

# Evaluation and Treatment of Sacral Somatic Dysfunction

Diagnosis and Treatment of Sacral Somatic  
Dysfunction, with Indirect, Direct and HVLA  
Techniques  
(Counterstrain and Muscle Energy)

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# Learning Objectives

- Review the following diagnostic and treatment techniques related to sacral somatic dysfunction:
  - Lumbosacral spring test
  - Sacral palpation
  - Respiratory motion test
  - Seated flexion test
  - Sacral somatic dysfunctions – see table
  - Clinical presentations applicable to sacral diagnosis and treatment
  - Techniques for sacral somatic dysfunction

## Sacral Techniques Covered:

1. Supine, indirect, respiratory cooperation, for bilateral flexion -
2. Supine, direct, muscle energy, for bilateral flexion -
3. Prone, direct, respiratory cooperation, for bilateral extension - Supine, indirect, respiratory cooperation, for bilateral extension- Prone, direct, LVMA, for sacral rotation on same axis (anterior torsions)-
4. Prone, direct, muscle energy, for sacral rotation on same axis (anterior torsions)-Prone, direct, LVMA, for unilateral flexion (shear) - Prone, direct, LVMA, for unilateral extension (shear) –
5. HVLA for Anterior and Posterior sacral torsions

# Sacral Clinical Presentations

- Presentations commonly associated with sacral somatic dysfunction and/or benefiting from correction of that dysfunction:
  - Low back pain – traumatic history
  - Status Post Labor – History of difficult labor
  - Constipation
  - Menstrual cramps / dysfunction
  - Prostate dysfunction

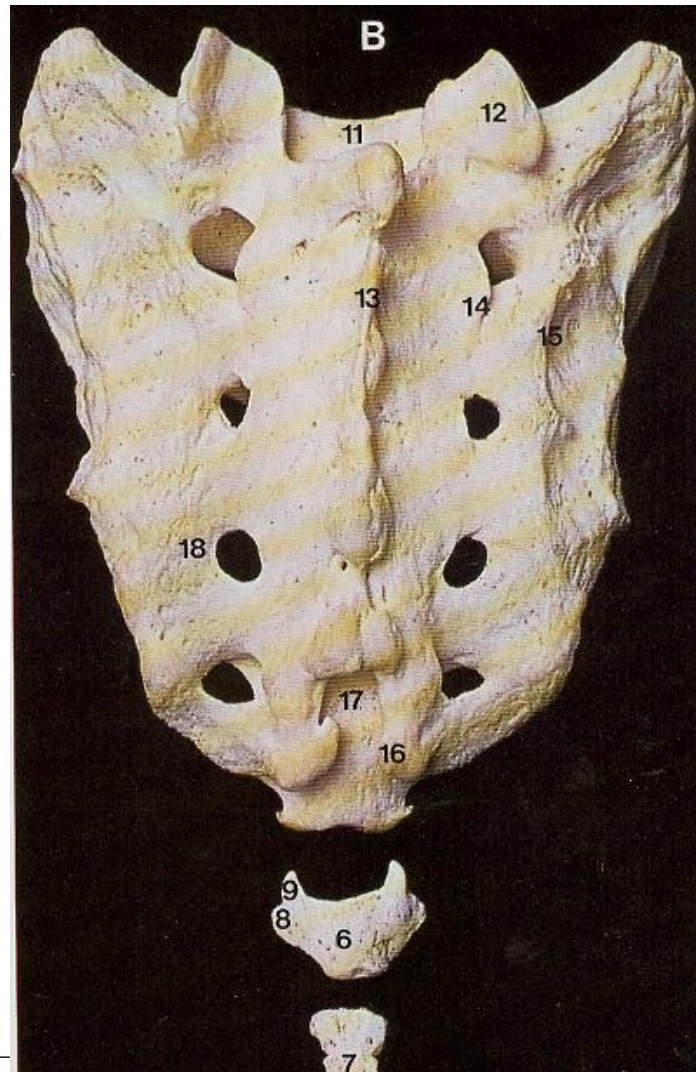
BACKGROUND

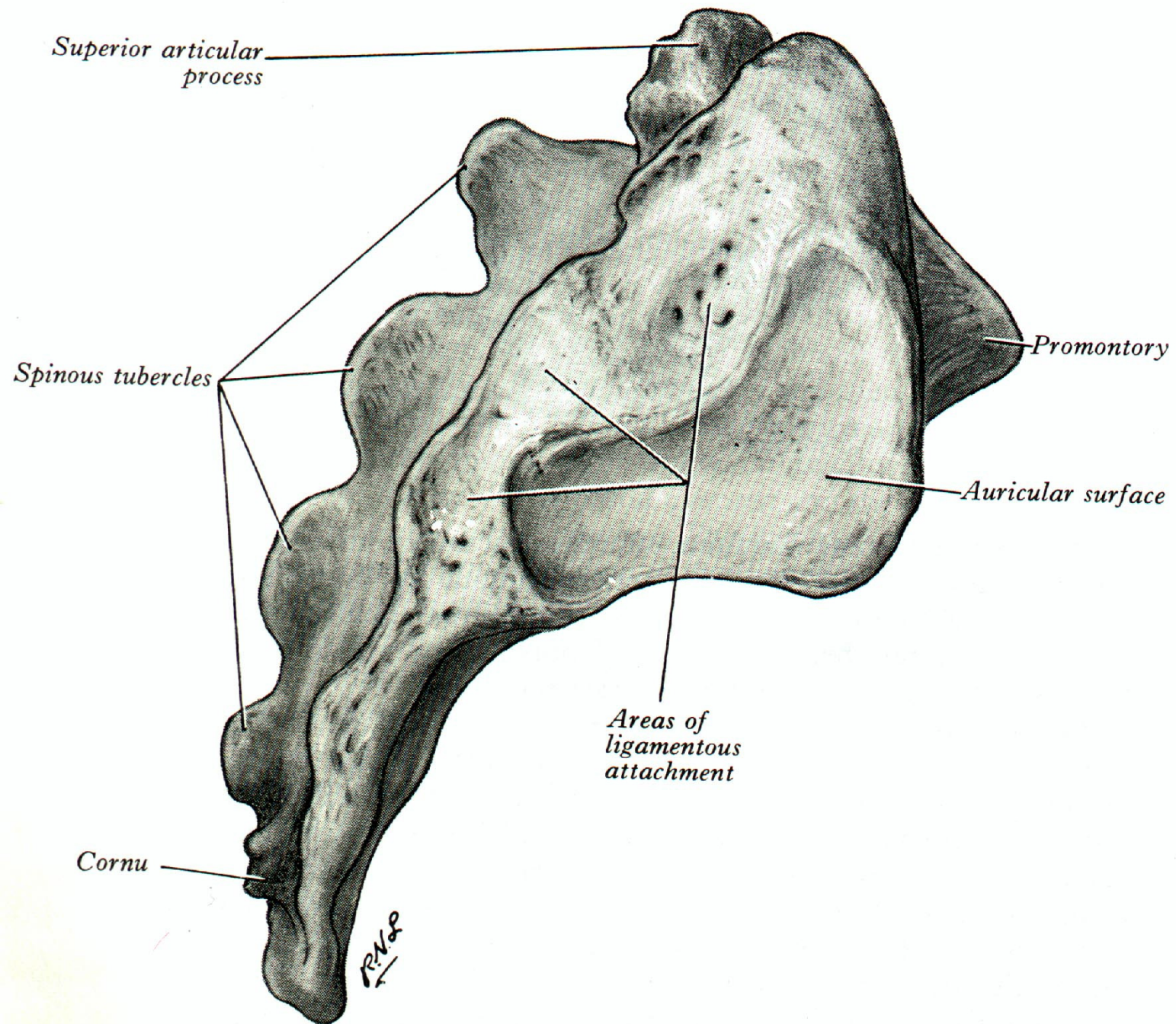
SACRAL  
STRUCTURE, LIGAMENTS AND  
MUSCLES

## THE SACRUM

Means “sacred”

because of its density it is the last bone to decay and because it protects the reproductive system



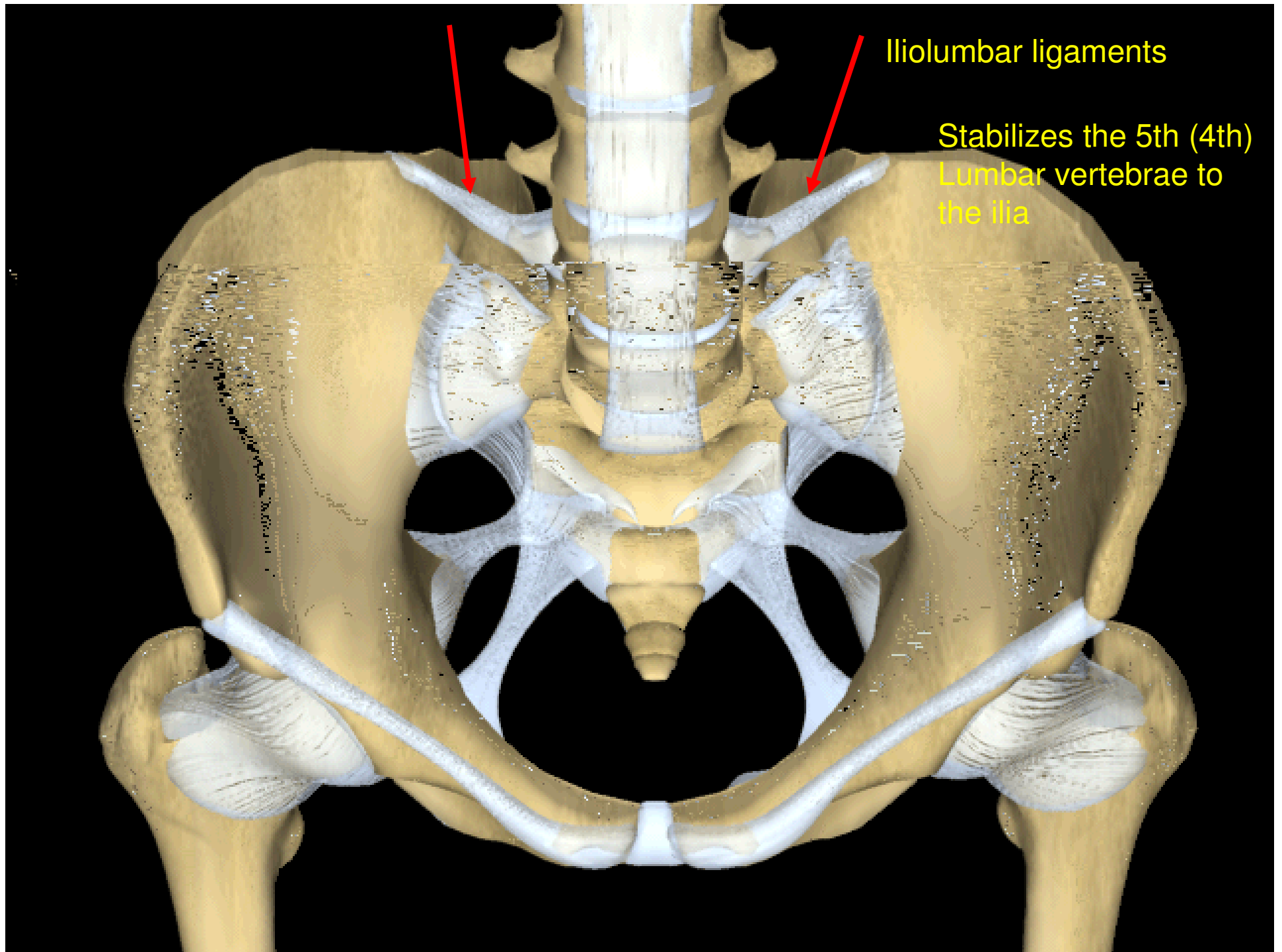


# Forces on the sacrum

- Angle of the sacroiliac joint “wedges” the sacrum in an anterior direction
  - Prevents posterior movement
- Dorsal (posterior) sacroiliac ligaments much stronger than anterior sacroiliac ligaments
- Purpose: counteract significant pelvic forces pushing apex posteriorly.

# Major Pelvic Ligaments

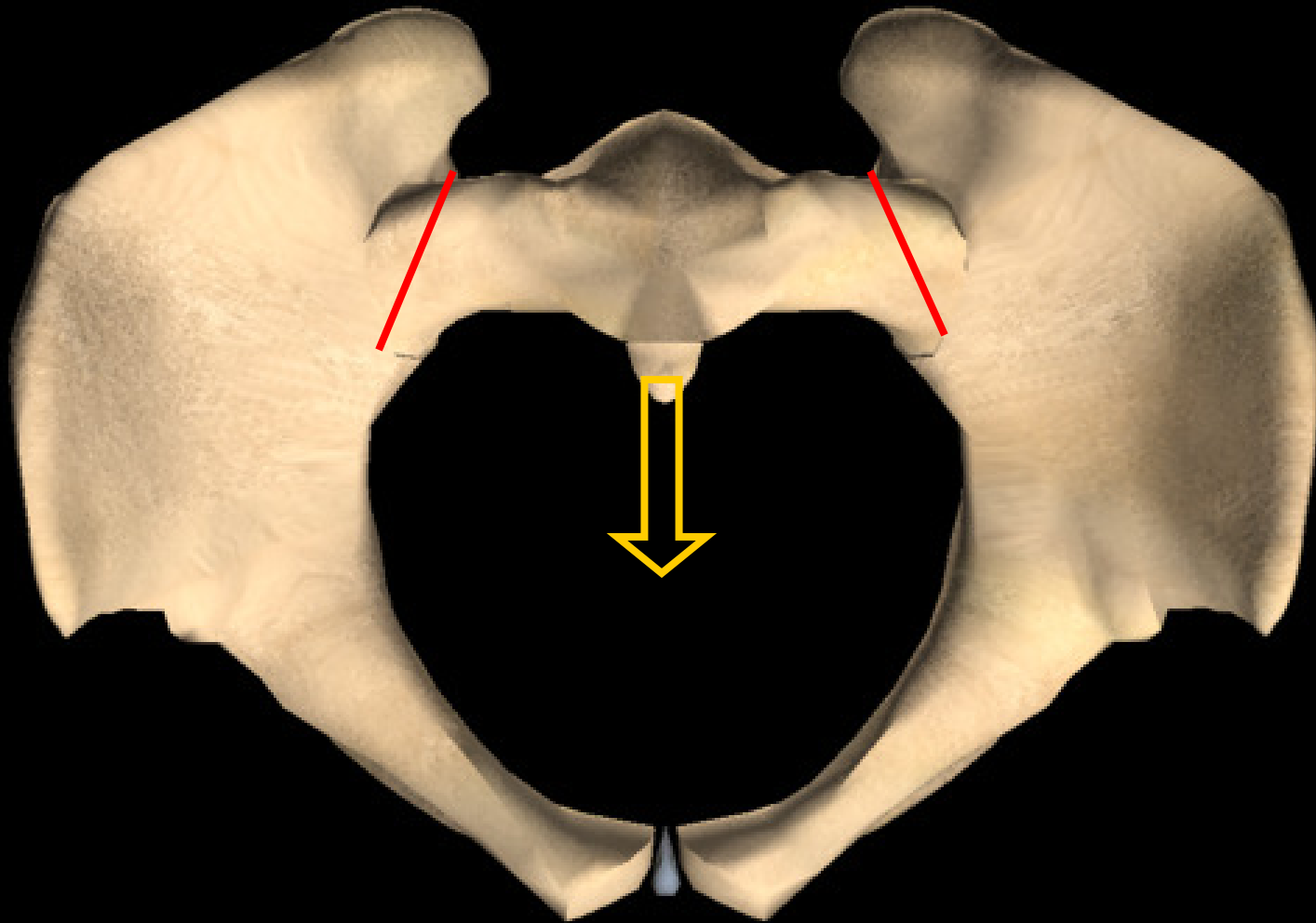
- Iliolumbar
  - from ilia to 5<sup>th</sup> lumbar vertebrae
- Sacrospinous
  - Sacrum to spine of the ischium
- Sacrotuberous
  - Sacrum to ischial tuberosity
- Sacroiliac Ligament
  - Covers much of the sacroiliac joint, ant & post



Iliolumbar ligaments

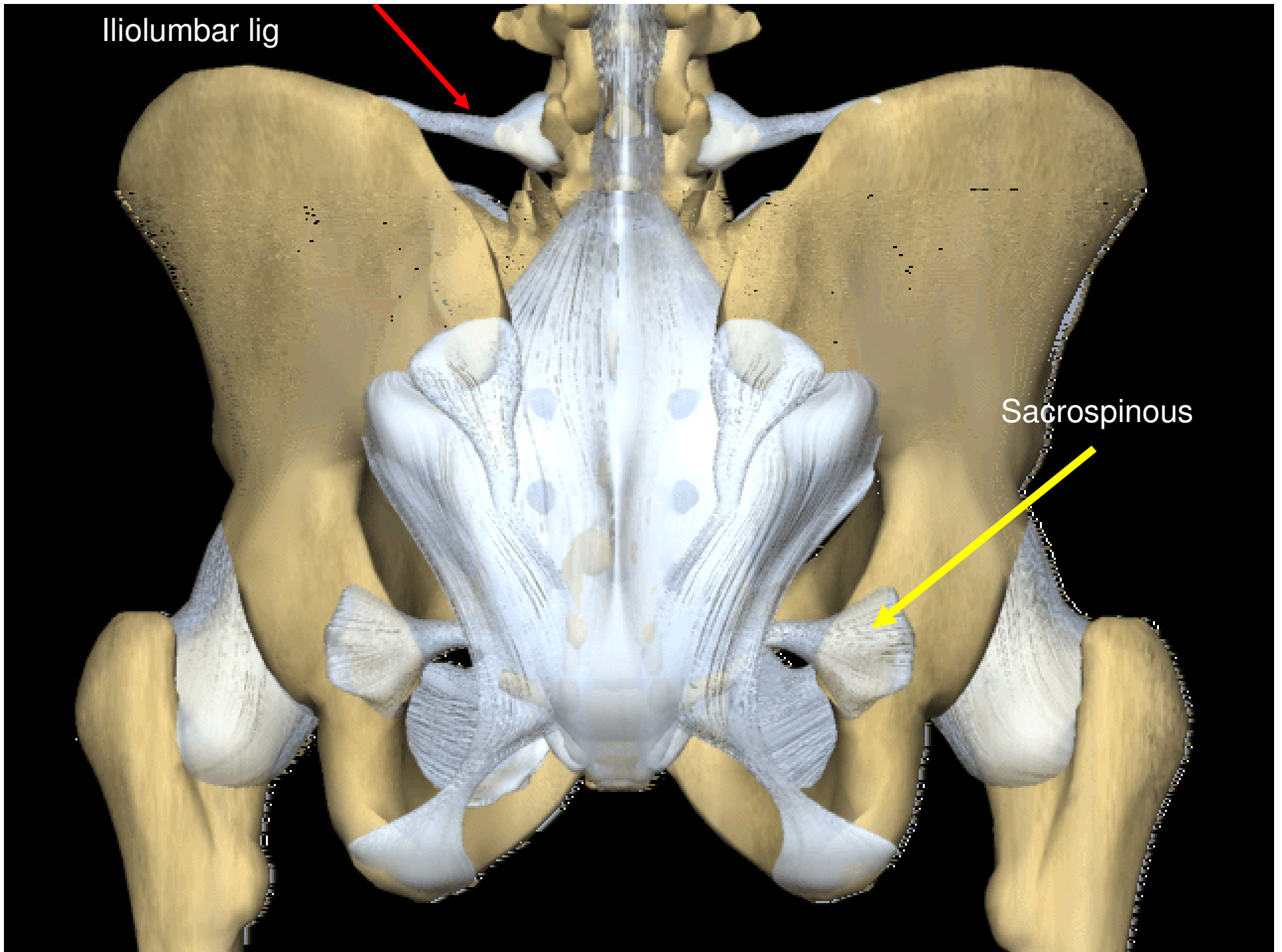
Stabilizes the 5th (4th)  
Lumbar vertebrae to  
the ilia

