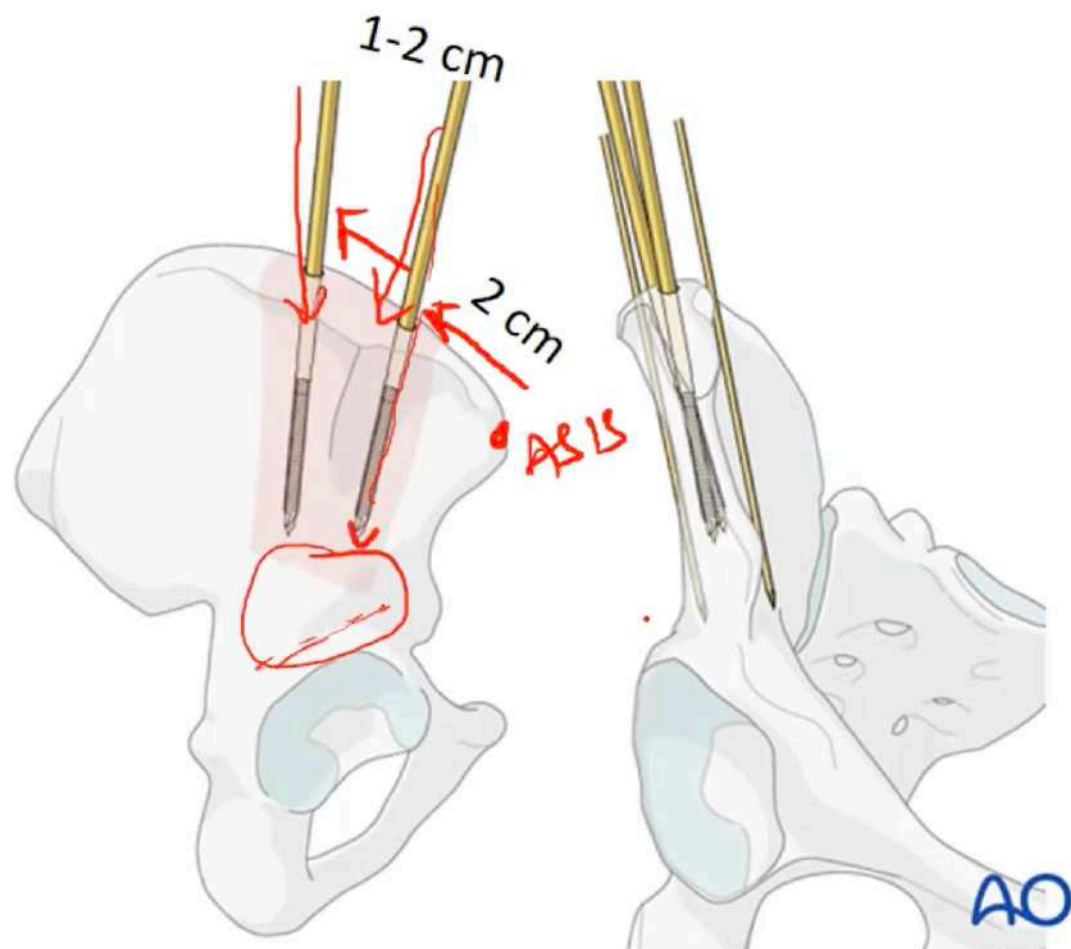
Anterior
✓ Anterior frame (Iliac crest frame)
Hannover frame

✓ C-clamp → Vertically

- How to reduce the pelvis?