Wedging of the sacrum creates an anterior force



Iliolumbar lig

Sacrospinous

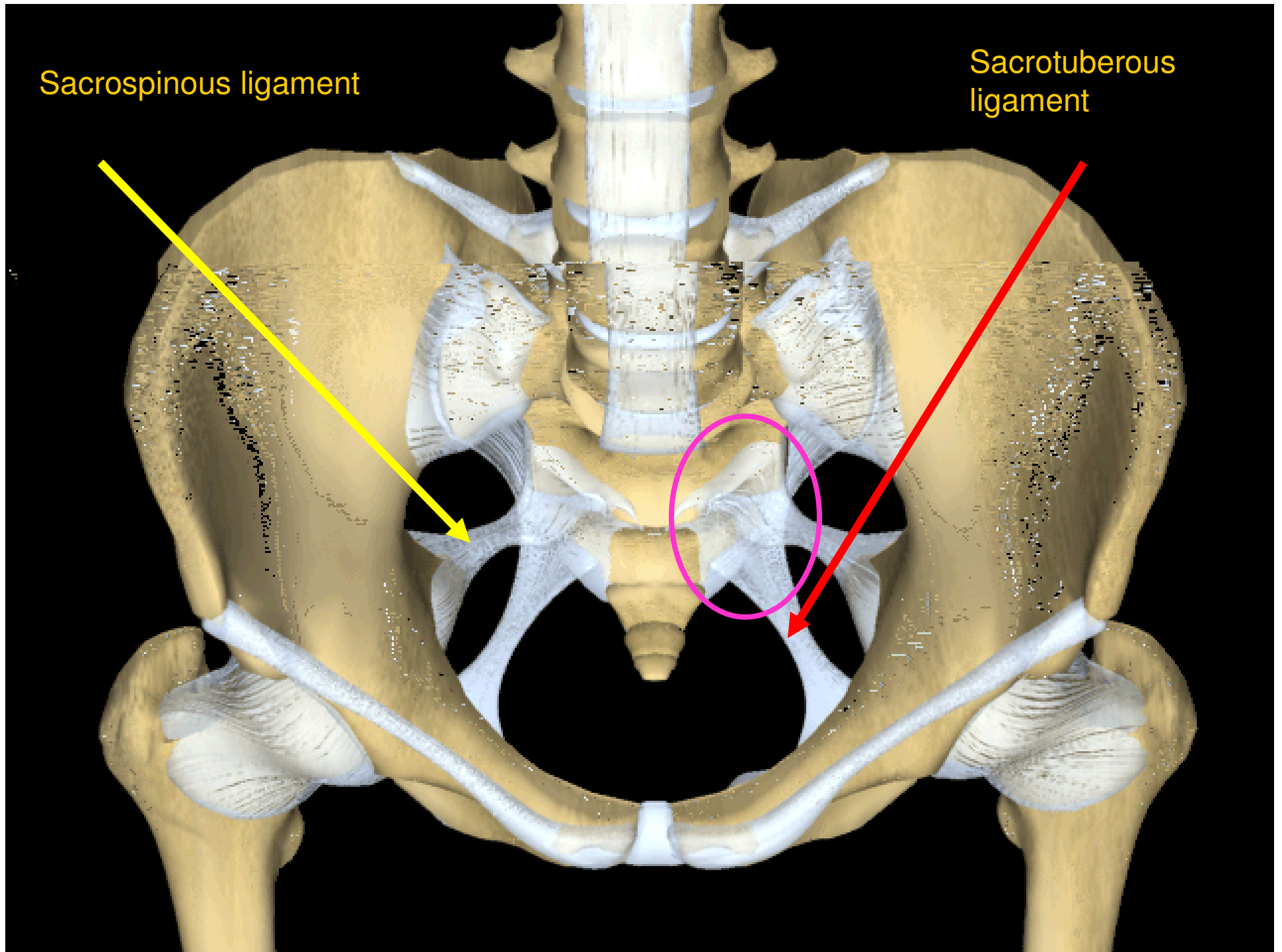


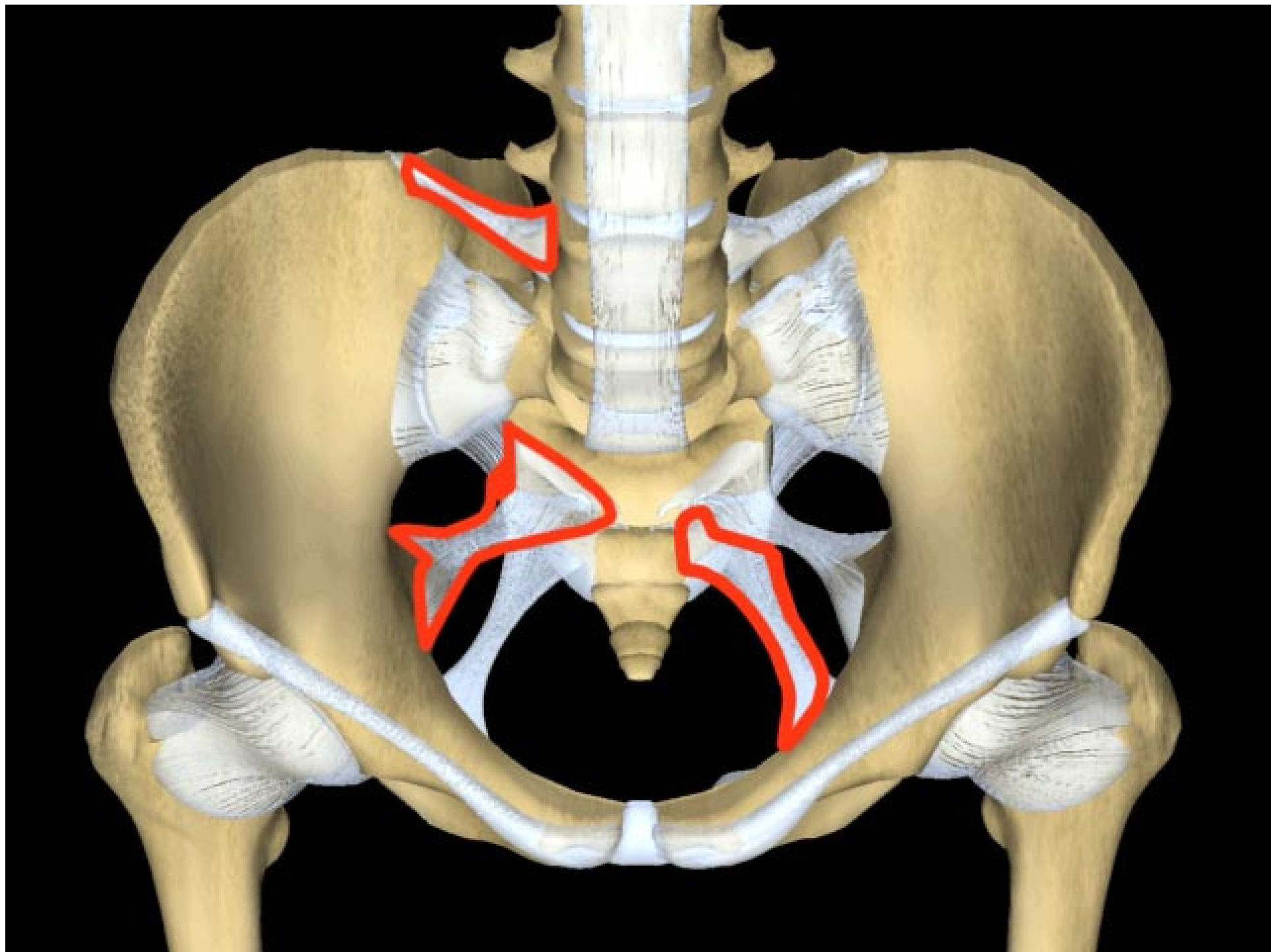
# Sacrospinous Ligament

- Runs from lower sacral tubercles to ischial tuberosity
- Gluteus maximus attachment
- Tendon of the biceps femoris attachment
- Connects with fascia of the pelvis
  - from sacrum to ischial tuberosity
  - stabilizes anterior motion

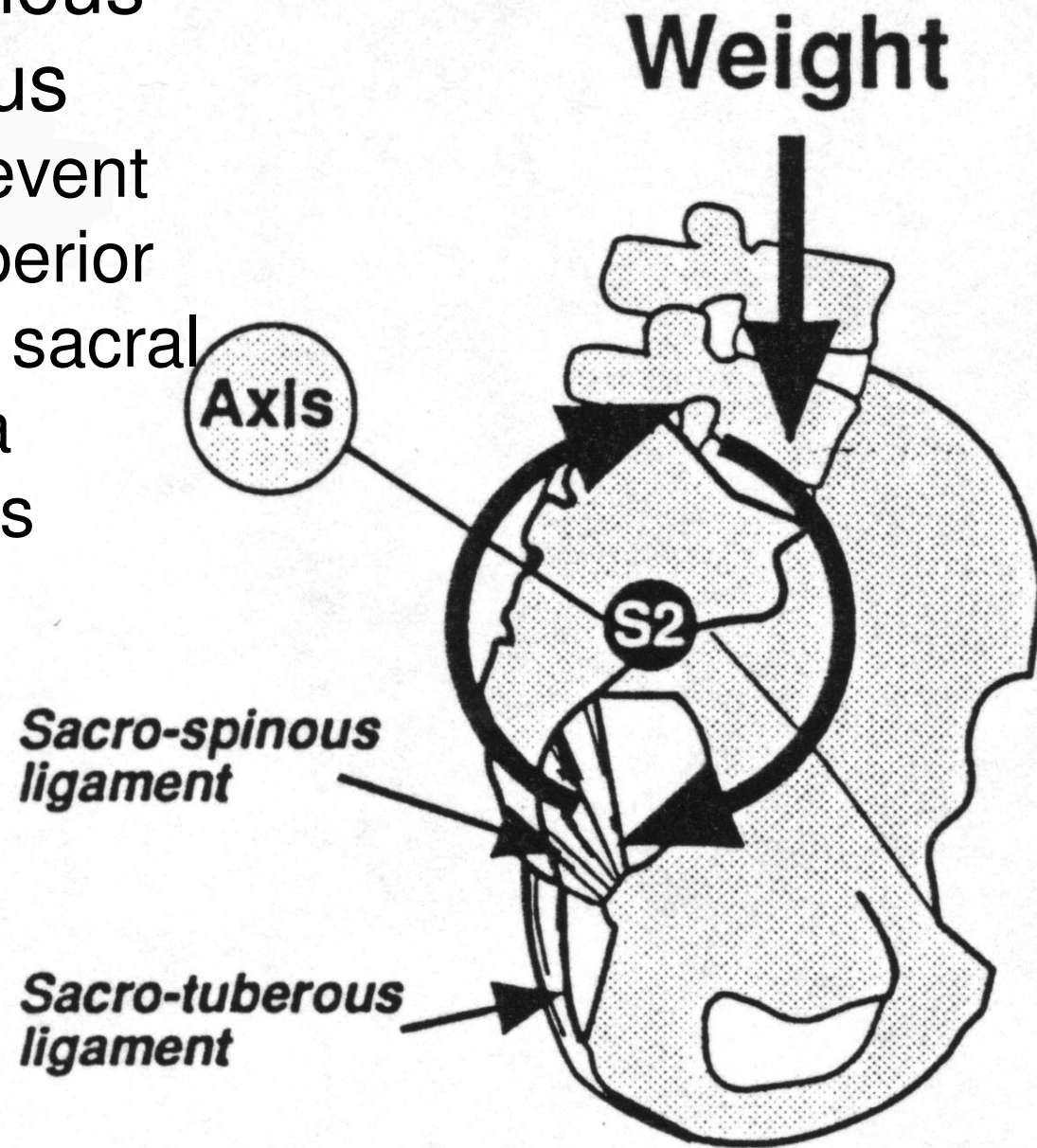
Sacrospinous ligament

Sacrotuberous ligament





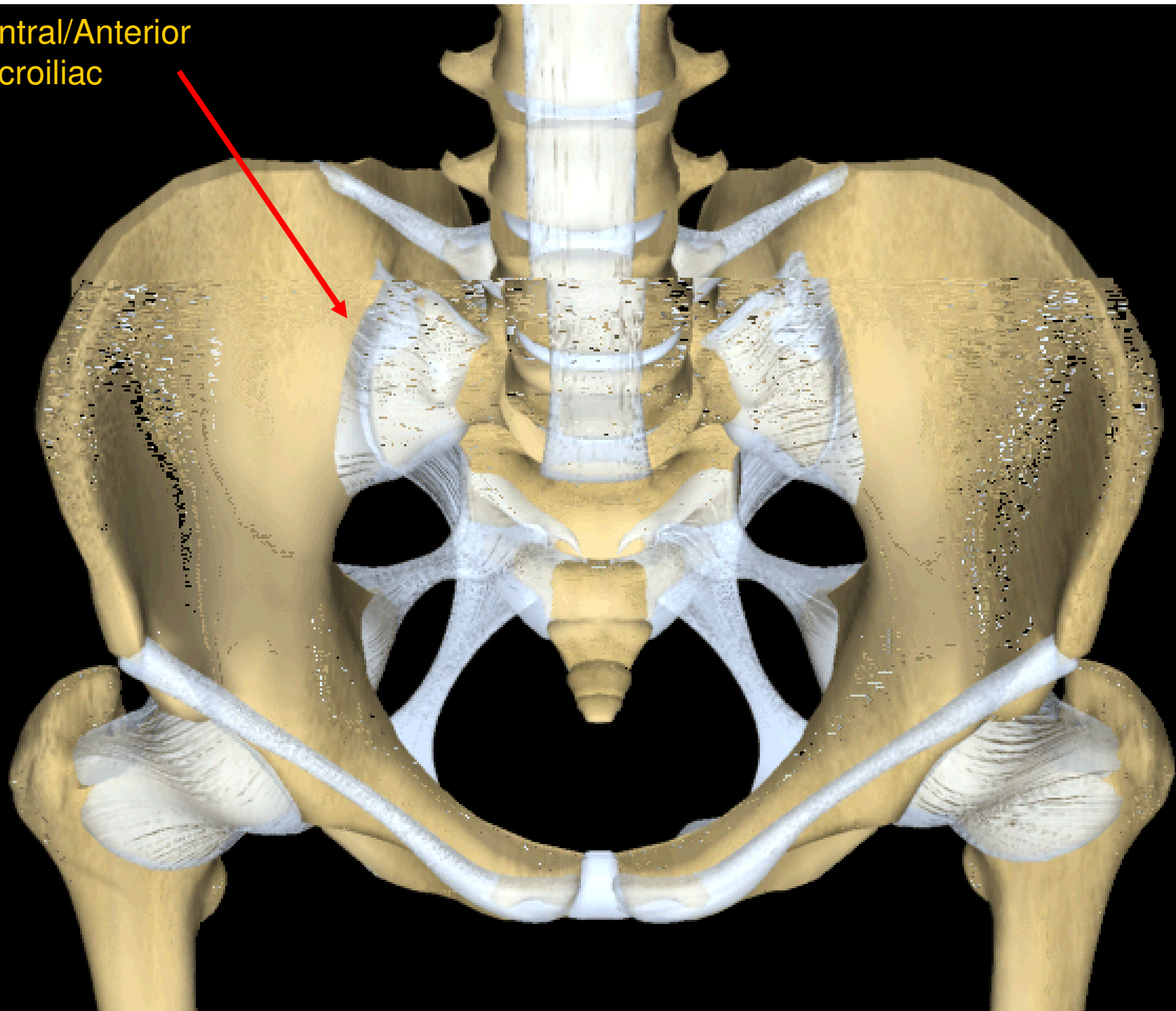
Both Sacrospinous  
& Sacrotuberous  
stabilize to prevent  
posterior - superior  
*rotation* of the sacral  
apex around a  
transverse axis



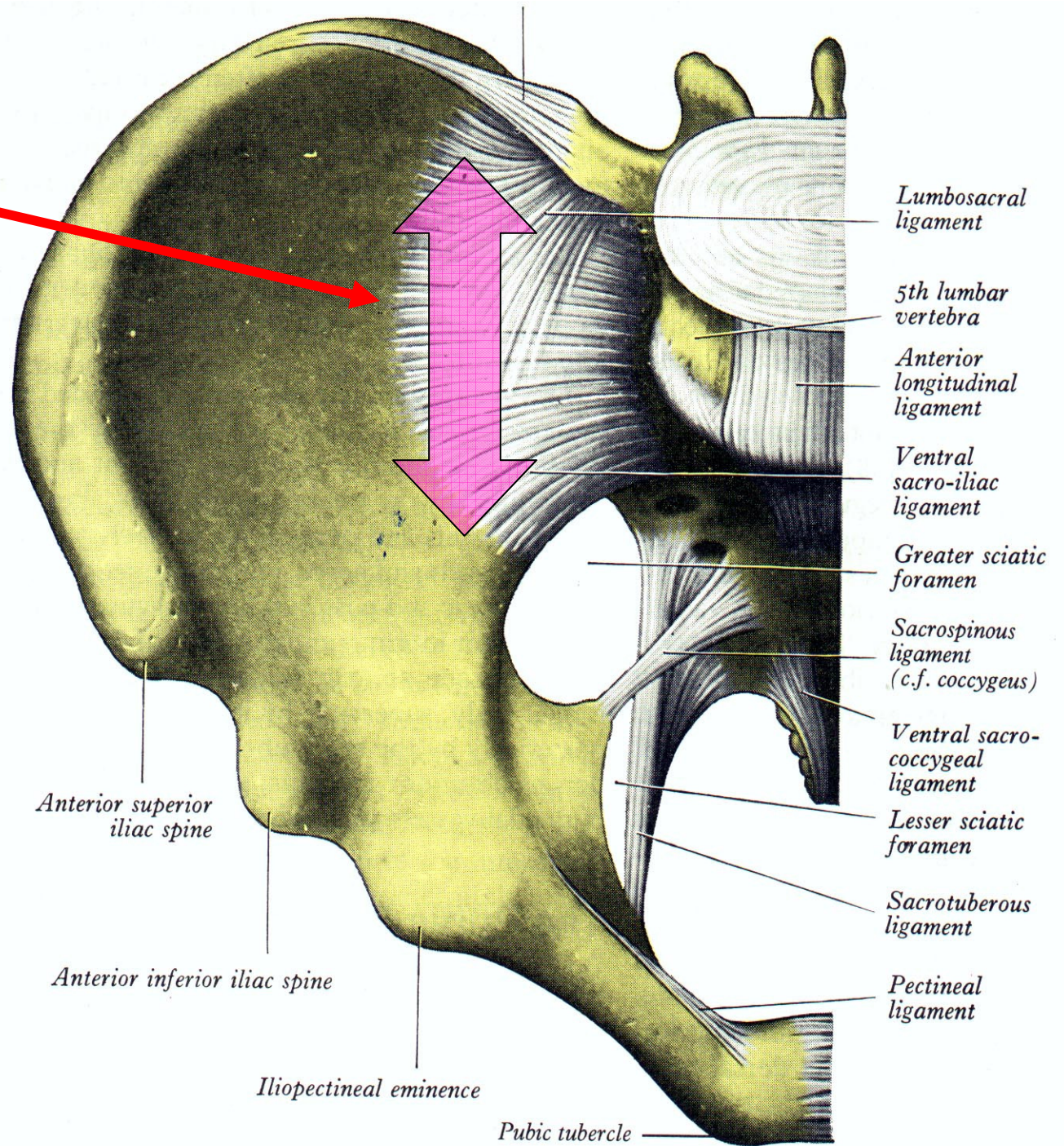
# Sacroiliac Ligament

- Sacroiliac
  - actually three ligaments
    - Anterior or ventral sacroiliac
      - from 3rd sacral segment to lateral preauricular sulcus
    - interosseous sacroiliac
      - massive bond between the upper parts of the joint
    - dorsal sacroiliac
      - Partly covers the interosseous, from lateral sacral crest to PSIS and internal iliac crest.

Ventral/Anterior  
Sacroiliac

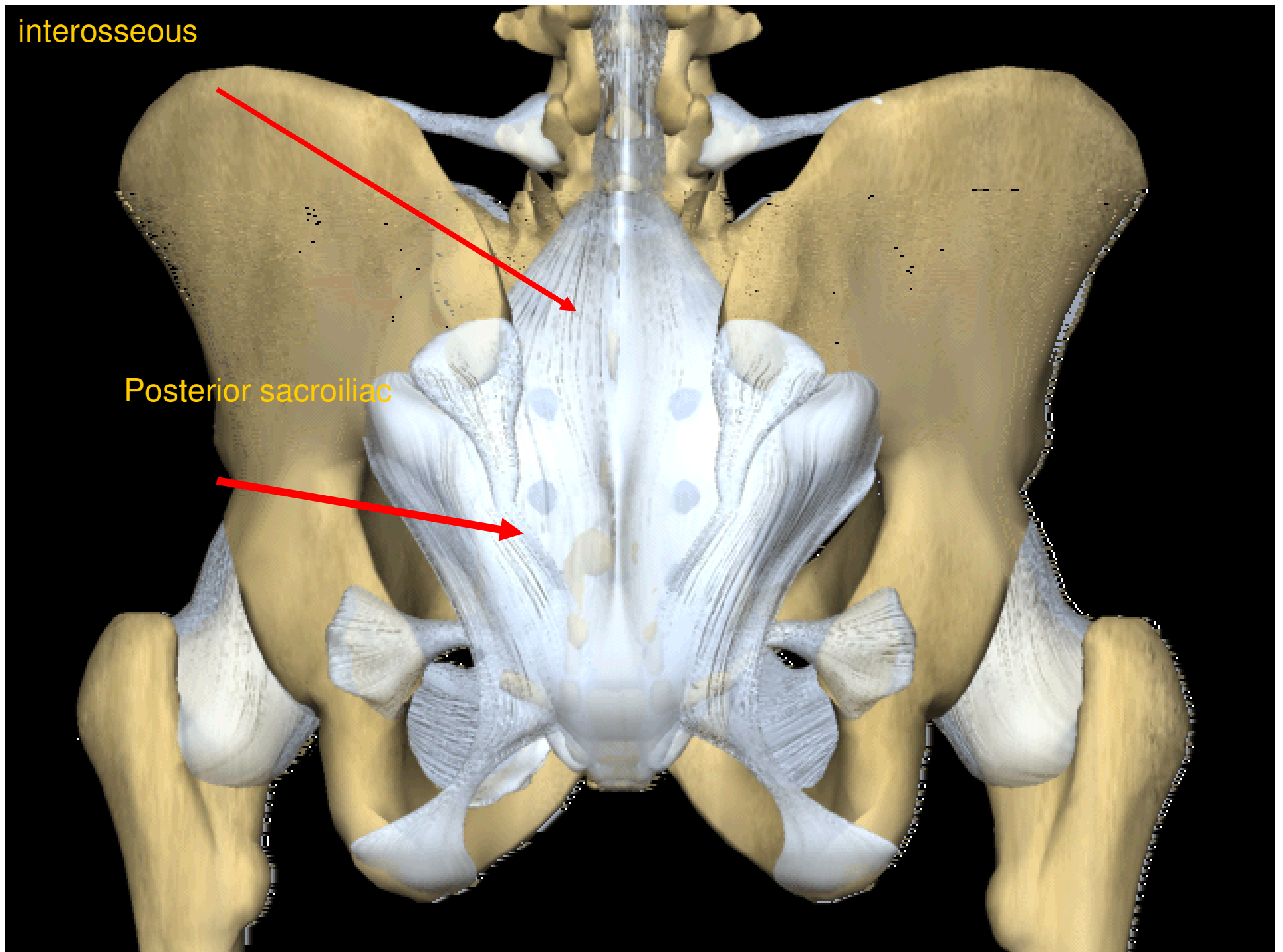


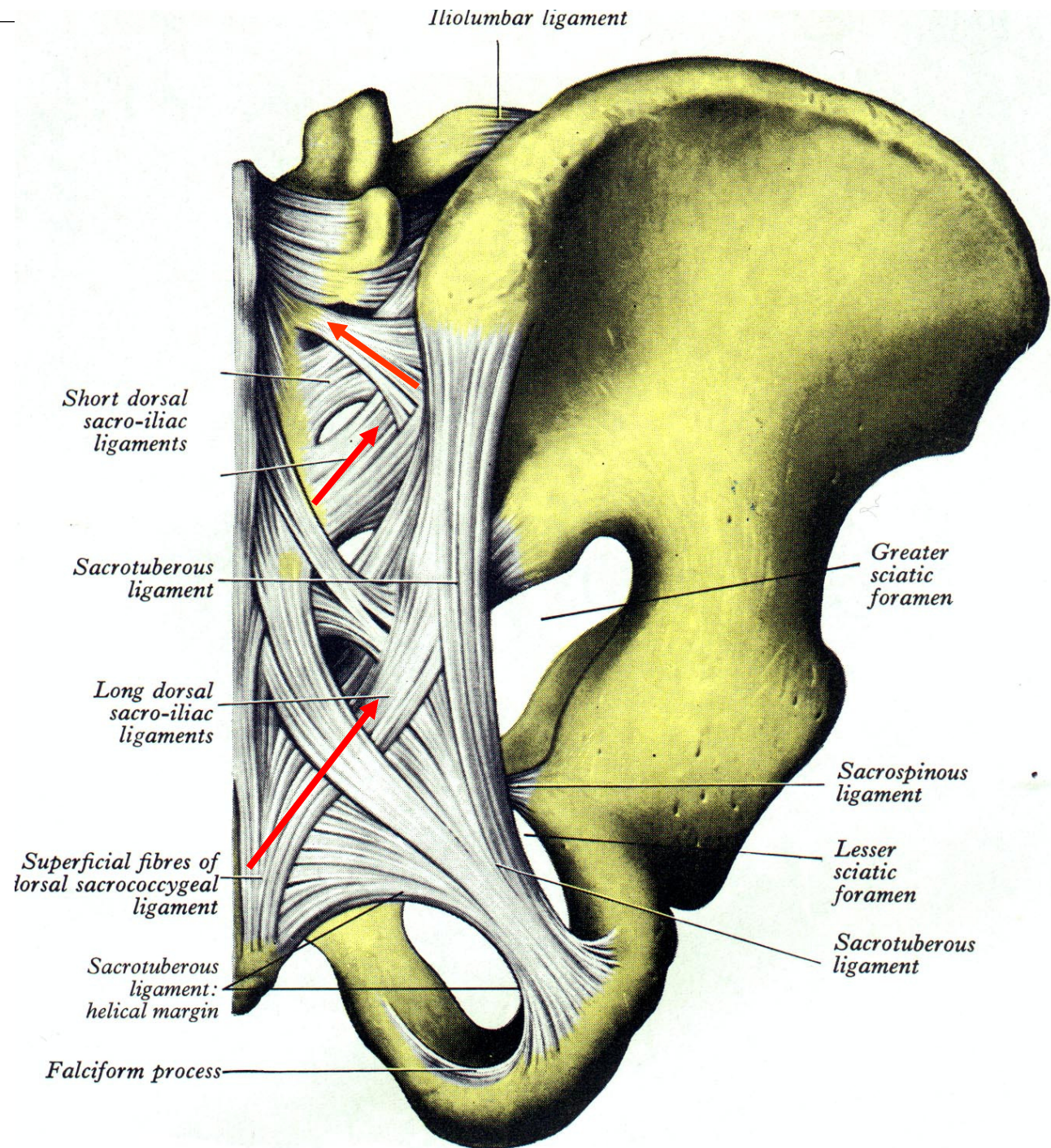
# Sacroiliac Ligament



interosseous

Posterior sacroiliac

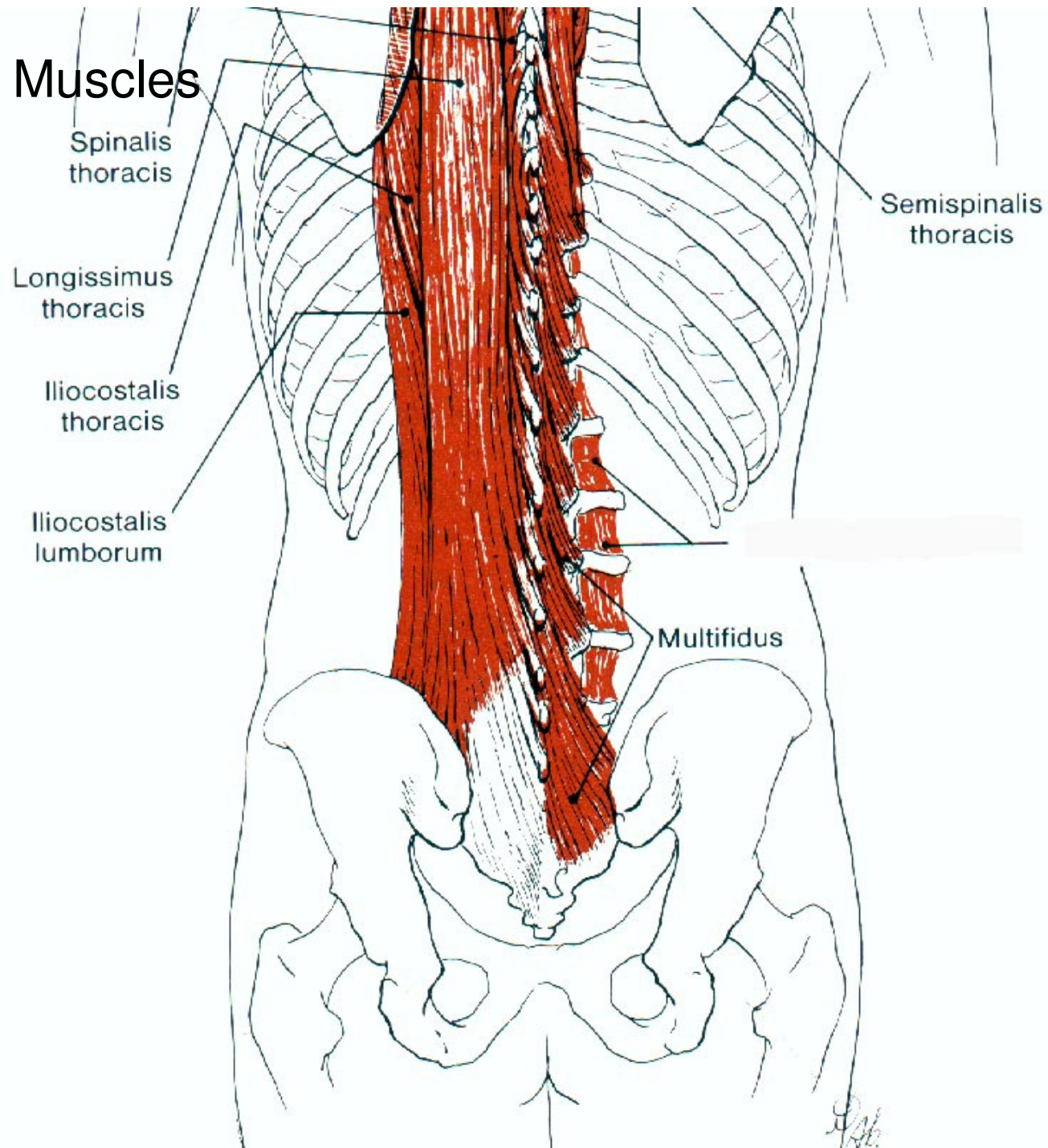




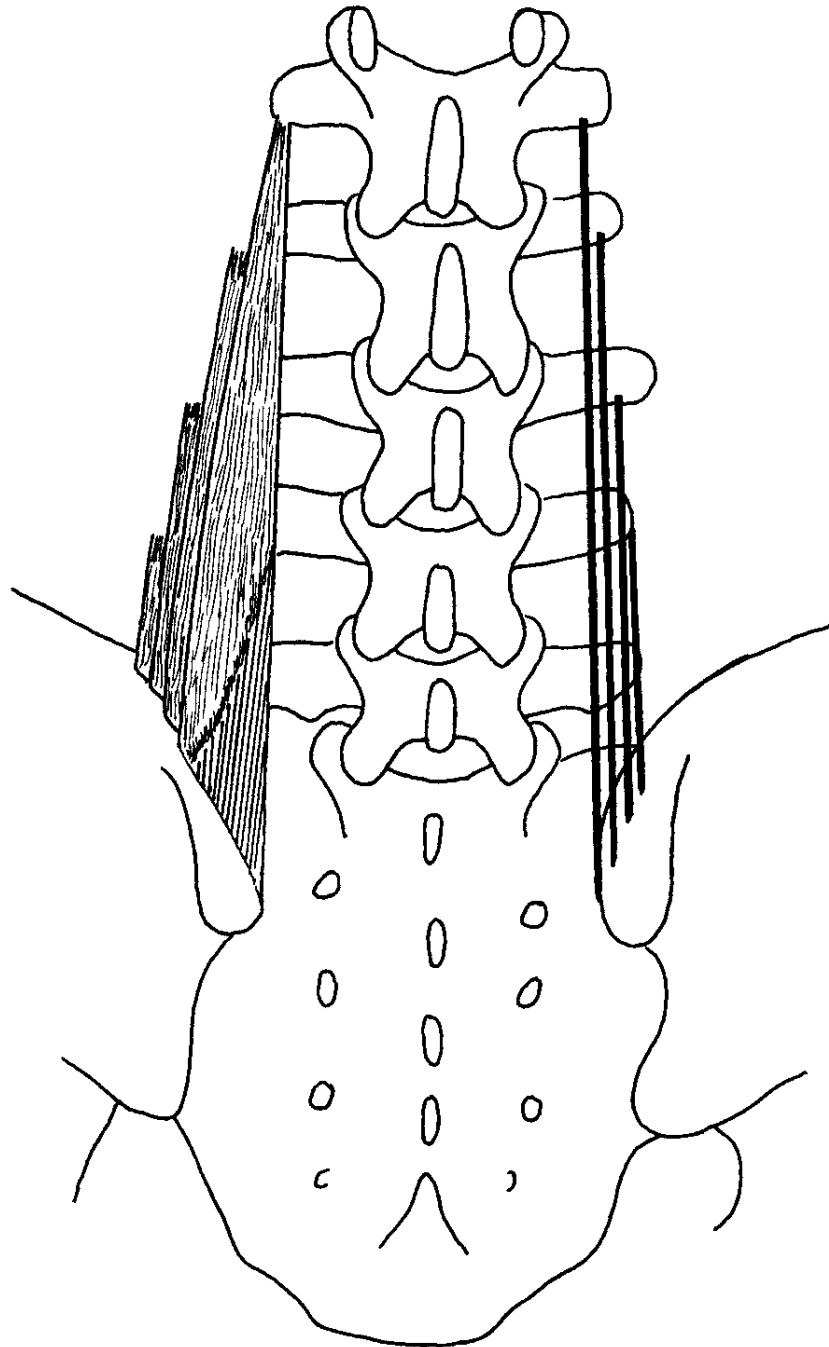
# Pelvic muscle attachments from above.

- Posterior Muscular Attachments
- Attach to Sacrum
  - Erector Spinae
    - Iliocostalis
    - Longissimus
    - Erector Spinae
  - Multifidus
- Attach to Innominates
  - Obliques (internal, external, transverse)
  - Quadratus Lumborum