→ PrnX

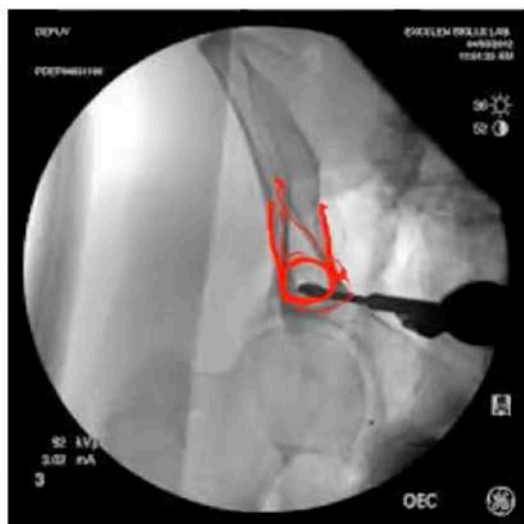
Conventional Anterior Frame



Hannover Frame (Supraacetabular)

Adv- Better purchase of pin – So only one pin each side is sufficient
Abdomen is free

Disadv - C-arm -



Obturator Outlet view

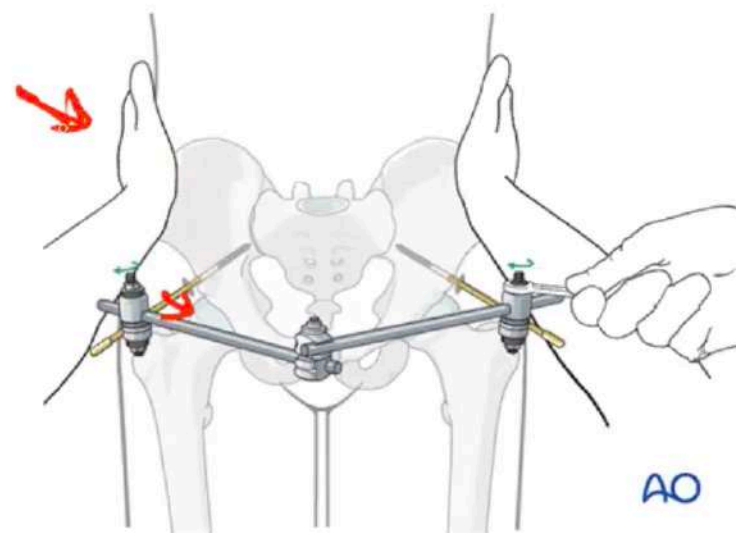
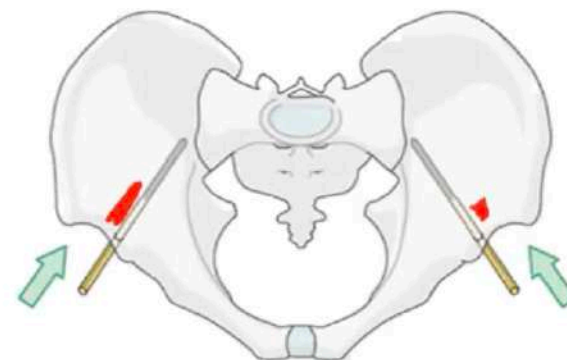
(Tear drop view)