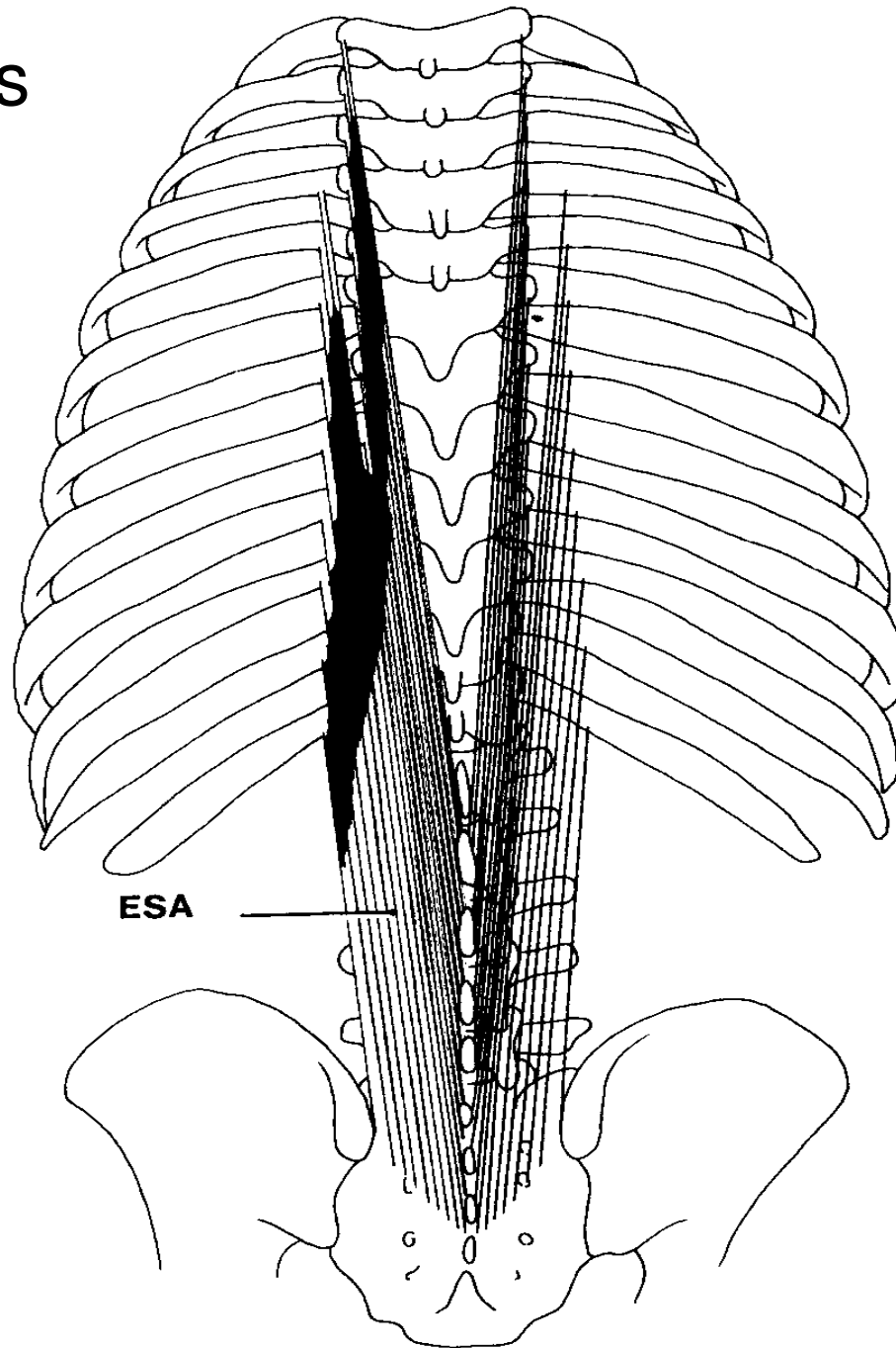
# Posterior Muscles



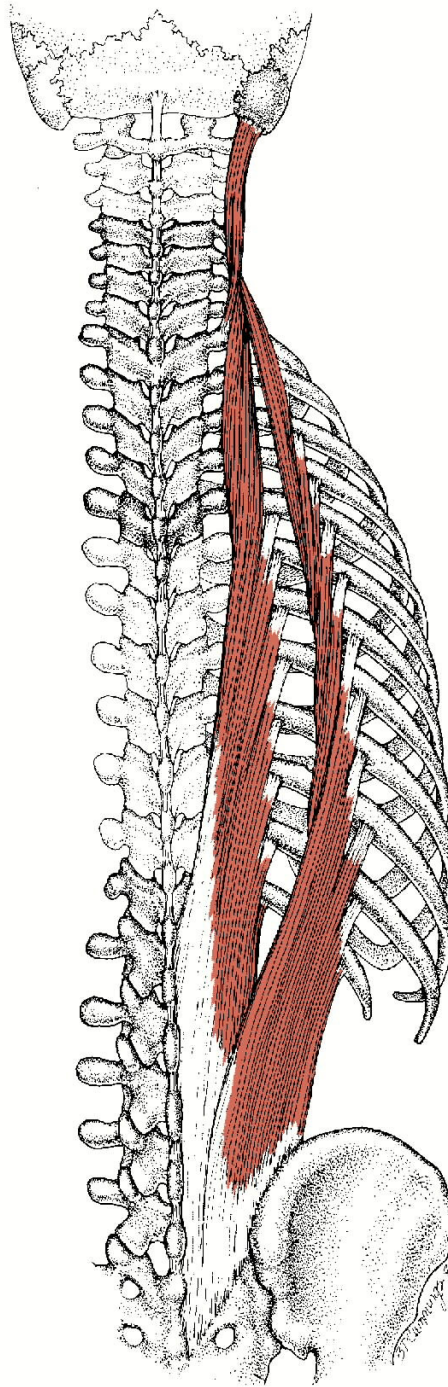
# Iliocostalis

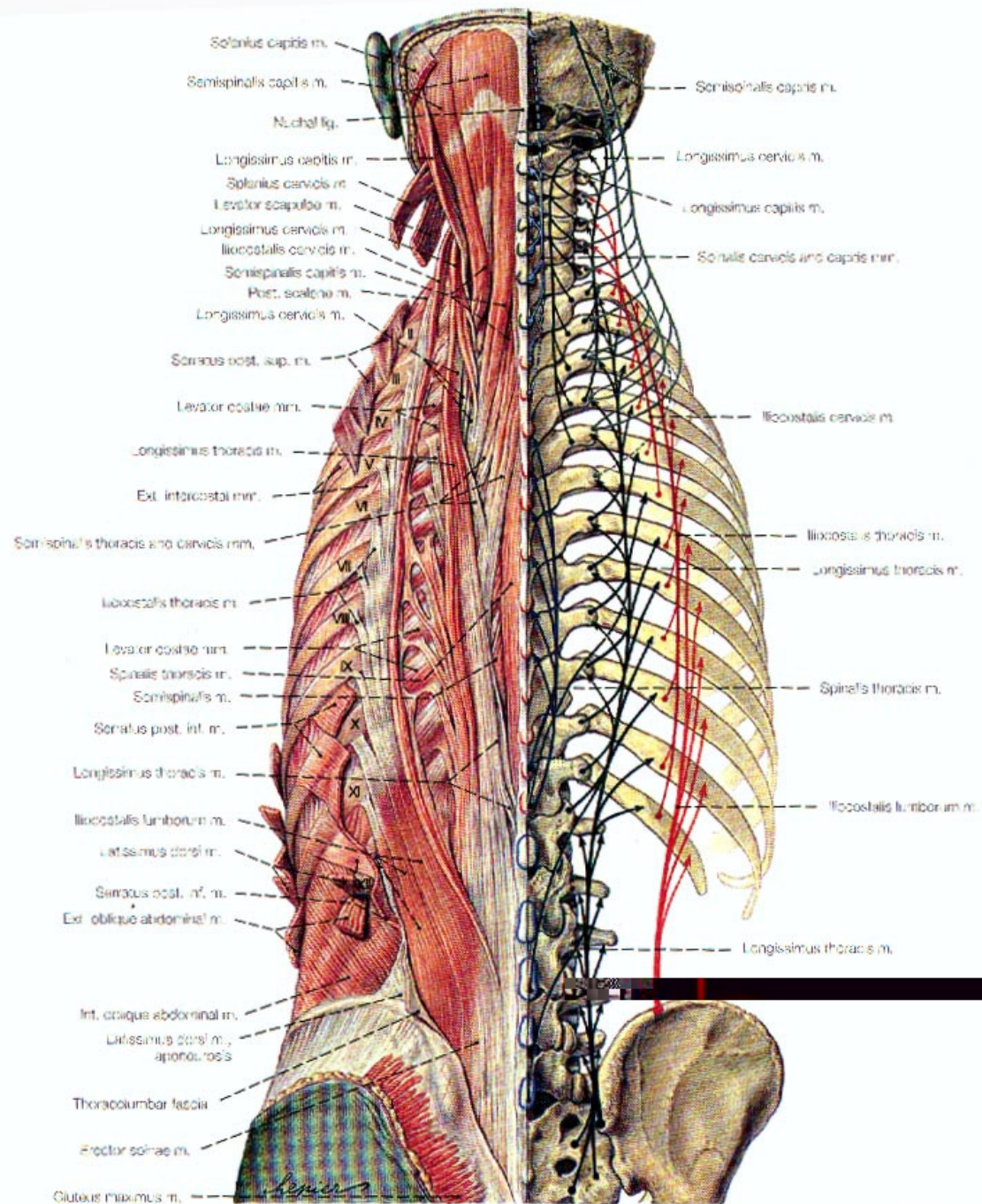


# Longissimus

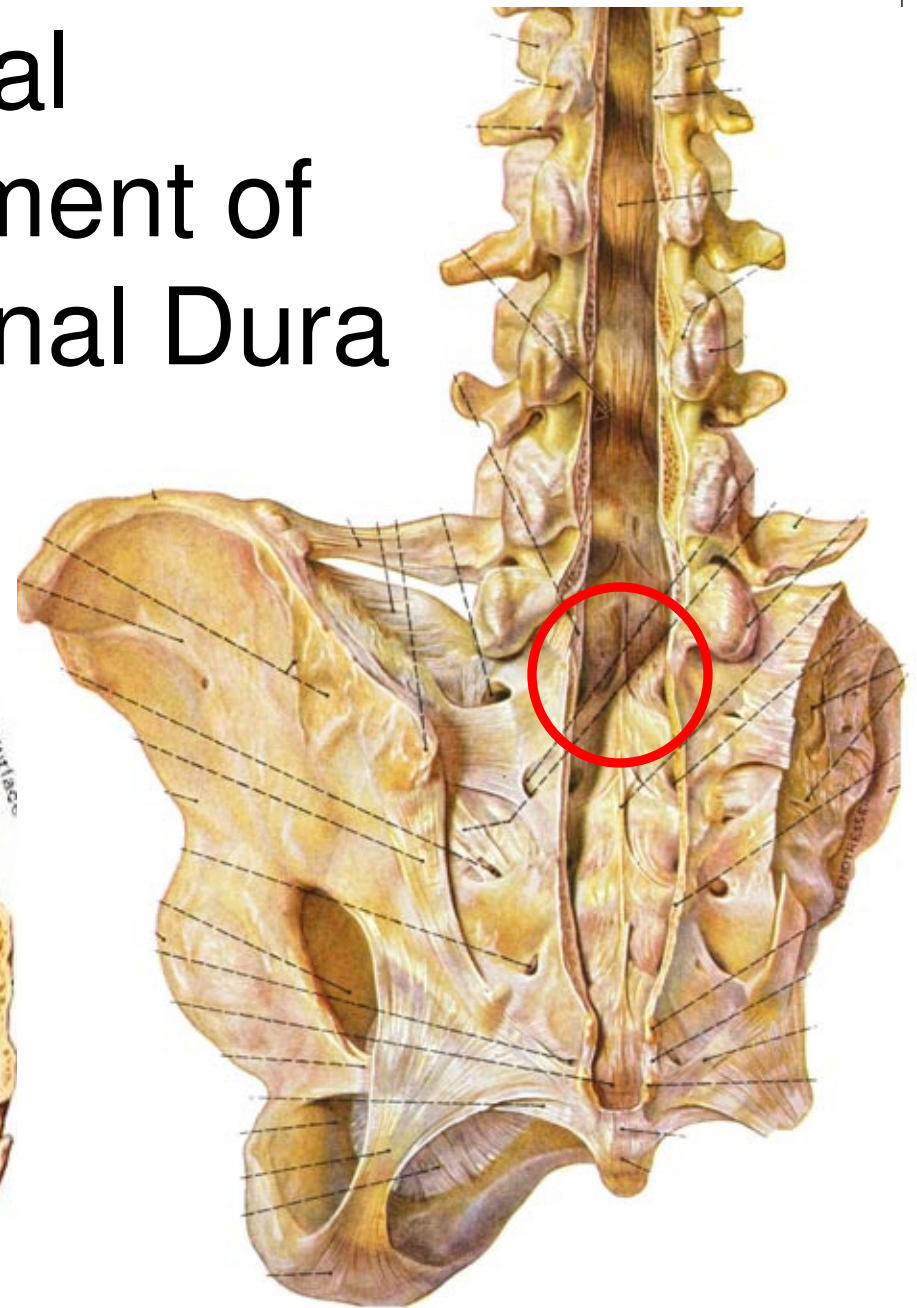
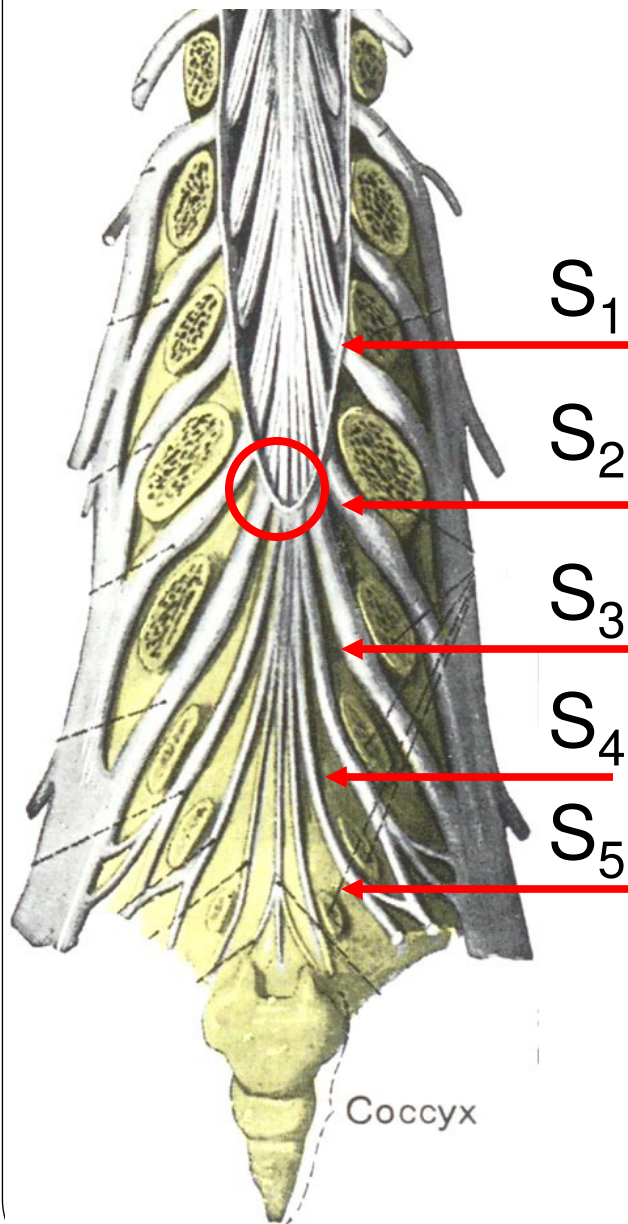


# Erector Spinae (sacrospinalis)



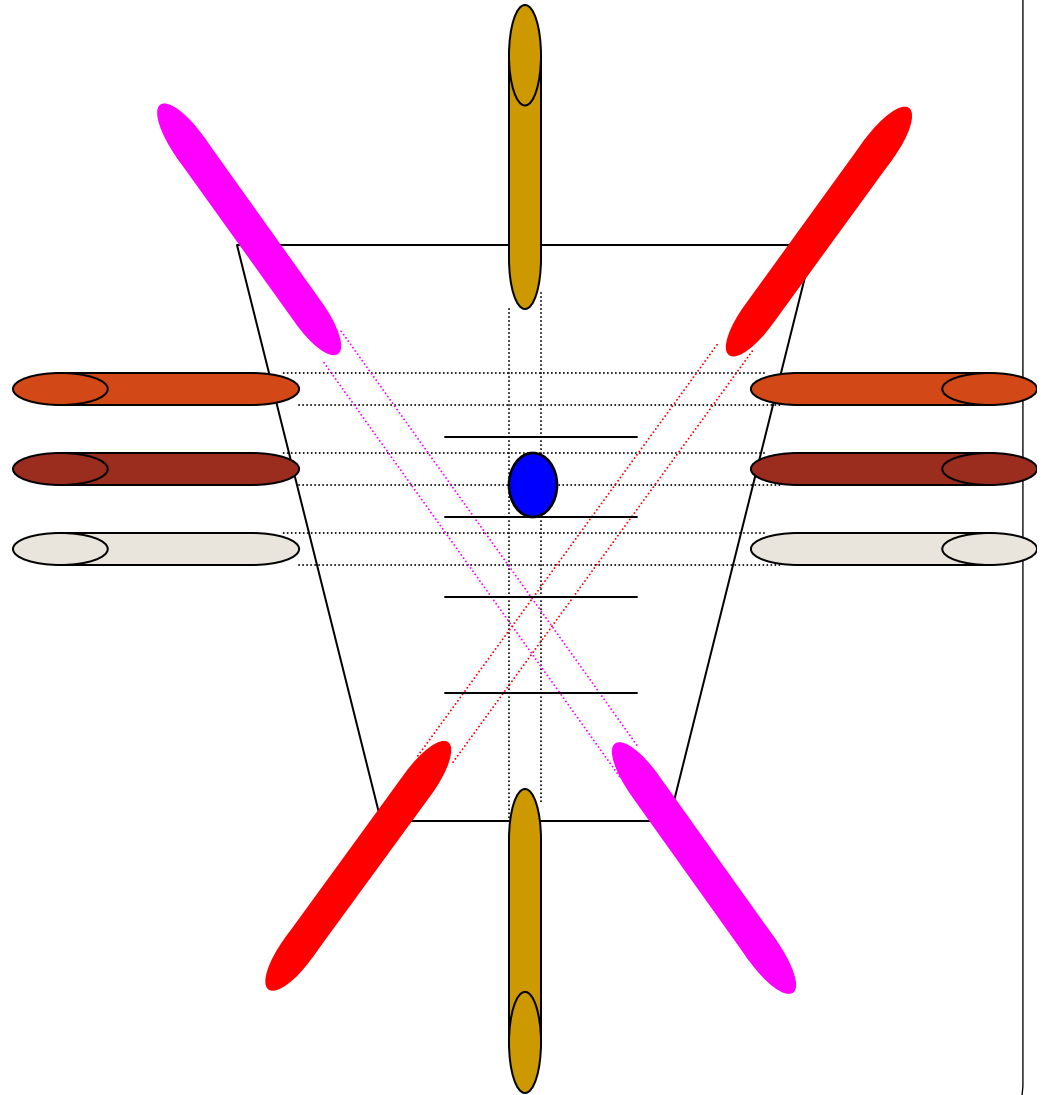


# Terminal Attachment of the Spinal Dura



# Sacral Axes

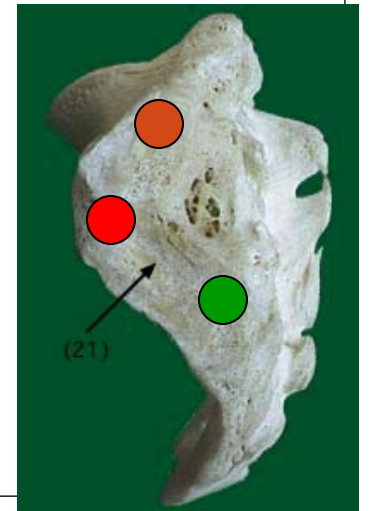
- Multiple axes of motion:
  - Transverse (3)
    - Superior S1
    - Middle S2
    - Inferior S3
  - Vertical (sagittal)
  - A/P
  - Oblique (2)
    - Left
    - Right

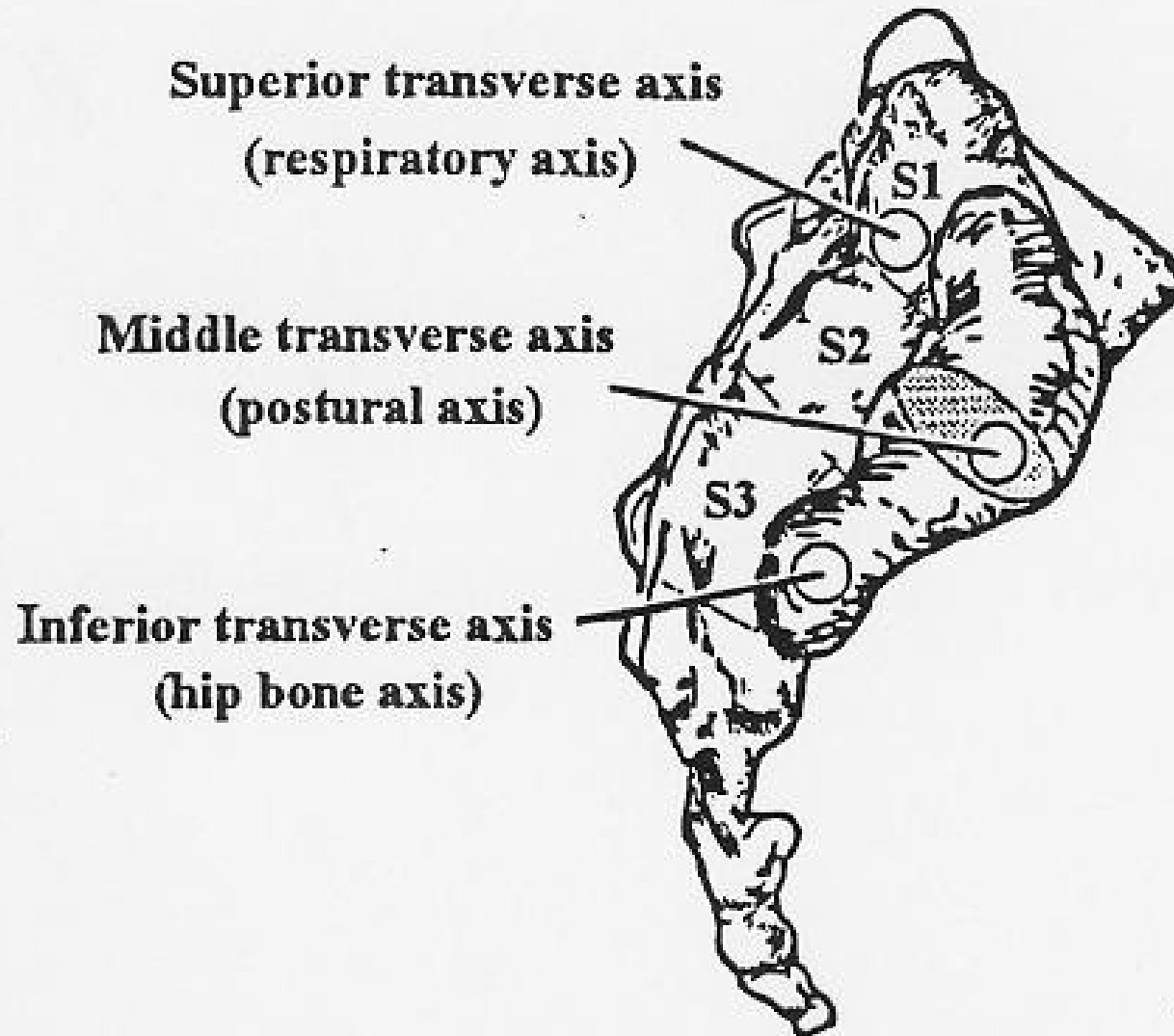


# SACRAL ANATOMICAL AXIS

## Transverse axis

- **Superior**: the cranial&primary respiratory mechanism creates motion around this axis
- **Middle**: sacral base anterior and posterior (FB/BB) occur around this axis
- **Inferior**: the innominates rotate around this axis

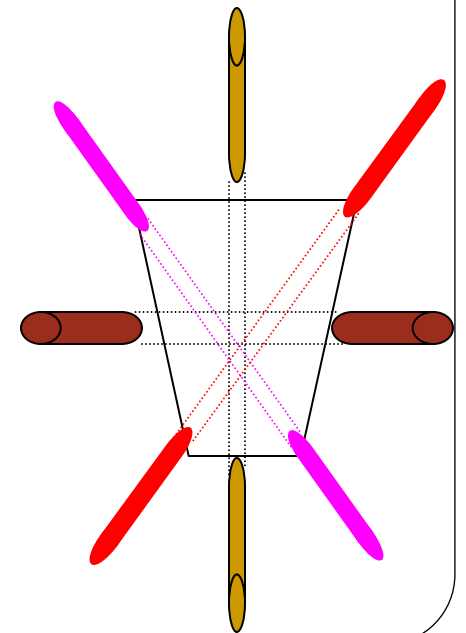




**Figure 19.** Sacral transverse axes

# SACRAL PHYSIOLOGIC AXIS

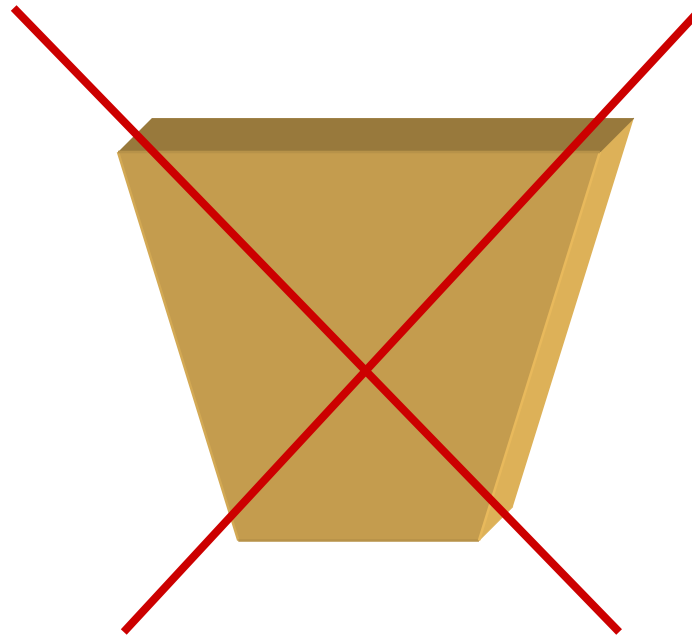
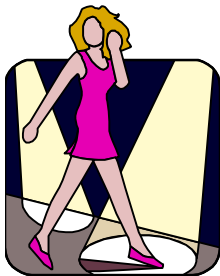
- Oblique: both **left** and **right** oblique axes are named for the superior pole
- Sagittal: includes both mid-sagittal and an infinite number of parasagittal axes
- Horizontal: functional axis of sacral flexion/extension occur around this axis (analogous to the middle transverse axis above)



(footnote on functional anatomy)

# Why are the Oblique Axes so significant?

## They are the Axes of Walking.



## The walking cycle as it applies to our discussion

1. From a standing (**neutral**) position, when you take a step forward, your weight is shifted onto one lower extremity.
2. This induces spinal column SB to the weight bearing side, and pins the upper pole of the sacrum on the side of the SB.
3. As the free lower extremity swings forward, it carries the free pole of the sacrum anterior, creating rotation of the sacrum about the Oblique Axis, towards the weight bearing extremity.

Ex.:  $R_L$  on LOA



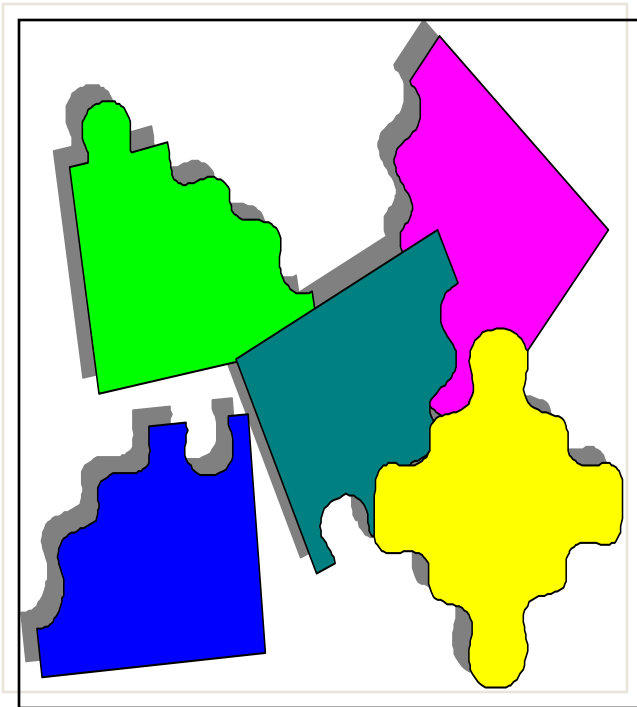
$R_R$  on ROA



Bottom Line: You form Oblique Axes with every step you take!

TESTS

# To make a Sacral Diagnosis you will need to know the following:



- Static (Pure) Landmarks
  - Sacral base - Ant/ Post
  - ILA -Ant/Post
  - ASIS & PSIS -Sup./Inf.
  - Pubes -Sup./Inf & Ant./Post
- Mixed Landmarks
  - Sacral Sulcus - Deep/ Shallow
  - STL - Tight/ Loose/ Equal
- Motion Testing
  - *Spring test*
  - L5
  - Sacrum

## STANDING FLEXION TEST

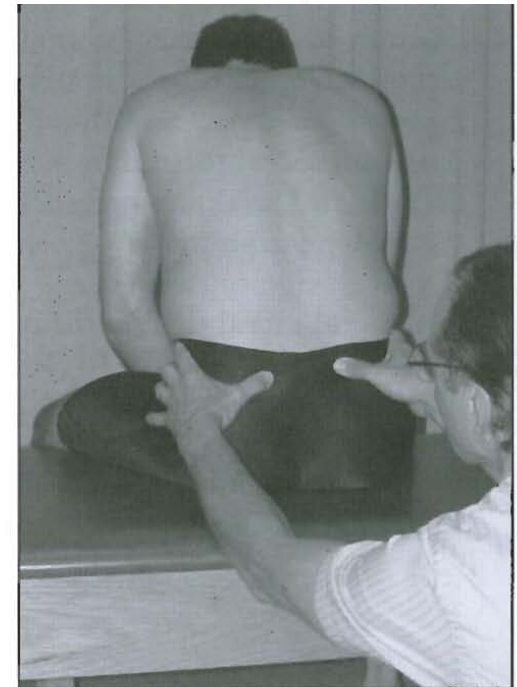
1. Place your thumbs on the undersurface of the posterior superior iliac spines (PSIS) of the standing patient;
2. Ask the patient to bend forward with the legs straight and allow your thumbs to follow PSIS movement;
3. The side of last superior PSIS movement is the side of pelvis restriction;
4. False positives:  
Contralateral hamstring tightness; Short leg; Sacral somatic dysfunction on same side.



## Seated Flexion Test

1. Place your thumbs on the undersurface of the posterior superior iliac spines (PSIS) of the seated patient, taking care to keep both thumbs horizontal;
2. Ask the patient to bend forward with feet on the floor and allow your thumbs to follow PSIS movement, taking care to maintain both thumbs underneath the PSIS;
3. The side on which the PSIS stops moving superiorly the last is the side of sacrum restriction at the sacroiliac joint;
4. False positives: pelvis somatic dysfunction on same side.

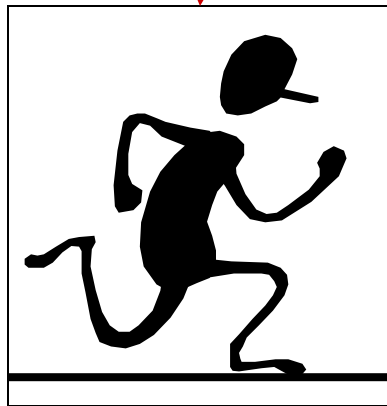
•Record Positive Right, Positive Left, or Negative Test



# Most of those pieces we have discussed, except...

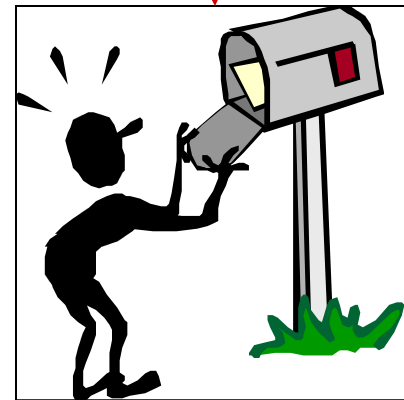
- There is one that we have not talked much about yet.  
The “*Spring Test*.”
- It’s purpose: To be an indicator of whether you are dealing with a sacral Oblique Axis that is a:

Forward Torsion (Neutral)



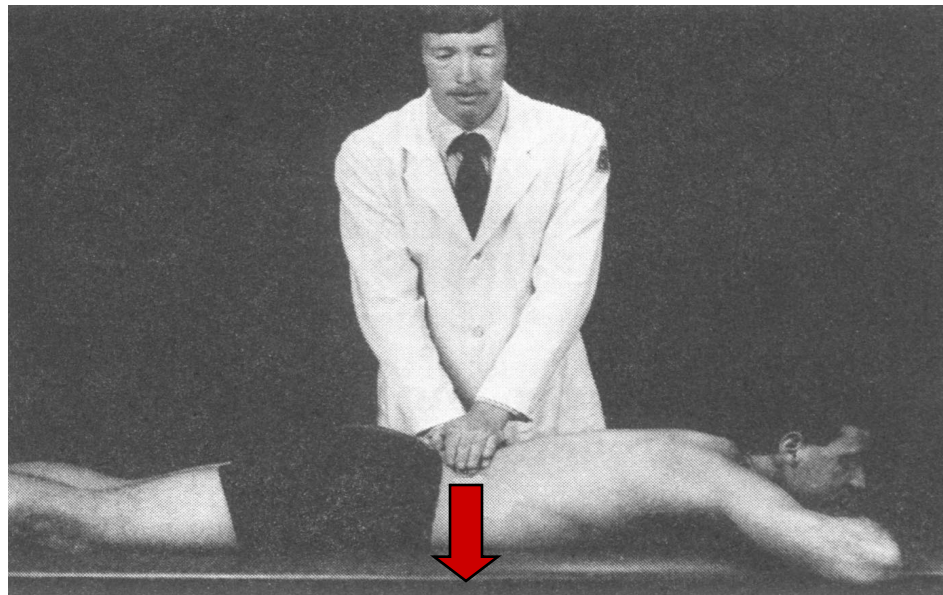
Vs.

or Backward Torsion (Non-Neutral).



# Spring Test

1. Find sacral base
2. Place heel of hand over Lumbosacral junction
3. Spring in an Anterior motion
4. Results:
  - a. Positive test = If there is NO springing allowed = Non-neutral condition  
(AKA Backward torsion)
  - b. Negative test = If there is springing allowed = Neutral condition.



# Prone Landmarks

# Sacral Base

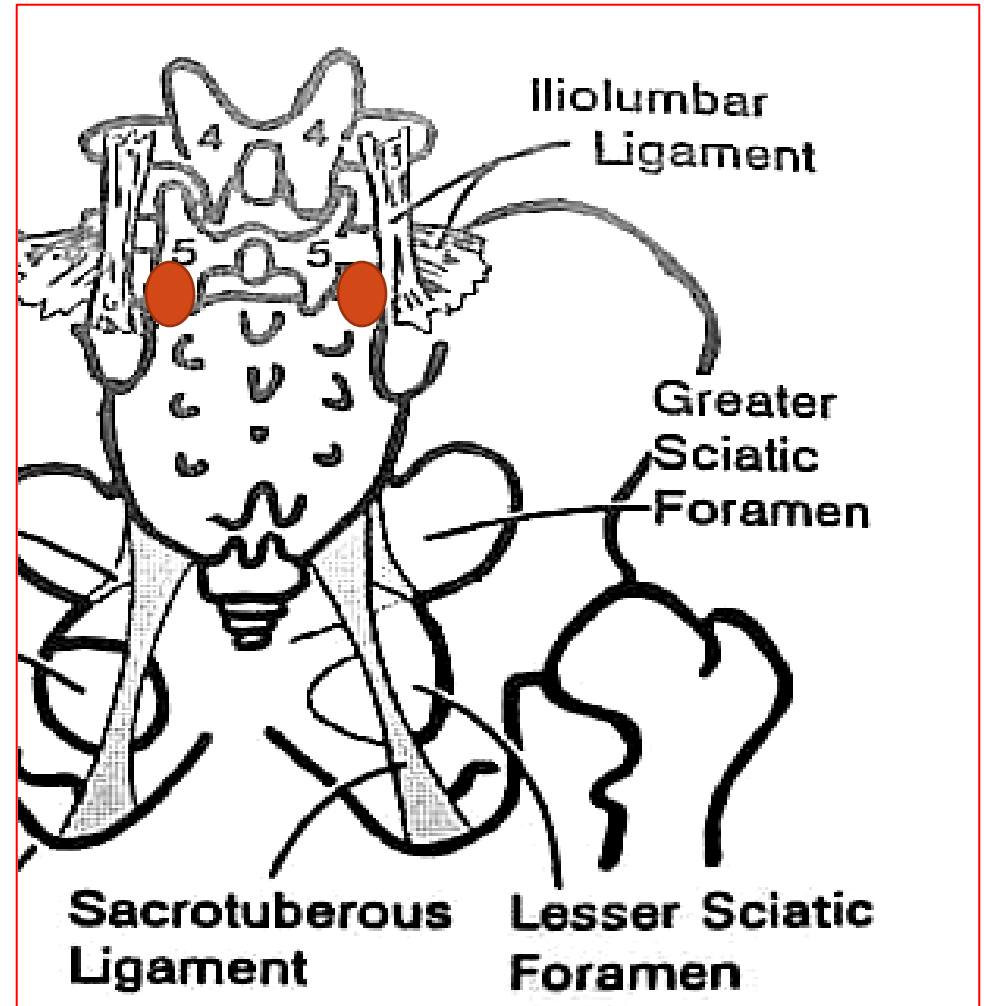
- Judge whether the tip of the thumb is more anterior on one side than the tip of the thumb on the other side.
- Can also bring index fingers over onto sacral base and take measurement on the lateralized side.
- Record which base is anterior.



Sacral base palpation

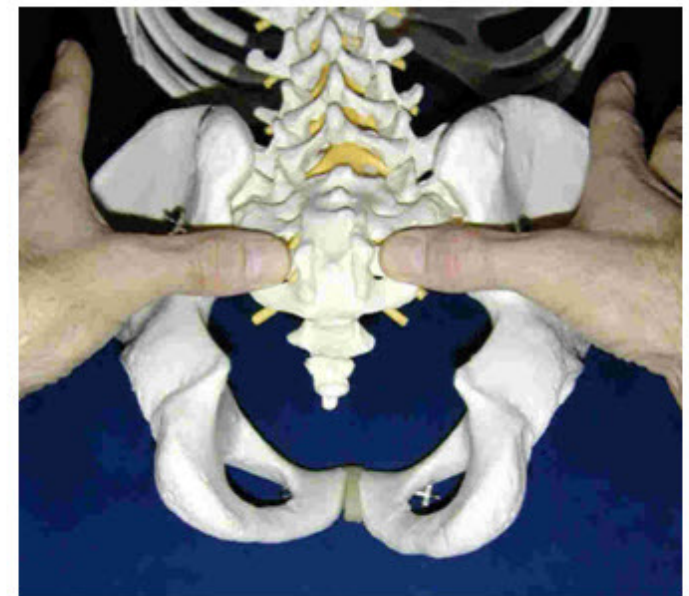
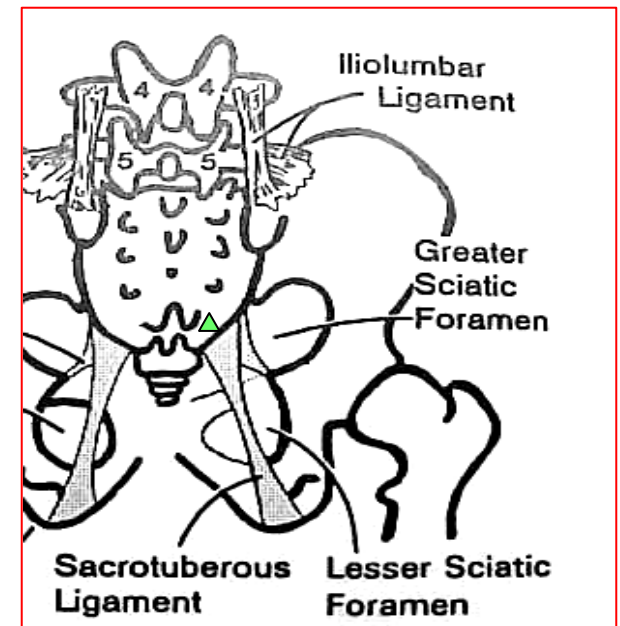
# Sacral Sulcus Depth

- Palpable groove just medial to PSIS.
- Space between sacral spines and lateral sacral crest.
- Place thumbs in inferior border of PSIS.
- Move ½-1" up and medial to PSIS.
- Push thumb tips on sacral base.
- Pads of thumbs are on ilium and tips on sacral base.
  - **Measure the depth of each sacral sulcus relative to opposite sulcus?**
  - **Record even, deep, or shallow, comparing one side to the other.**
  - **Both sides may be shallow or deep as well.**



# Inferior Lateral Angle

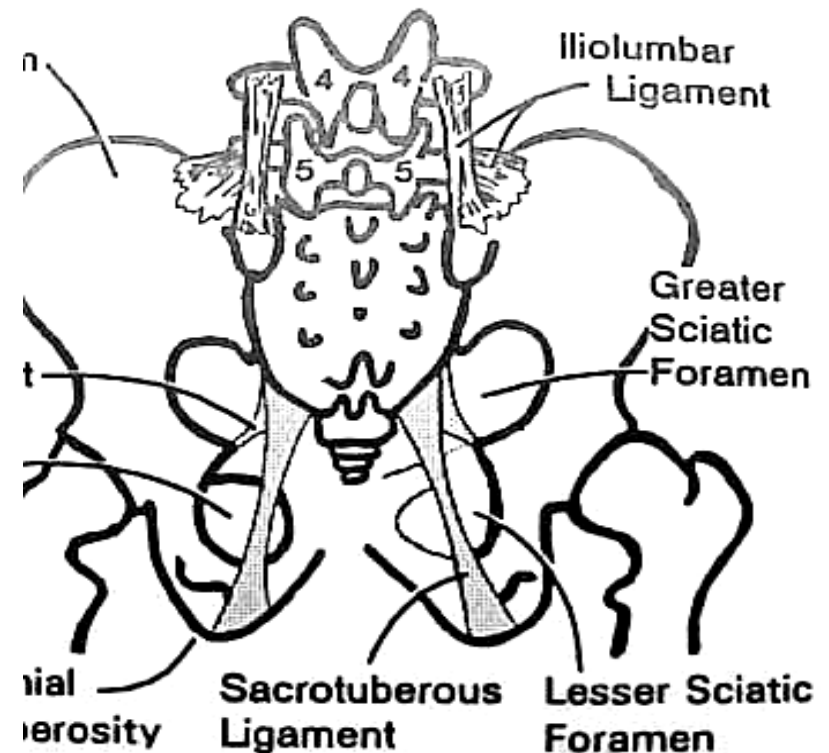
- 1. Place flat of hand over sacrum near its caudal end and identify the coccyx.
- 2. Thumbs approximately 1" apart. Place thumbs in gluteal area about 1" caudal and on each side of coccyx.
- 3. Push thumbs cephalad until pads rest on inferior margin of ILA. Take a reading on the lateralized side: Inferior or superior? Possibly even?
- 4. Move thumbs approximately 1" cephalad from the inferior margin of the ILAs and place the pads of the thumbs over the posterior surface of the ILAs near the apex of the sacrum.
- 5. Use moderate equal pressure & judge if one side is more anterior or posterior than the other one or are they equal? Record on the lateralized side.



ILA palpation

- 1. Place thumbs on the inferior margin of ILA.
- 2. Move thumbs inferiorly and laterally from the ILA bilaterally, palpating for the sacrotuberous ligament.
- 3. Ligament will be found between the ILA and the ischial tuberosity on each side.
- 4. Press thumbs anteriorly, superiorly, and 45-50 degrees laterally to check the tension on the sacrotuberous ligaments.
- 5. Are they equal in tension or is one tighter or looser than the other? Note which side is looser and which is tighter, relative to the other side.

## Sacrotuberous Ligament



# L5

- Locate L5 transverse processes, bilaterally
- Place thumbs over L5 transverse processes, bilaterally
- Note relative positions of L5 transverse processes bilaterally
  - Which is anterior?
  - Which is posterior?
  - What is the preference of motion at L5 for Rotation?
- **Record the Rotation of L5, Right, Left, or No Rotation**

# Motion Tests for Sacral Diagnosis

# Lumbosacral Spring Test

- Patient Prone
- Physician at Side of Table
- Place Heel of Hand over Lumbosacral Junction (L5-S1)
- Keep arms straight, and lean with body
- Spring Several Times –
- Negative Test is a Mobility to Springing (motion is felt at joint) – “extension restriction”
- Positive Test is Restriction to Anterior Springing (absent or restricted springing) – “flexion restriction”



Lumbosacral spring test

## Respiratory Motion Test

1. With the patient prone, let your hand rest gently on the sacrum with fingertips at sacral base and palm at coccyx;
2. Ask the patient to take a deep breath and follow the sacrum into anatomical extension with inhalation and anatomical flexion with exhalation;
3. Restriction of sacral extension indicates flexion ease;
4. Restriction of sacral flexion indicates extension ease.



**Respiratory motion testing of sacrum**

# Hip Flop

- a) Setting the pelvis: Have the supine patient bend the knees, place the feet on the table, lift the pelvis off the table and set it down, and straighten the legs;



Setting the pelvis before anterior palpation

# ASIS Compression Test

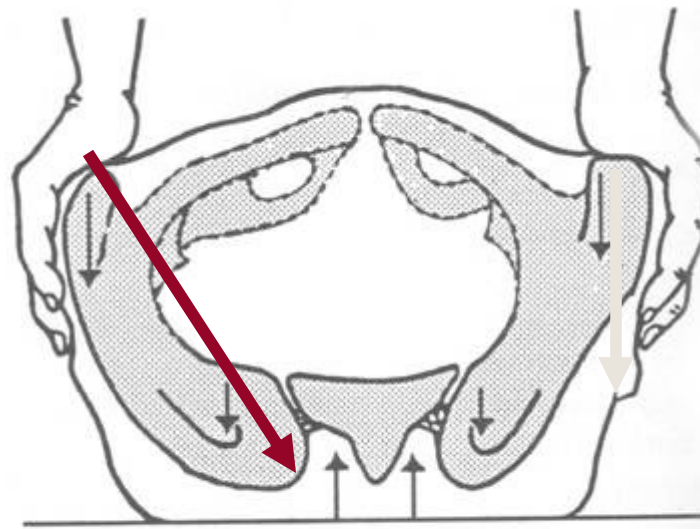
- Have the patient lie supine. The patient is then asked to raise his/her bottom up off the table and then set it back down again.
- Doctor Stands with head and shoulders centered over the patient.
- Contact the ASIS
  - Stabilize one ASIS while applying pressure at a 45 degree angle to the other ASIS
- Positive test - restricted movement of the Sacroiliac joint -> rock like motion
- Negative test - a sense of give or resilience => bounce or spring like motion



# ASIS compression test figure

Approx. 45  
degree angle

Aim toward  
SI Joint



Stabilization

**Positive - Resistance to compression (or a  
lack of spring)**

# DIAGNOSIS AND TREATMENT

# Sacral Dysfunction Assessment

Are ILA's Symmetric Superior/Inferior?

Yes

No

Physiologic:  
Oblique Axis:  
Sacral Torsions

Non - physiologic:  
Upslipped Innominate  
Unilateral Sacral Shear  
(Unilateral Sacral Flexion)

Is the Sacral Base Symmetric Anterior  
/Posterior?

No

Yes

Sacral Base Posterior

Sacral Base Anterior

Sacral Margin Posterior

Neutral Sacrum

**BILATERAL SACRAL FLEXION (SACRAL BASE ANTERIOR)**  
**(SAGITTAL PLANE - MIDDLE TRANSVERSE AXIS)**

Diagnostic findings:

- Tissue texture changes over the sacroiliac joints or related musculature
- PSIS's level
- Inferolateral angles level
- Sulci deep bilaterally
- Sacral base anterior bilaterally
- Sacral apex posterior bilaterally
- Base anterior springing present
- Apex anterior springing restricted
- Sacrotuberous ligaments tight bilaterally
- Tenderness to palpation over the sacroiliac joints

# Sacral Base Anterior-synonyms

(several terms describing the same motion)

- Sagittal Plane-Middle Transverse Axis
- Bilateral Sacral Flexion
  - Kimberly manual 2006, p. 193 (4521.11A-E)
  - (different than the sacral “flexion & extension” in the Magoun-type cranial field model)
- Nutation
  - From the Latin “nutare”- to nod
  - Nutated Sacrum
- Anterior Nutation

# Sacral Base Anterior:

Base bilat. anterior on the middle transverse axis

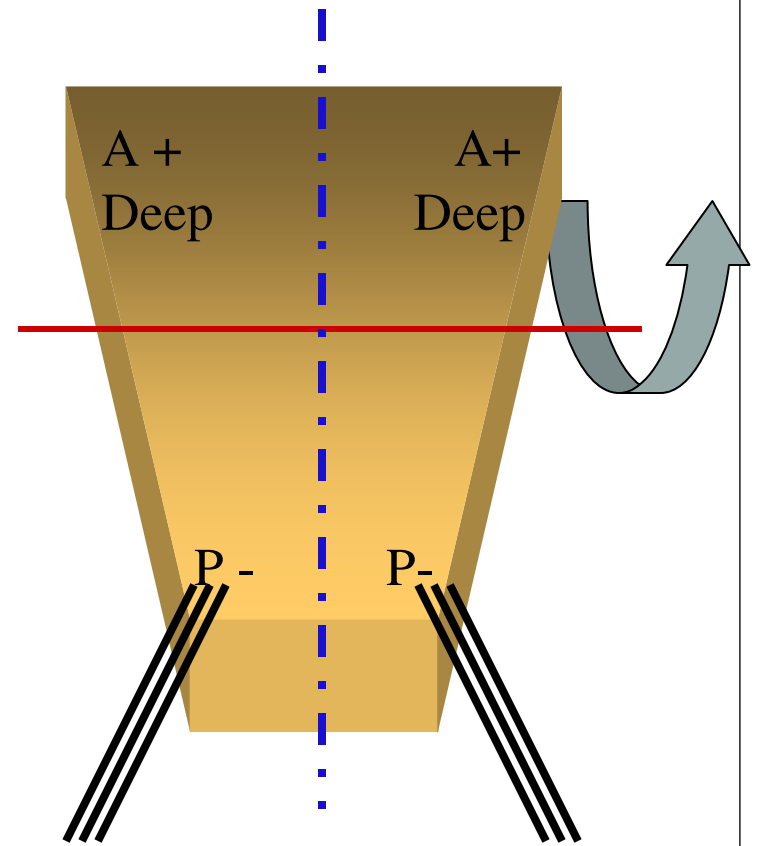
**Name:** Sacral Base Anterior,  
Or bilat. Sacral Flexion, Or Nutation

## **Landmarks:**

Sacral Base:	Bilat. Anterior
Sacral Sulcus:	Bilat. Deep
ILA:	Bilat. Posterior
STL:	Bilat. Tight

## **Motion:**

Sacral Base:	Bilat. +
ILA:	Bilat. -



# Sacral Base Anterior (Bilateral Sacral Flexion)

- Inferolateral angles level
- Sulci deep bilaterally
- Sacral base anterior bilaterally
- Sacrotuberous ligaments tight bilaterally
- Base anterior springing present
- Apex anterior springing restricted
- Look for “discontinuity” at the lumbo-sacral junction

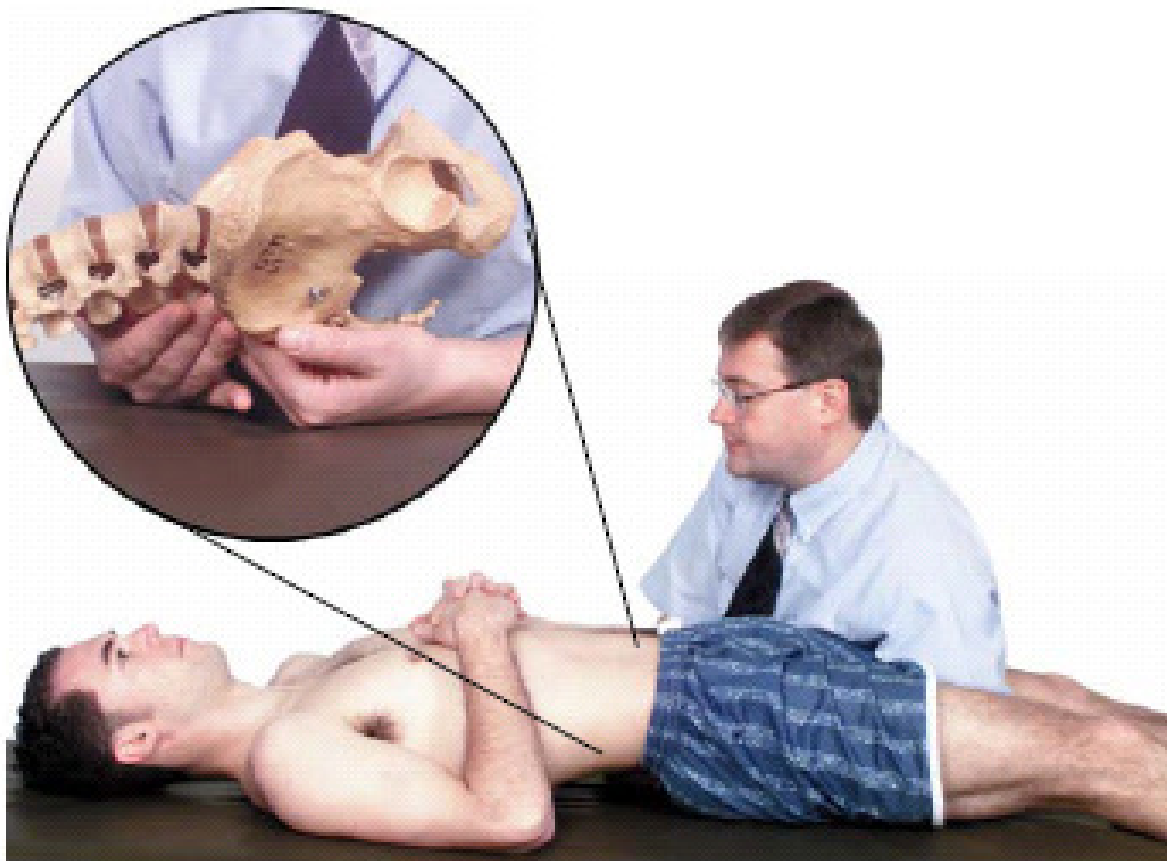
### C. Supine--indirect method—respiratory force (4521.11C)

*Diagnosis: Bilateral Sacral Flexion*

1. Patient is supine and the physician stands at the side of the patient
2. Physician has the patient flex his/her knees and raise the pelvis off the table. The physician places his/her hand between the patient's thighs and under the sacrum. The patient is then asked to let the pelvis come back to the table and the patient's legs are extended. The physician's caudad hand is now cupping the sacrum with the fingers on the base and the palm on the apex
3. Physician then sits on a stool at the side of the table
4. Physician lifts the sacral bases anterior to the point of balanced ligamentous tension



## Supine, indirect, respiratory cooperation, for bilateral flexion - 4521.11C

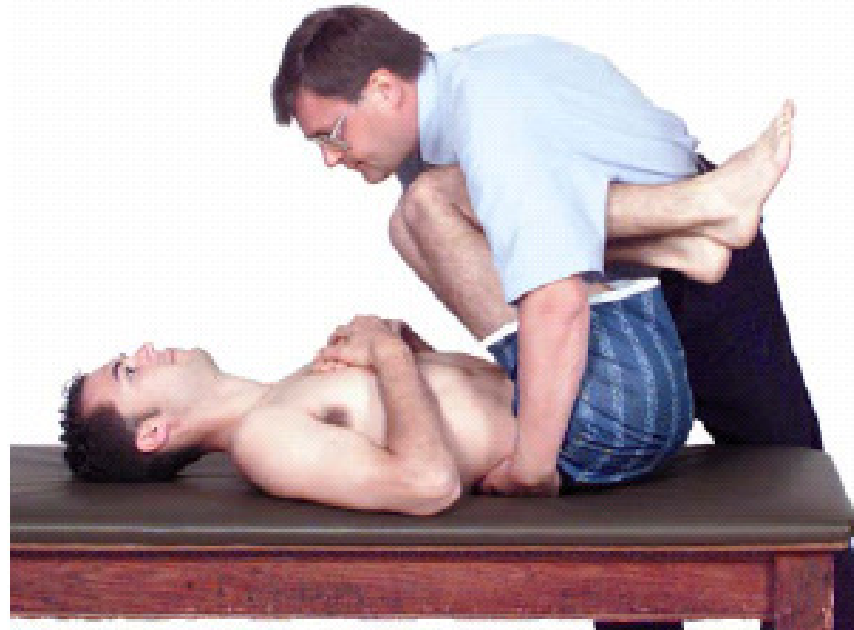


5. Patient's respiratory phases are tested and he/she is instructed to hold the breath as long as possible in the phase that provides the best ligamentous balance
6. Step 5 is repeated until the best motion is obtained (average is 3 times)
7. Recheck.