For entry point



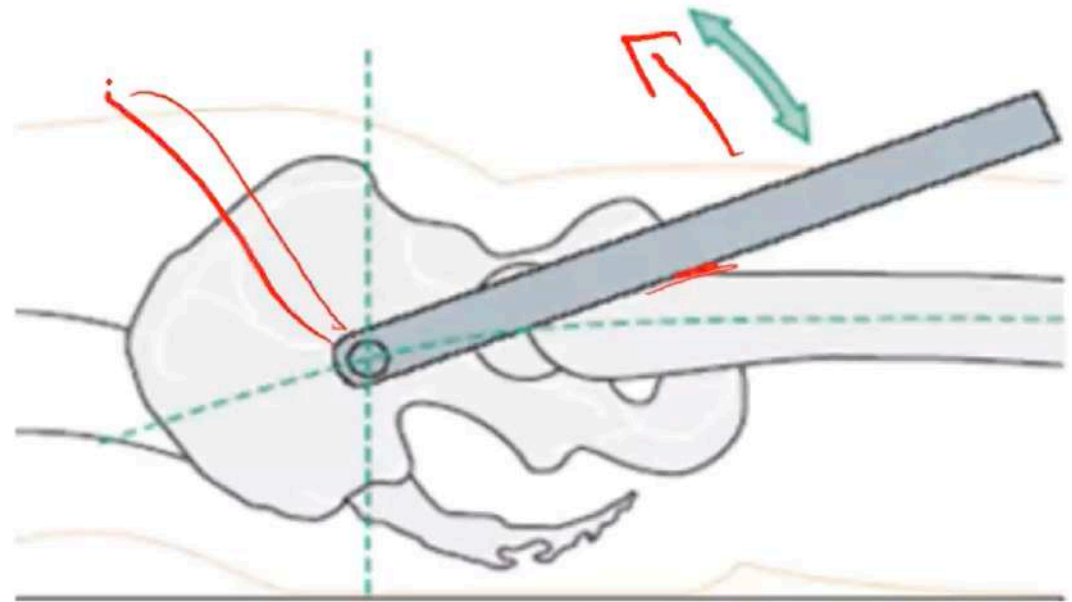
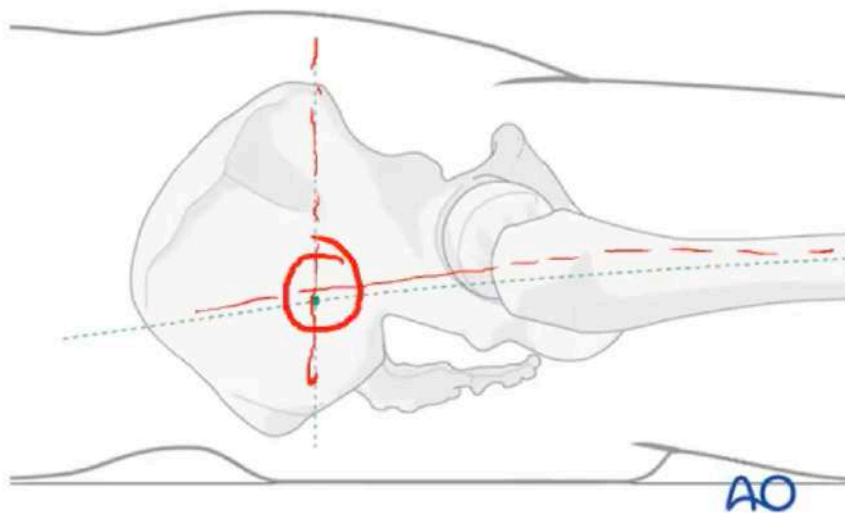
Obturator Inlet view

For trajectory



C Clamp (Gams)

- Indications – Displaced Posterior injuries- APC III and VS injuries
- Contraind- Iliac wing # close to SI joint
- Entry point
- Advantage over anterior frame-



Treatment Algorithm

#	Tile	Young & Burgess		Temporary/ Emergency
<u>Stable/ Undisplaced</u>	<u>A</u>	<u>LC I</u>	<u>APC I</u>	-
<u>Rotationally unstable</u>	<u>B</u>	<u>LC II/III</u>	<u>APC II</u>	Anterior external fixator
<u>Vertically unstable</u>	<u>C</u>	<u>VS</u>	<u>APC III</u>	Ganz / C- clamp fixator

Definitive treatment

Non operative

< 2.5cm

Anterior ring ORIF

External fixator as Definitive

Anterior ring Fixation-

ORIF

External fixator

Posterior ring Fixation-

ORIF

Anterior ring Fixation

- Pubic symphysis diastasis

- 
- Pubic rami #

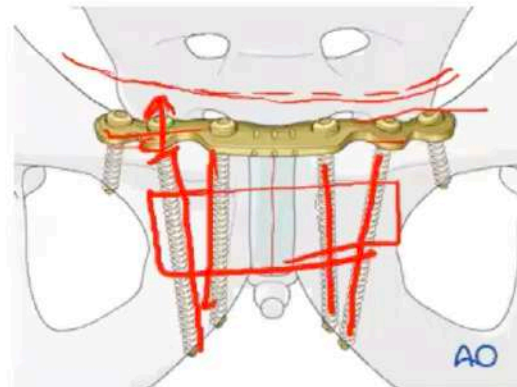
Pubic diastasis

- Indications – Tile B/ APC II – with Pubic diastasis > 2.5 cm

- Approach- Pfannenstiel

- Implants-

3.5mm DCP or Recon plates



- Configuration –

Single plate- Superior plating – More length of screws- More stability

Dual plate- Superior + Anterior → DSI

Posterior ring Fixation

Sacral #

Sacroiliac dislocation

Iliac bone #

Options-

- Iliosacral screw fixation (Percent.)
- Anterior plating of Iliac bone or SI joint
- Posterior Iliosacroiliac plating