#### D. Supine--direct method—ME (isometric) (4521.11D)

*Diagnosis: Bilateral Sacral Flexion*

1. Patient is supine with both lower extremities flexed with the knees over the abdomen. The physician stands at the side of the table with the patient's knees and legs resting on his/her chest
2. Physician reaches around each side of the patient to contact the paraspinal tissues lateral to L5
3. Physician increases flexion until the forces are localized at the lumbosacral junction
4. Patient is instructed, "Gently push your knees against me."
5. Physician has the patient maintain the force long enough to sense that the patient's contractile force is localized at the lumbosacral junction (typically 3-5 seconds)
6. Patient is instructed to gently cease the directive force and the physician simultaneously ceases his/her counterforce
7. Physician waits for the tissues to relax completely (about 2 seconds) and then flexes the lumbosacral joint to the new restrictive barrier
8. Steps 4-7 are repeated until the best motion is obtained (average is 3 times)
9. Recheck



## **BILATERAL SACRAL EXTENSION (SACRAL BASE POSTERIOR)**

**(SAGITTAL PLANE - MIDDLE TRANSVERSE AXIS)**

### **Diagnostic findings:**

- Tissue texture changes over the sacroiliac joints and related musculature
- PSIS's level
- Inferolateral angles are level
- Sulci shallow bilaterally
- Base posterior bilaterally
- Apex anterior bilaterally
- Tissue texture changes over the sacroiliac joints or related musculature
- Apex anterior springing present
- Base anterior springing restricted
- Sacrotuberous ligaments are relaxed bilaterally
- Tenderness to palpation over the sacroiliac joints

# Sacral Base Posterior-synonyms

- Sagittal Plane-Middle Transverse Axis
- Bilateral Sacral Extension
  - Kimberly manual 2006, p. 197 (4522.11A-C)
  - (different than sacral “flexion & extension” in the Magoun-type cranial field model)
- Counter Nutation
- Posterior Nutation

# Sacral Base Posterior:

Base bilat. posterior on the middle transverse axis

**Name:** Sacral Base Posterior,

Bilat. sacral extension ,or Counternutation

## **Landmarks:**

Sacral Base: Bilat. Posterior

Sacral Sulcus: Bilat. Shallow

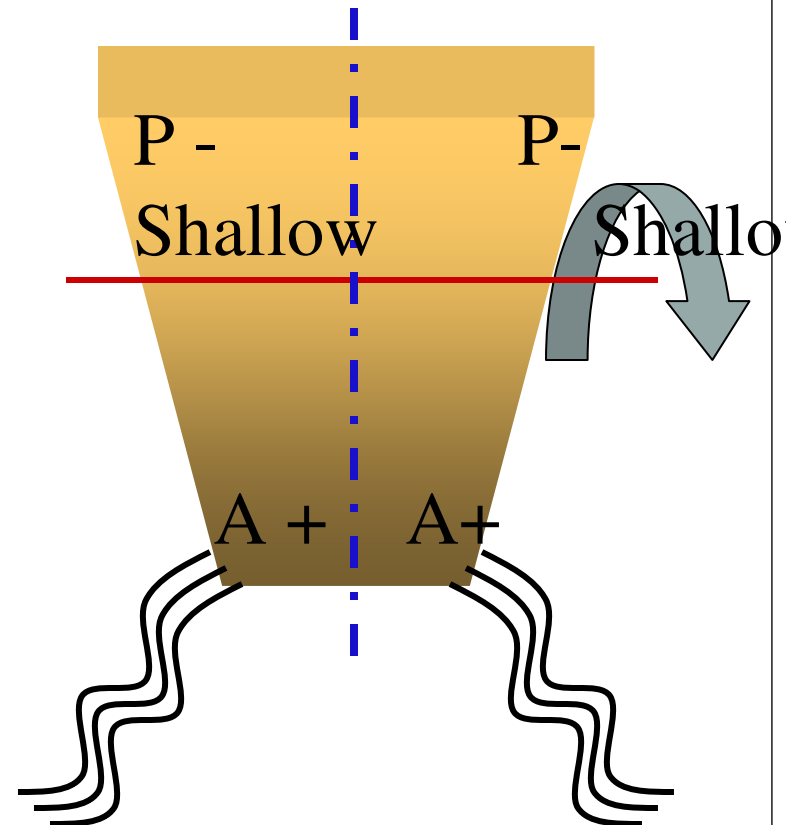
ILA: Bilat. Anterior

STL: Bilat. Loose

## **Motion:**

Sacral Base: Bilat. —

ILA: Bilat. +



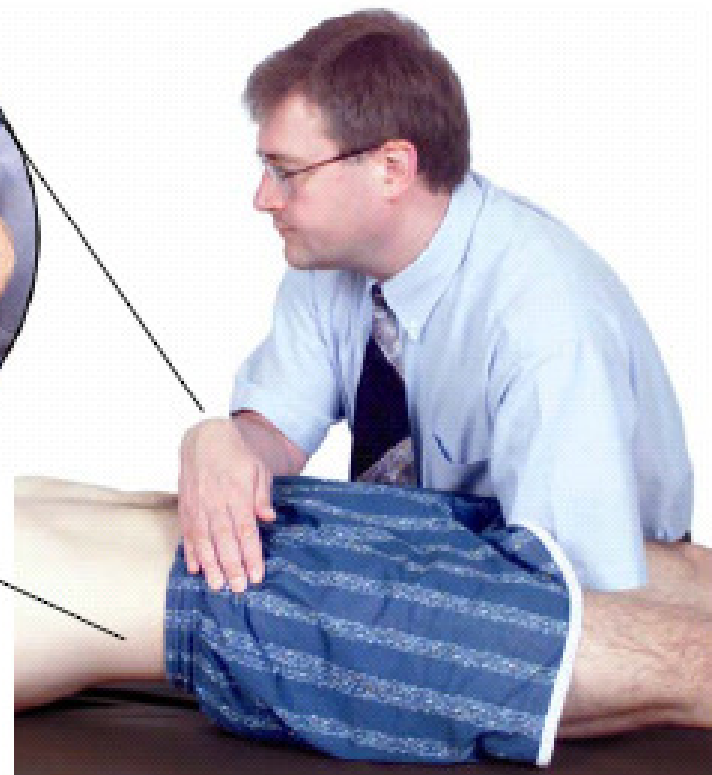
## Sacral Base *Posterior* (Bilateral Sacral *Extension*)

- Inferolateral angles level
- Sulci *shallow* bilaterally
- Sacral base *posterior* bilaterally
- Sacrotuberous ligaments “*relaxed*” bilaterally
- Apex anterior springing present
- Base anterior springing restricted

### C. Supine--indirect method—respiratory force (4522.11C)

*Diagnosis: Bilateral Sacral Extension*

1. Patient is supine and the physician stands at the side of the table
2. Physician has the patient flex his/her knees and raise the pelvis off the table. The physician places his/her hand between the patient's thighs and under the sacrum. The patient is then asked to let the pelvis come back to the table and the patient's legs are extended. The physician's caudad hand is now cupping the sacrum with the fingers on the base and the palm on the apex
3. Physician then sits on a stool at the side of the table
4. Physician lifts the sacral apex anterior to the point of ligamentous balance
5. Patient is instructed, "Take a very deep breath and hold it as long as possible." The physician makes minor adjustments to maintain ligamentous balance
6. Step 5 is repeated until the best motion is obtained (average is 3 times)
7. Recheck.



**B. Prone--direct method—patient cooperation, respiratory force (4522.11B)**

*Diagnosis: Bilateral Sacral Extension*

1. Patient is prone, supporting the upper trunk on his/her elbows and the physician stands at the side of the table
2. Physician places the heel of his/her cephalad hand over the patient's sacral base and places his/her caudad hand on the patient's ankle or leg to provide counterforce



3. The sacral base is carried anteriorly to the restrictive barrier
4. Patient is instructed, "Take a very deep breath" and the physician resists the posterior motion of the sacral base
5. Physician then instructs the patient, "Bend backwards as you let your breath out completely" while the physician follows the sacral base forward
6. Steps 4-5 are repeated until the best motion is obtained (average is 3 times)
7. Recheck

## SACRAL ROTATION ON THE SAME OBLIQUE AXIS

Diagnostic findings: (Sacrum rotated left on a left oblique axis, left on left, as an illustration)

- Tissue texture changes over the sacroiliac joints or in related musculature
- Right base anterior
- Right sulcus deep
- Left inferolateral angle is posterior and slightly inferior
- Left sacrotuberous ligament tight
- Motion of the right base is present
- Motion of the left ILA is restricted
- Motion at poles forming the left oblique axis (left base and right ILA) restricted
- Left rotation around the left oblique axis is present
- Right rotation around the left oblique axis is restricted
- Associated pelvic findings:
  - Right innominate is carried anterior by the sacrum
  - Right PSIS is superior
  - Left innominate is carried posterior by the sacrum
  - Left PSIS is inferior
  - Right medial malleolus may be inferior
  - L5 may be sidebent left and rotated right (left pelvic torsion)
- Tenderness to palpation over the sacroiliac joints

# SACRAL MECHANICS

- Physiologic diagnoses of the sacrum occur in **neutral** and **non-neutral** mechanics:

# Neutral Mechanics a.k.a.

or

- Left rotation on a Left Oblique Axis
- Forward Torsion
- Sacral Nutation

or

(all three are equivalent terms!!)

- **In neutral mechanics, the sacrum rotates in the same direction as the oblique axis (left rotation on a left oblique axis)**

# Non-neutral Mechanics a.k.a.

or  
or

- Right rotation on a Left Oblique Axis
- Backward Torsion
- Sacral Counter-Nutation

- (all three are equivalent terms!!)

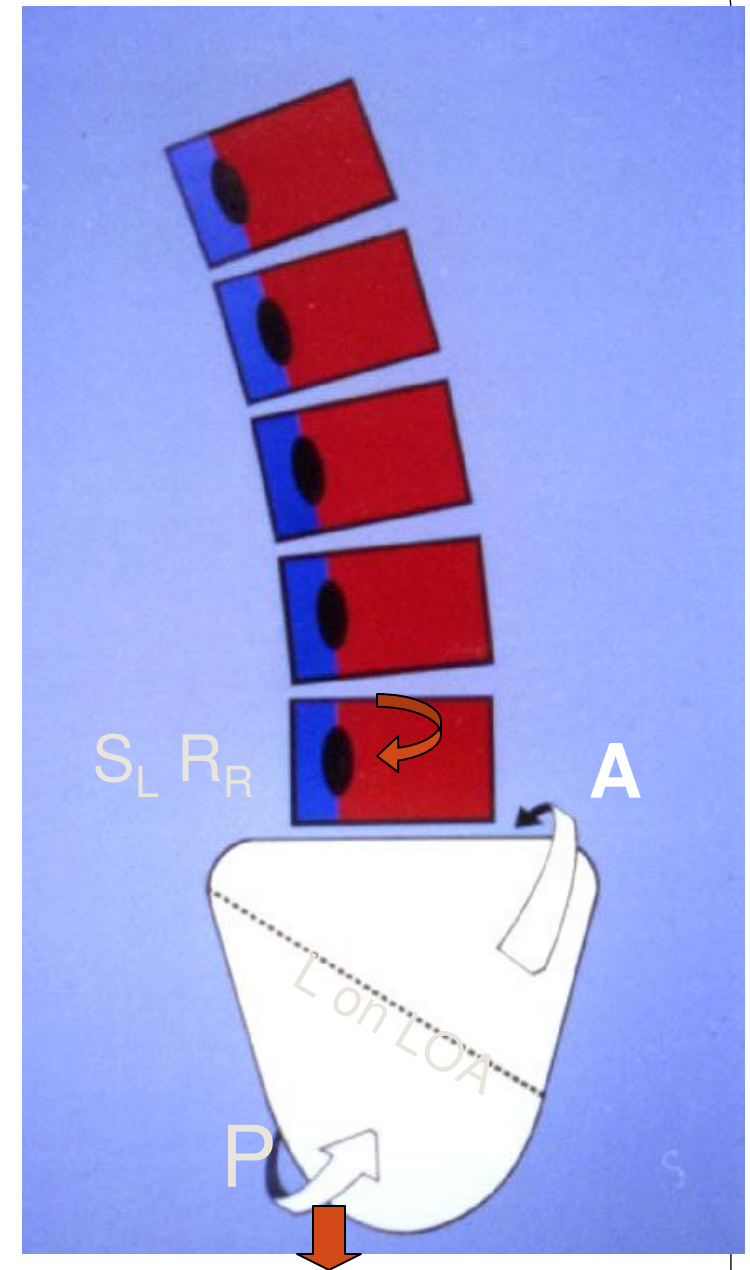
- In non-neutral mechanics, the sacrum rotates in the opposite direction of the oblique axis (right rotation on a left oblique axis)

# Lumbosacral motion

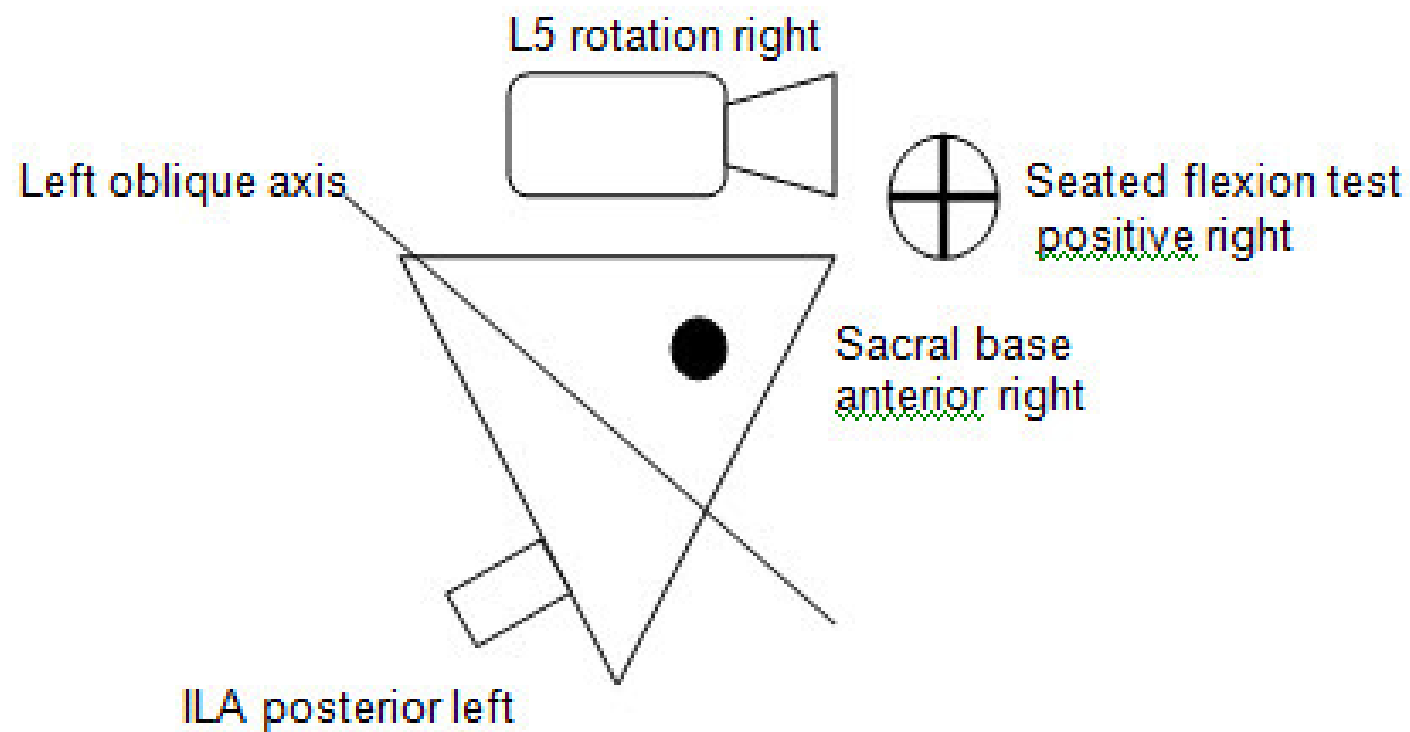
- Lumbar spine and sacrum rotate in **OPPOSITE** directions
- Neutral (type I) mechanics:
  - Example: L on LOA, the right sacral base moves anteriorly while L5 is  $S_L R_R$
- In non-neutral (type 2) mechanics, the sacral base rotates backwards...
  - Example: R on LOA, the right sacral base moves posteriorly while L5 is  $R_L S_L$

# Lumbosacral Mechanics

- Example L rotation on LOA
- Lumbar spine neutral:  $S_L R_R$  (note in all torsions, L5 will rotate opposite of sacrum)
- Requires normal lordosis
- Occurs when (R) sacral base rotates anterior (“forward”) and does not rotate back (feels “springy”)
- left ILA posterior, & inferior



KEY TO FIGURE: Findings for a left on left sacral torsion



# L5 – Sacrum Relationship

<sup>1</sup> With a sacral torsion the seated flexion test is positive on the opposite side of the involved oblique axis.

<sup>2</sup> With a sacral torsion the sacrum is rotated to the opposite side of the anterior sacral base.

<sup>3</sup> With a sacral torsion L5 is rotated to the opposite side of sacral rotation. If L5 is rotated to the same side as the sacrum the dysfunction is termed a sacral rotation.

<sup>4</sup> Motion testing can be done with the lumbosacral spring test, backward bending test (lumbosacral flexion test), respiratory motion testing, or axis motion testing.

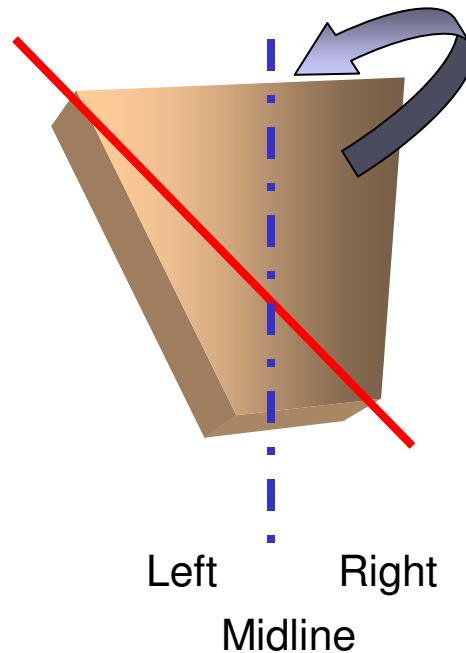
<sup>5</sup> Torsions are named for the direction on the axis: Left on left torsion = rotation left on a left oblique axis.