Iliosacral screw fixation

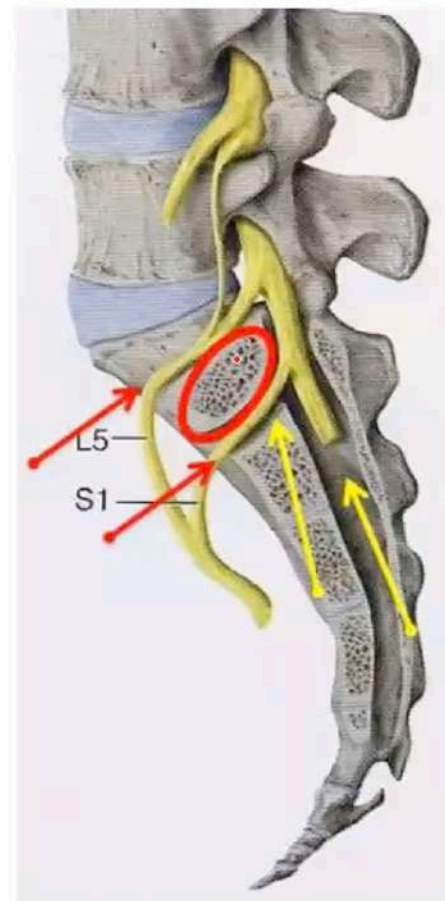
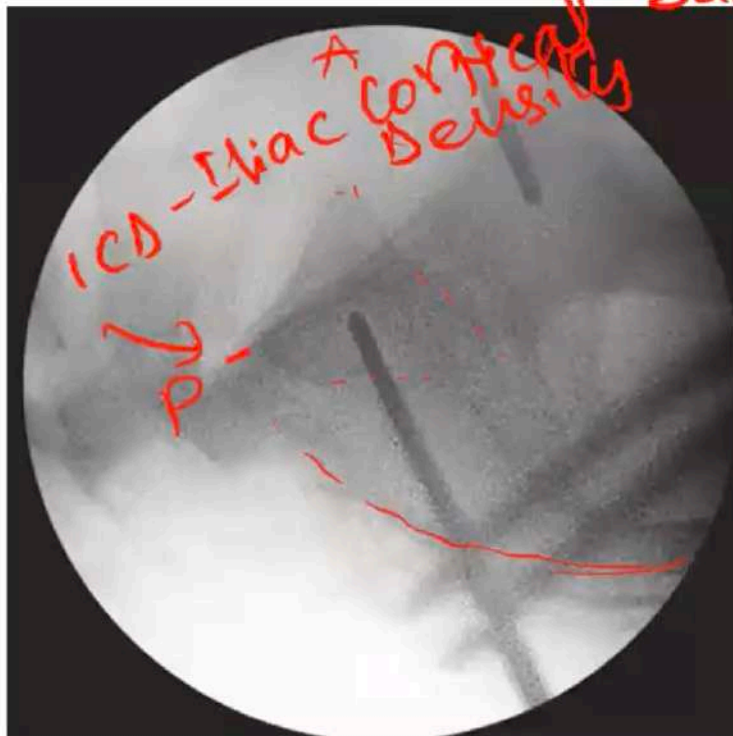
- SI dislocations- Screw perpendicular to joint
- Sacral # - Screws transversely passed.
- ✓ Transsacral – transiliac screw- More cortices purchase



Entry point – Posteroinferior to Iliac cortical density

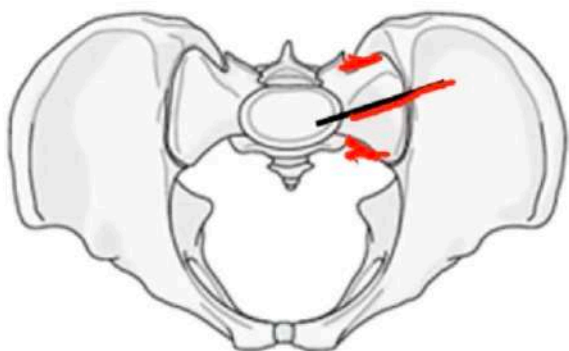
- Entry point

Lateral sacral.