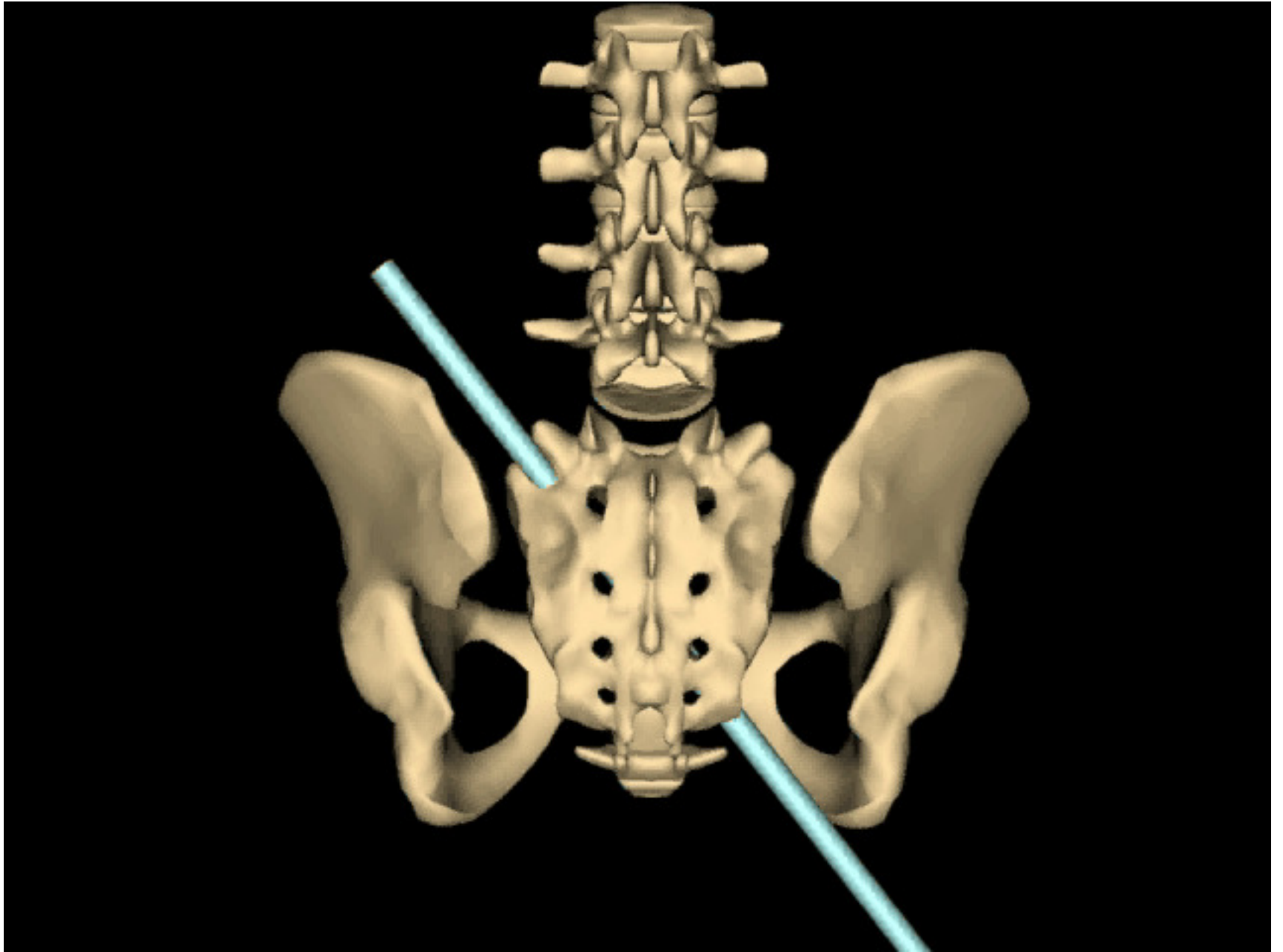
<sup>6</sup> Also known as sacral shear.

There are 2 types of Sacral Oblique Axis Dysfunctions.

$N_{\text{eutral}}$  &  $N_{\text{on } N_{\text{eutral}}}$

Let's start with Neutral Dysfunctions.





# Neutral - Left Oblique Axis Findings

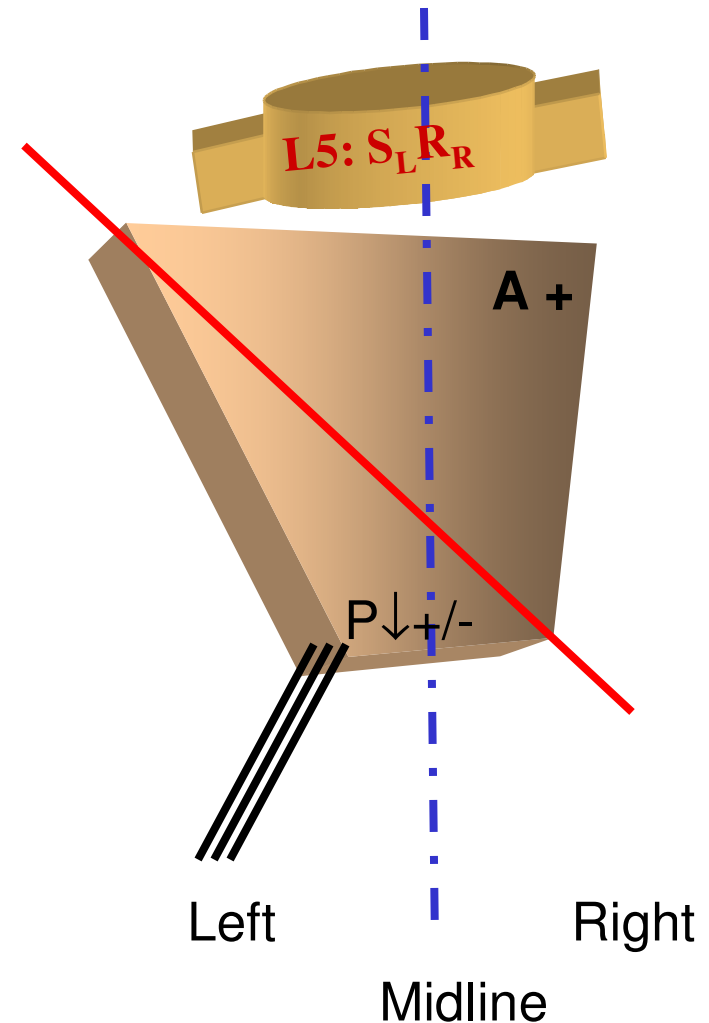
**Name:** L on LOA, R<sub>L</sub> on LOA,  
L Forward Torsion

## **Landmarks – Static:**

Sacral Base:	L posterior
Sacral Sulcus:	L shallow
ILA:	L Post/ Inf.
STL:	L Tight

## **Motion Testing:**

Spring:	- (neg)
L5:	S <sub>L</sub> R <sub>R</sub>
Sacral Base	L - R +
ILA:	L +/- R +/-



# Neutral - Right Oblique Axis Findings:

**Name:** R on ROA, R<sub>R</sub> on ROA,

R Forward Torsion

## Landmarks – Static:

Sacral Base: R posterior

Sacral Sulcus: R shallow

ILA: R Post/Inf.

STL: R tight

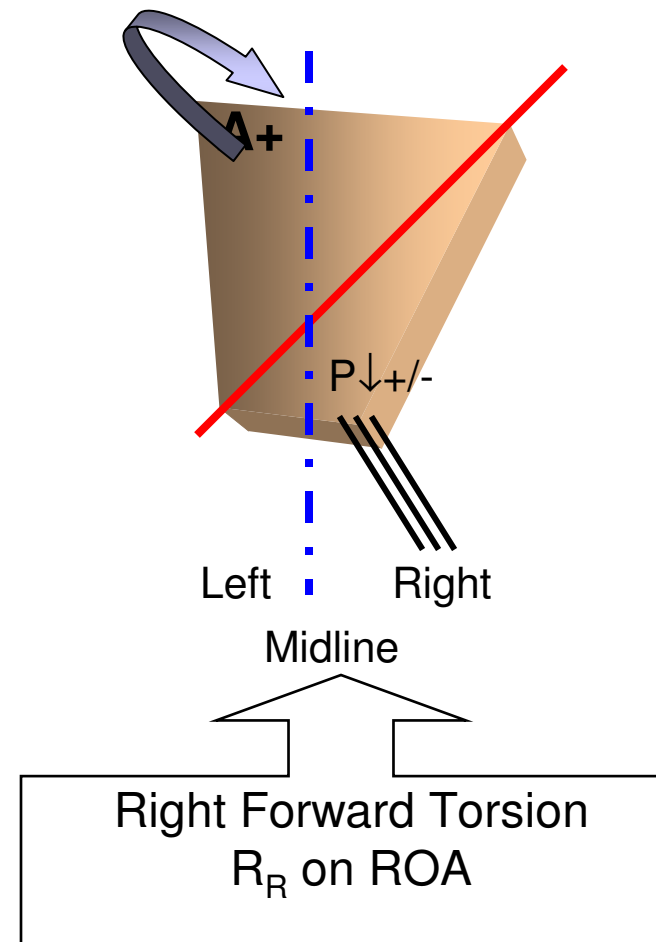
## Motion Testing:

Spring: - (neg)

L5: S<sub>R</sub>R<sub>L</sub>

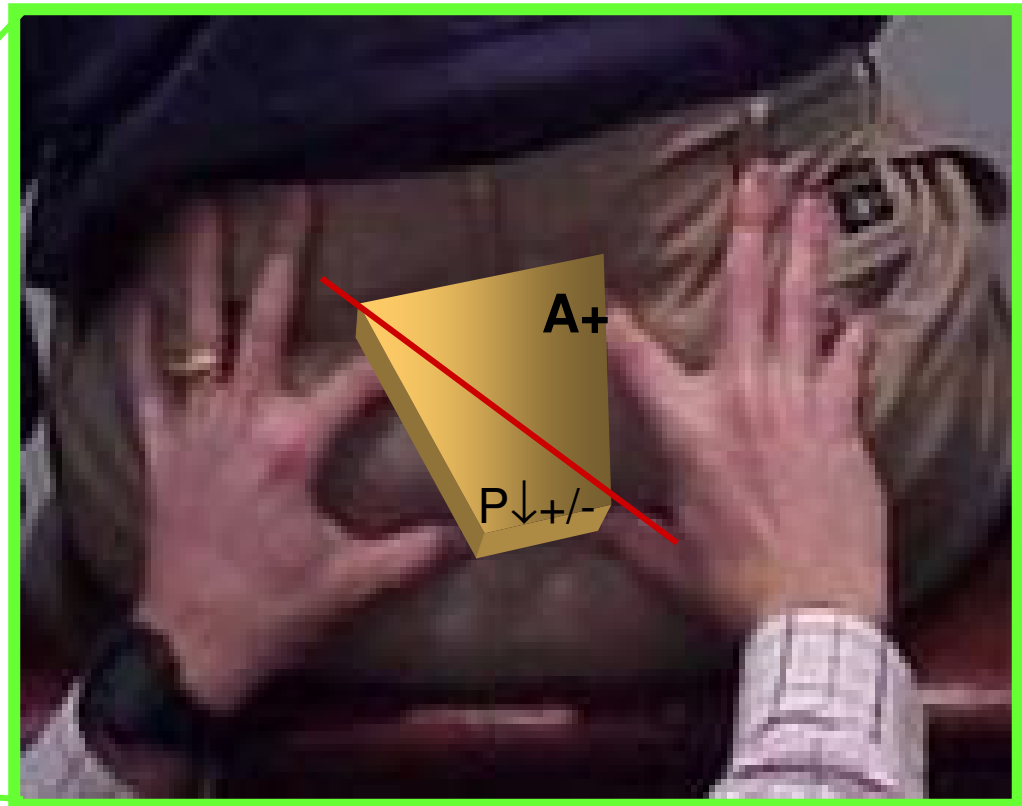
Sacral Base: L + R -

ILA: L +/- R +/-



## Palpatory Experience

We can induce these **Neutral** diagnoses using the mechanics of the sacrum and spine...  $SB_L \rightarrow$  **L on LOA**



**A. Prone--direct method—physiologic response and LVMA (springing) (4524.11A)**

*Diagnosis: Sacrum left on a left oblique axis*

1. Patient is prone and the physician stands at the patient's right side
2. Patient is instructed to flex his/her knees and raise his/her right hip.
3. Physician flexes the hips to at least  $90^{\circ}$  and guides the knees to the right side of the table



4. Physician supports the patient's knees on his/her right thigh to provide a fulcrum for the activating force and to protect the patient's thigh from the edge of the table

5. Physician monitors motion and flexes the hips until motion localizes at the lumbosacral junction

6. Physician grasps the spinous process of L5 with his/her fingers of the right hand to induce left rotation of vertebral bodies and lets the legs drop over the fulcrum inducing left sidebending

7. Low velocity, moderate amplitude springing is applied toward the floor to the patient's feet or legs. Physician uses his/her right hand to monitor the right sacral base for release

8. Physician carefully assists the patient to the prone position again with the legs extended on the table

9. Recheck



**B. Prone--direct method—ME (isometric), physiologic response (4524.11B)**

*Diagnosis: Sacrum left on a left oblique axis*

*Repeat steps 1-6 in technique 4524.11A above*

7. Physician uses his/her left hand to carry the patient's feet or legs toward the floor until sidebending is localized at the lumbosacral joint
8. Patient is instructed, "Lift your feet toward the ceiling" while the physician offers isometric counterforce
9. Physician has the patient maintain the force long enough to sense that the patient's contractile force is localized at the sacrum (typically 3-5 seconds)
10. Patient is instructed to gently cease the directive force and the physician simultaneously ceases his/her counterforce
11. Physician waits for the tissues to relax completely (about 2 seconds) and then moves the patient's feet toward the floor to the new restrictive barrier
12. Steps 8-11 are repeated until the best motion is obtained (average 3 times)
13. Recheck

Note: Sometimes springing force is added after the muscle energy activation.

# HVLA FOR ANTERIOR SACRUM

## Anterior Sacrum Leg Pull – HVLA (SDOFM 118 – 9.6)

Associated with forward sacral torsions, eg. L on L

1. Patient supine, physician stands at foot of table
2. Grasp patient's right ankle just Above malleoli with both hands.
3. Instruct patient to relax all muscles in low back and leg
4. Internally rotate leg to accumulate forces at Right Sacroiliac Joint (Gaps the SI joint)
5. Keep leg and thigh at level of table
6. Apply quick pull on leg, carrying right innominate anteriorly to meet sacrum (correcting the somatic dysfunction)
7. Recheck



FIGURE 9.6 HVLA leg pull for anterior sacrum.

Contraindicated in knee instability

## Posterior Sacrum Leg Pull – HVLA (SDOFM 119 – 9.7) Eg. Right Posterior Sacrum = Sacrum rotated Right on the Left Oblique Axis.

1. Patient supine, physician stands at foot of table
2. Grasp patient's right ankle just Above malleoli with both hands.
3. Instruct patient to relax all muscles in low back and leg
4. Internally rotate leg to accumulate forces at Right Sacroiliac Joint (Gaps the SI joint)
5. Keep the knee extended and flex hip until tension is felt on hamstrings
6. Apply final corrective force (quick pull on leg), carrying right innominate posteriorly to meet sacrum.
7. Recheck



FIGURE 9.7 HVLA leg pull for a posterior sacrum.

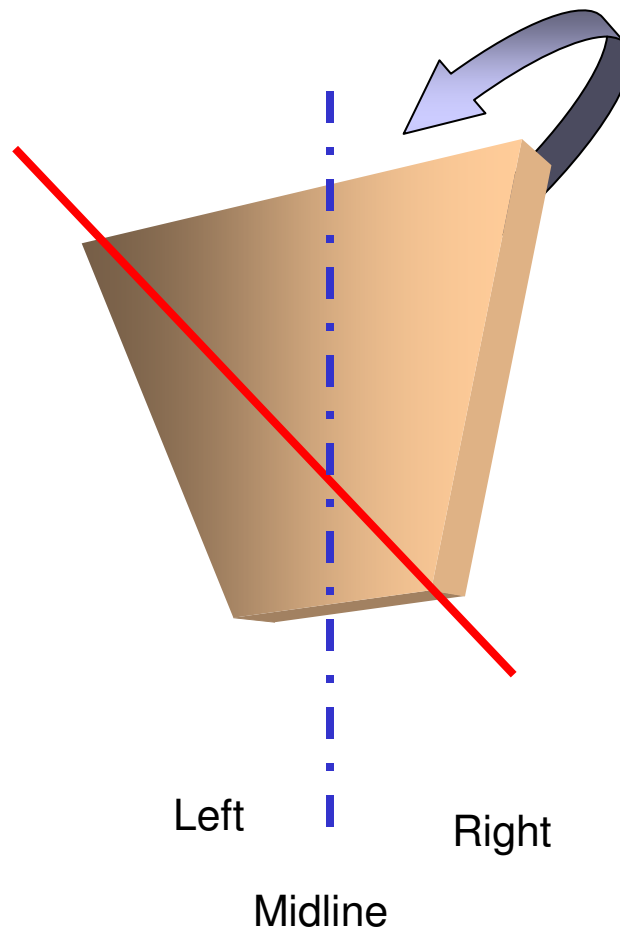
Contraindicated in knee instability

## SACRAL ROTATION ON THE OPPOSITE OBLIQUE AXIS

Diagnostic findings: (Sacrum rotated right on a left oblique axis, right on left, as an illustration)

- Tissue texture changes over the sacroiliac joints or in related musculature
- Right base posterior
- Right sulcus shallow
- Left inferolateral angle is anterior and slightly superior
- Left sacrotuberous ligament loose
- Motion of the left ILA is present
- Motion of the right base is restricted
- Motion at the poles forming the left oblique axis (left base and right ILA) is restricted
- Right rotation around the left oblique axis is present
- Left rotation around the left oblique axis is restricted
- Associated pelvic findings:
  - Right innominate is carried posterior by the sacrum
  - Right PSIS is inferior
  - Left innominate is carried anterior by the sacrum
  - Left PSIS is superior
  - Right medial malleolus may be superior
- Tenderness to palpation over the sacroiliac joints

Next, there are the Non-Neutral Sacral Dysfunctions



# Non-Neutral: Left Oblique Axis Findings

**Name:** R on LOA, R<sub>R</sub> on LOA,  
L Backward Torsion

## **Landmarks – Static:**

Sacral Base:	L Anterior
Sacral Sulcus:	L Deep
ILA:	L Ant/ Sup
STL:	L Loose

## **Motion Testing:**

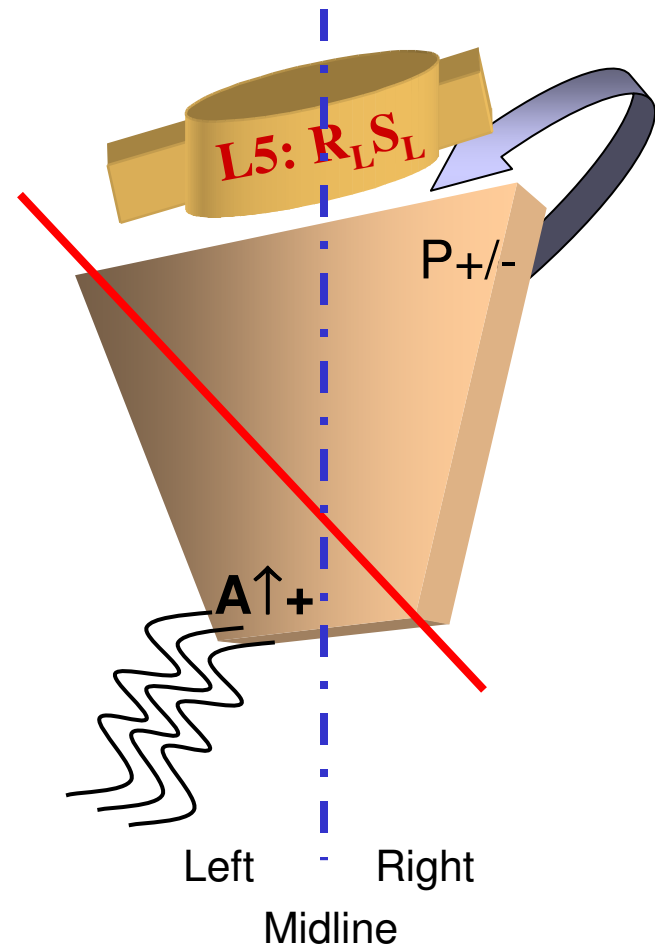
Spring:	+ (positive)
---------	--------------

L5:	R <sub>L</sub> S <sub>L</sub>
-----	-------------------------------

Sacral Base	L - R +/-
-------------	-----------

ILA:	L + R
------	-------

+/-



# Non-Neutral: Right Oblique Axis Findings

Name: L on ROA, R<sub>L</sub> on ROA,

R backward Torsion

## Landmarks:

Sacral Base: R Anterior

Sacral Sulcus: R Deep

ILA: R Ant./Sup.