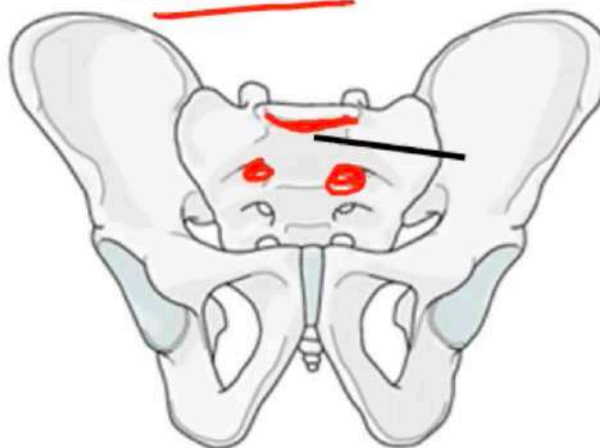


Trajectory

Inlet view



Outlet view

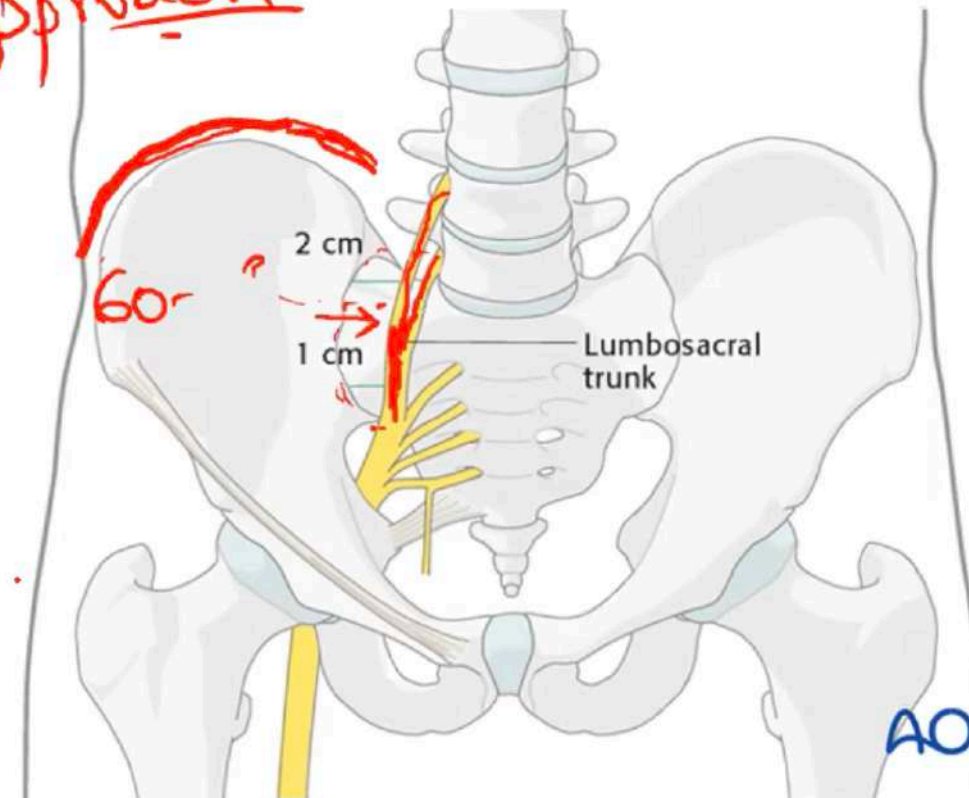


PI → AS.

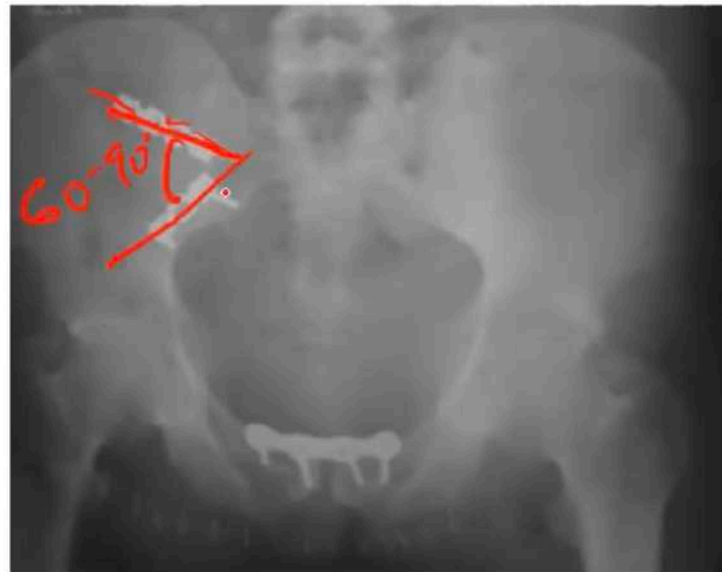
Anterior plating of SI joint or Iliac Bone

- Approach? →
- Implant choice? ✓
DCP (Recon) ②
- Configuration of implant
- How to protect L5 nerve root?? ✓

S.P approach

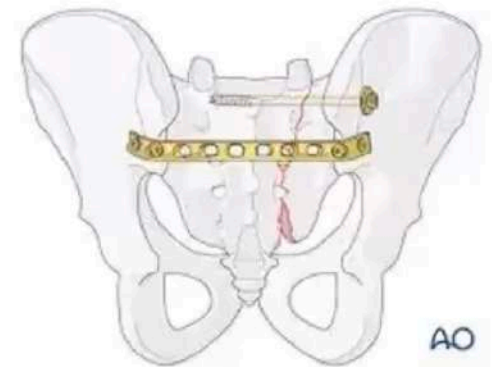
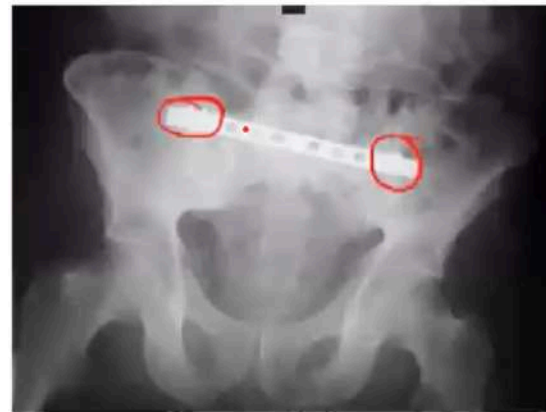
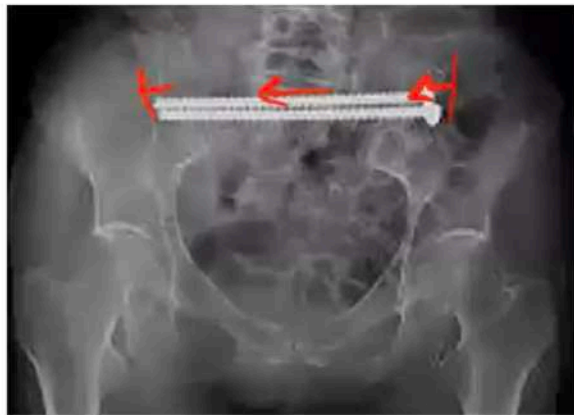


Anterior plating of SI joint



For sacral # or Bilateral SI dislocation

170-180mm



- Transiliac transsacral screw fixation

- Ilio-iliac plate (Tension Band plate)