STL: R loose

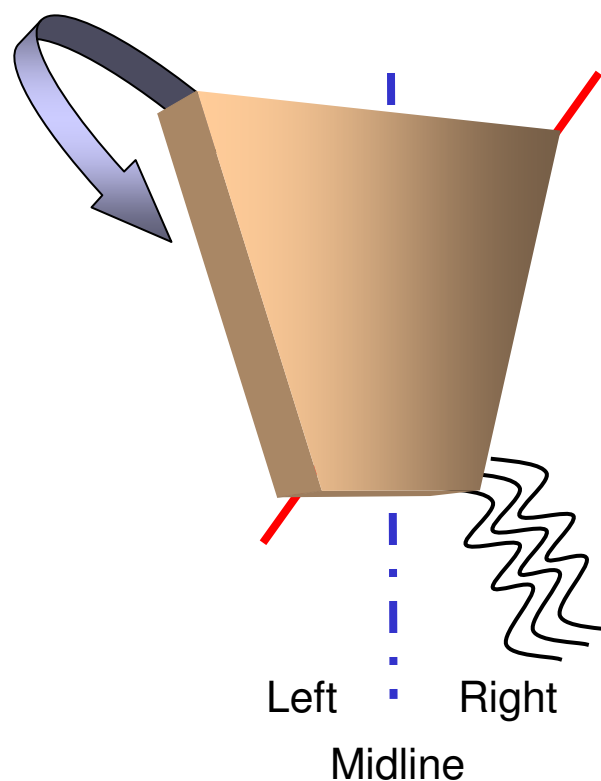
## Motion Testing:

Spring: +

L5: R<sub>R</sub>S<sub>R</sub>

Sacral Base: L +/- R -

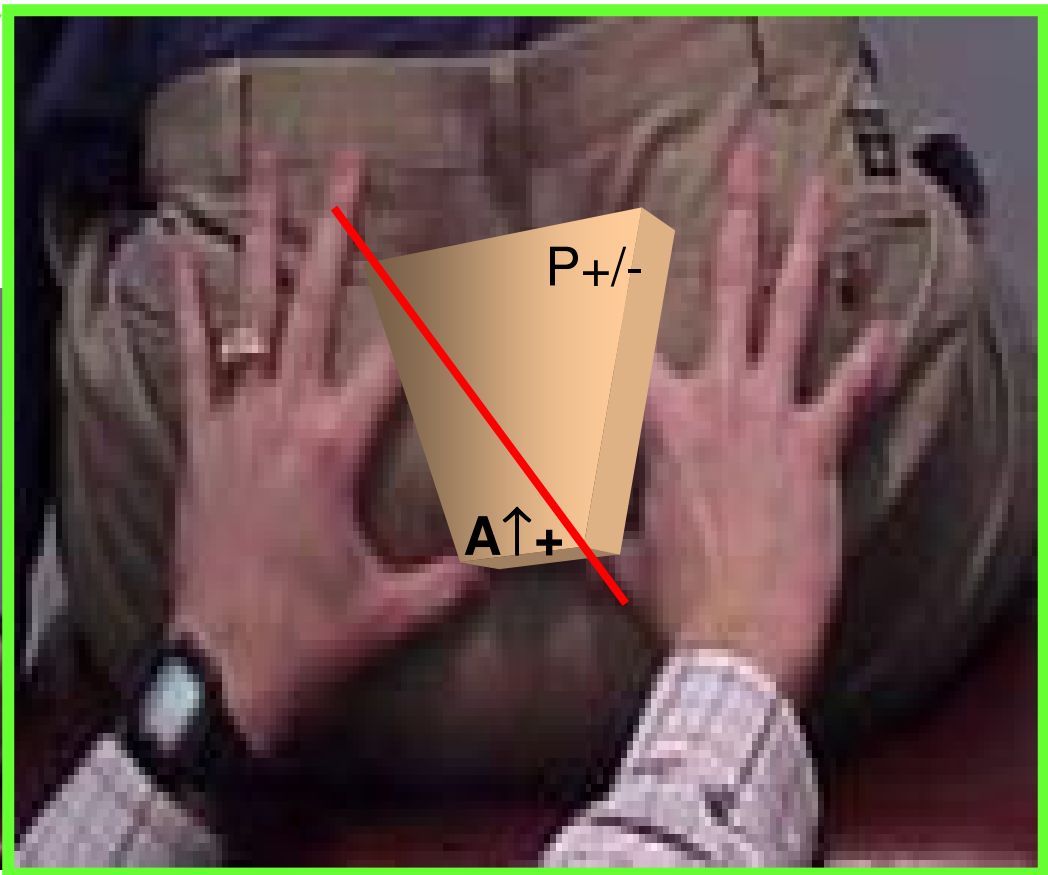
ILA: L +/- R +



Right Backward Torsion  
R<sub>L</sub> on ROA

## Palpatory Experience

We can induce these **Non-Neutral** diagnoses using the mechanics of the sacrum and spine...  $SB_L \rightarrow R$



**A. Lateral recumbent--direct method—physiologic response, respiratory force and LVMA (springing) (4525.11A)**

*Diagnosis: Sacrum right on left oblique axis*

1. Patient is left lateral recumbent and the physician stands in front of the patient
2. Patient's left shoulder is drawn forward to induce right rotation down to the lumbosacral junction
3. Patient's knees and hips are flexed just enough to allow the legs and feet to drop downward over the edge of the table. Flexion must be slight so that non-neutral sacral mechanics will not be induced





4. Physician's right hand monitors the sacral base while the right forearm carries the patient's right shoulder backwards
5. Patient is instructed, "Take a deep breath and let it all out." As the patient exhales the physician pushes the patient's right shoulder further posterior and springs the feet toward the floor increasing the left sidebending
6. Step 5 is repeated until the best motion is obtained (average is 3 times)
7. Recheck



## HVLA FOR POSTERIOR SACRUM

### Anterior Sacrum Leg Pull – HVLA (**SDOFM 118 – 9.6**)

Associated with forward sacral torsions, eg. L on L

1. Patient supine, physician stands at foot of table
2. Grasp patient's right ankle just Above malleoli with both hands.
3. Instruct patient to relax all muscles in low back and leg
4. Internally rotate leg to accumulate forces at Right Sacroiliac Joint (Gaps the SI joint)
5. Keep leg and thigh at level of table
6. Apply quick pull on leg, carrying right innominate anteriorly to meet sacrum (correcting the somatic dysfunction)
7. Recheck

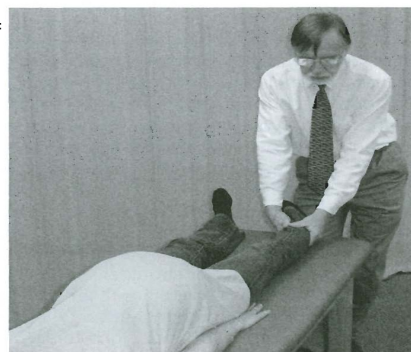


FIGURE 9.6 HVLA leg pull for anterior sacrum.

Contraindicated in knee instability

### Posterior Sacrum Leg Pull – HVLA (**SDOFM 119 – 9.7**) Eg. Right Posterior Sacrum = Sacrum rotated Right on the Left Oblique Axis.

1. Patient supine, physician stands at foot of table
2. Grasp patient's right ankle just Above malleoli with both hands.
3. Instruct patient to relax all muscles in low back and leg
4. Internally rotate leg to accumulate forces at Right Sacroiliac Joint (Gaps the SI joint)
5. Keep the knee extended and flex hip until tension is felt on hamstrings
6. Apply final corrective force (quick pull on leg), carrying right innominate posteriorly to meet sacrum.
7. Recheck

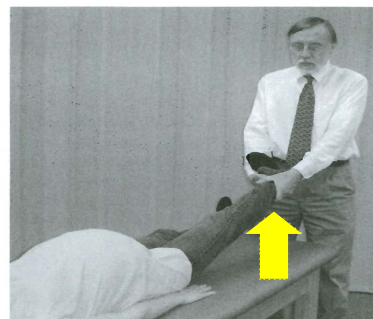


FIGURE 9.7 HVLA leg pull for a posterior sacrum.





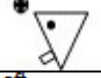



Contraindicated in knee instability

## **COUNTERSTRAIN FOR SACRAL TORSION**

**(not the same as counterstrain for the sacrum)**

- Paper published by Ramirez in 1990s describing the following:
- Both anterior and sacral torsions were treated by:
- 1) noting the side of the tender sacral foramina – (will be the same as the axis side of the torsion)
- 2) sitting on opposite side of the tender points and abducting prone patient's leg 30 degrees off table and flexing hip 30 degrees
- 3) pushing anteriorly on ipsilateral PSIS with operator's forearm for 90 seconds

## SACRUM SOMATIC DYSFUNCTION DIAGNOSIS

DIAGNOSIS	Seated flexion test <sup>1</sup>	Sacral base levelness <sup>2</sup>	ILA levelness	L5 rotation <sup>3</sup>	Sacral motion testing <sup>4</sup>
Left on left torsion <sup>5</sup> 	right	anterior right	posterior left	right	extension restriction
Left on right torsion <sup>5</sup> 	left	anterior right	posterior left	right	flexion restriction
Right on right torsion <sup>5</sup> 	left	anterior left	posterior right	left	extension restriction
Right on left torsion <sup>5</sup> 	right	anterior left	posterior right	left	flexion restriction
Left unilateral flexion <sup>5</sup> 	left	anterior left	posterior left	-	extension restriction
Left unilateral extension <sup>5</sup> 	left	anterior right	posterior right	-	flexion restriction
Right unilateral flexion <sup>5</sup> 	right	anterior right	posterior right	-	extension restriction
Right unilateral extension <sup>5</sup> 	right	anterior left	posterior left	-	flexion restriction

<sup>1</sup> With a sacral torsion the seated flexion test is positive on the opposite side of the involved oblique axis.

<sup>2</sup> With a sacral torsion the sacrum is rotated to the opposite side of the anterior sacral base.

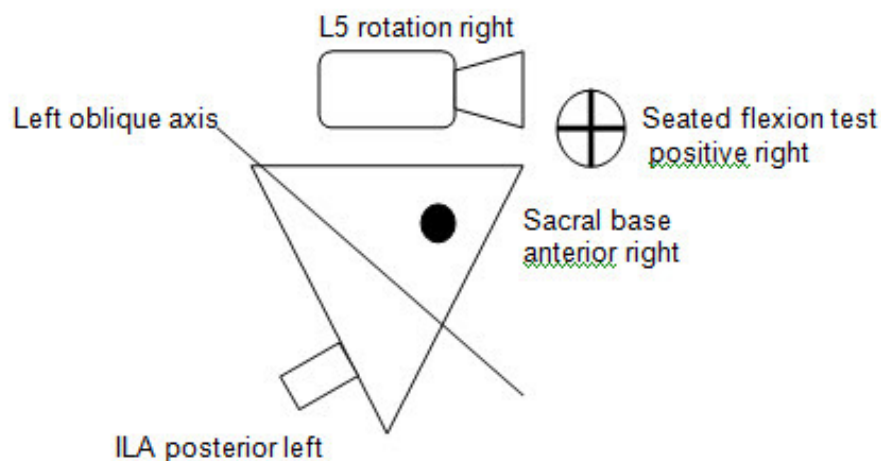
<sup>3</sup> With a sacral torsion L5 is rotated to the opposite side of sacral rotation. If L5 is rotated to the same side as the sacrum the dysfunction is termed a sacral rotation.

<sup>4</sup> Motion testing can be done with the lumbosacral spring test, backward bending test (lumbosacral flexion test), respiratory motion testing, or axis motion testing.

<sup>5</sup> Torsions are named for the direction on the axis: Left on left torsion = rotation left on a left oblique axis.

<sup>6</sup> Also known as sacral shear.

KEY TO FIGURE: Findings for a left on left sacral torsion



# SACRAL DIAGNOSIS

Diagnosis	Seated Flexion Test	Sacral Base/Sulci	ILA levelness	L5 Rot	Spring Test	LS Flexion Asymmtry
Left on left	Right	Anterior right	Posterior left	Right	Negative	Decreased
Left on Right	Left	Anterior right	Posterior left	Right	Positive	Increased
Right on right	Left	Anterior left	Posterior Right	Left	Negative	Decreased
Right on Left	Right	Anterior Left	Posterior Right	Left	Positive	Increased
Left Unilat Flex	Left	Anterior Left	Posterior Left	-	Negative	Decreased
Left Unilat Ext	Left	Anterior Right	Posterior Right	-	Positive	Increased
Right Unilat Flex	Right	Anterior Right	Posterior right	-	Negative	Decreased
Right Unilat Ext	Right	Anterior Right	Posterior left	-	Positive	Increased
Ant Margin - R	Right	Anterior Right	Anterior Right	Left	Negative	Decreased
Ant Margin – L	Left	Anterior Left	Anterior Left	Right	Negative	Decreased
Post Margin – R	Right	Shallow R	Posterior Right	Right	Positive	Increased
Post Margin – L	Left	Shallow L	Posterior Left	Left	Positive	Increased
Bilateral Flexion	N/A	Deep Bilateral	Shallow Bilateral	-	Negative	N/A
Bilateral Extnsn	N/A	Shallow Bilateral	Deep Bilateral	-	Positive	N/A

## PELVIC SOMATIC DYSFUNCTION

POSITIONAL DIAGNOSIS	ASIS	PSIS	Pubic symphysis	Pubic tubercle
Anterior innominate	inferior	superior	-	-
Posterior innominate	superior	inferior	-	-
Superior innominate shear	superior	superior	-	-
Inferior innominate shear	inferior	inferior	-	-
Pubic compression	-	-	tender	symmetrical
Superior pubic shear	-	-	tender	superior
Inferior pubic shear			tender	inferior

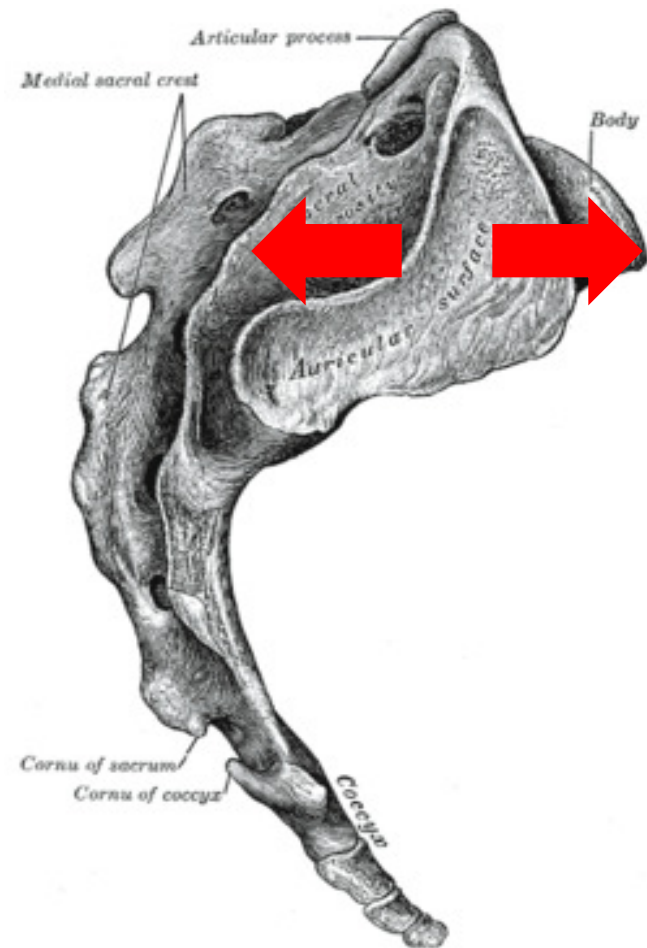
## UNILATERAL SACRAL FLEXION (SACRAL SHEAR)

Diagnostic findings: (Left unilateral sacral flexion as an illustration)

- Tissue texture changes over the sacroiliac joints
- Iliac crests are level
- Left base is anterior
- Left sulcus is deep
- Left ILA is substantially inferior
- Left ILA is slightly posterior
- Left sacrotuberous ligament is loose
- ASIS compression test is positive on the left
- Motion of the left base is present but limited
- Motion of the left ILA is restricted
- Motion of the right base and ILA may be altered
- Tenderness to palpation over the sacroiliac joints

# Sacral Shears

- Produced when the sacrum shifts forward within the sacroiliac joint.
- Two Types:
  - Unilateral Sacral Flexion
  - Unilateral Sacral Extension
- Sx: Chronic low back pain.



# Findings for Sacral Shear

- The distinct finding of the static landmarks that indicates a sacral shear is:

**Markedly Inferior ILA**  
(on the lateralized side)

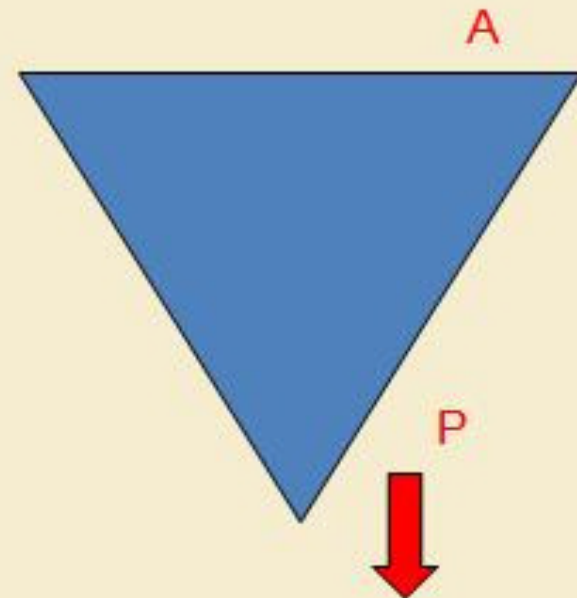


Left sacral shear

# Findings for Sacral Shear

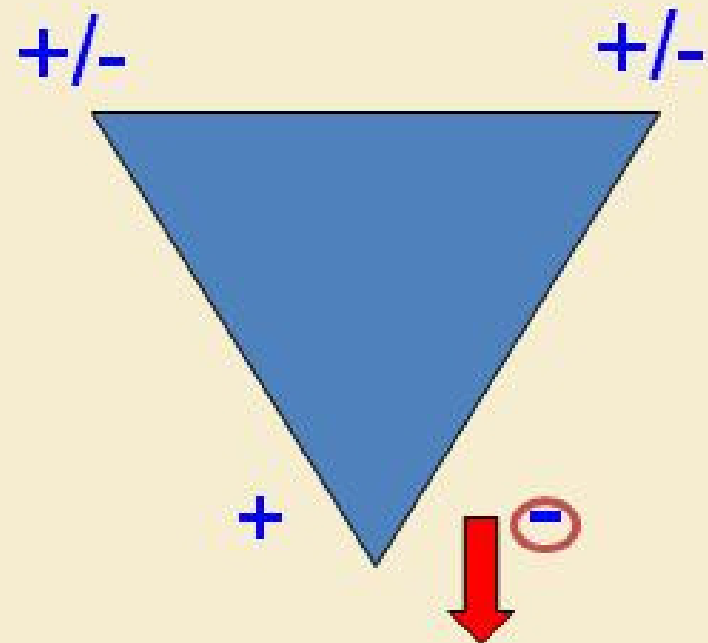
## Static examination

- The sacral base on the side of the inferior ILA will generally be anterior
- The markedly inferior ILA will also be posterior (anatomically, it has to be)
- Sacral sulcus will be **deep** if the innominates are normal but may be shallow if the innominate is also rotated anterior.



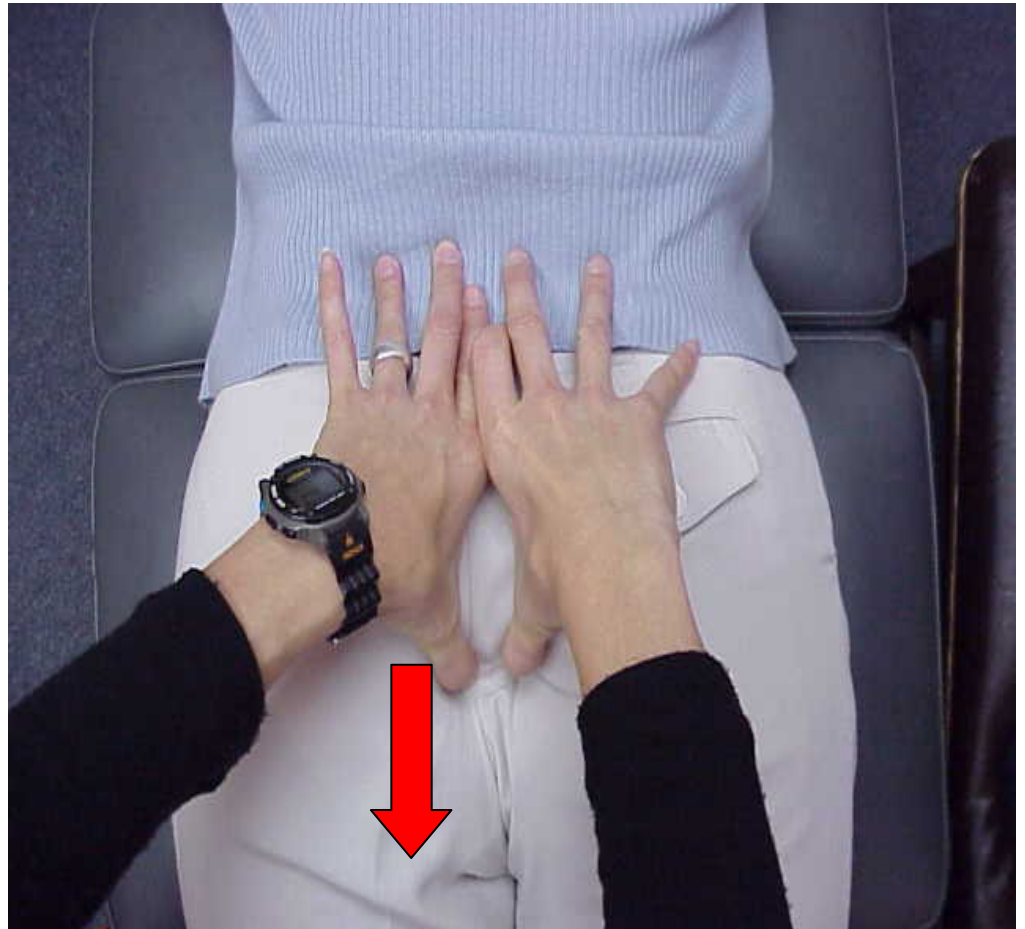
# Motion Testing for Sacral Shear

- There will be no motion at the inferior ILA- it is locked down.
- The base on the same side is likely to have adequate motion
- There is generally good motion at any of the other locations but the motion is not likely to “add up”



# Naming the Shear

- The shear is named for the side of the inferior ILA..  
The sulcus is deep on same side- (which distinguishes this from a torsion)  
The seated flexion positive side will tell you how to interpret whether it is a unilateral flexion or extension,  
i.e., sulcus deep and ILA on R with R seated flexion + =  
R unilateral Flexion;  
L unilateral extension if seated is + L  
with the same findings of: deep sulcus R and ILA post/inf R



# THE GOLDEN OPP SACRUM DX REFERENCE (M. Christensen/ Edited by Dr. Heath)

SACRAL TORSIONS*				
Forward	<b>L on L</b> -R Sulcus Deep (L Shallow) -L ILA Posterior/Inferior -Pos. R Seated Flexion Test -Neg. Lumbosacral Spring Test		<b>R on R</b> -L Sulcus Deep (R Shallow) -R ILA Posterior/Inferior -Pos. L Seated Flexion Test -Neg. Lumbosacral Spring Test	
	<b>L on R</b> -L Sulcus Shallow (R Deep) -R ILA Anterior/Superior -Pos. L Seated Flexion Test -Pos. Lumbosacral Spring Test		<b>R on L</b> -R Sulcus Shallow (L Deep) -L ILA Anterior/Superior -Pos. R Seated Flexion Test -Pos. Lumbosacral Spring Test	
* Blue arrows indicate motion preference. (Ex. R on R- Left base will move anterior and Right ILA will move posterior and inferior.)				
	<b>L Margin Posterior</b> -L Sulcus Shallow -L ILA shallow -Anterior motion L side restricted. -Anterior motion R side present.		<b>R Margin Posterior</b> -R Sulcus Shallow -R ILA shallow -Anterior motion R side restricted. -Anterior motion L side present.	
	<b>Bilateral Flexion</b> -R & L Sulci Deep -Bilateral ILAs Shallow -Neg. Lumbosacral Spring Test		<b>Bilateral Extension</b> -R & L Sulci Shallow -Bilateral ILAs Deep -Pos. Lumbosacral Spring Test	
SHEARS**				
Flexion	<b>Unilateral Flexion Right</b> -R Sulcus Deep -R ILA Posterior/Inferior -Pos. R Seated Flexion Test -Neg. Lumbosacral Spring Test		<b>Unilateral Flexion Left</b> -L Sulcus Deep -L ILA Posterior/Inferior -Pos. L Seated Flexion Test -Neg. Lumbosacral Spring Test	
	<b>Unilateral Extension Right</b> -R Sulcus Shallow -R ILA Superior/Anterior -Pos. R Seated Flexion Test -Pos. Lumbosacral Spring Test		<b>Unilateral Extension Left</b> -L Sulcus Shallow -L ILA Superior/Anterior -Pos. L Seated flexion -Pos. Lumbosacral Spring Test	
**Shears will have greater superior/inferior motion than anterior/posterior.				

\*\*Shears will have greater superior/inferior motion than anterior/posterior.

\*\*Key: "v" = " indicates posterior position.

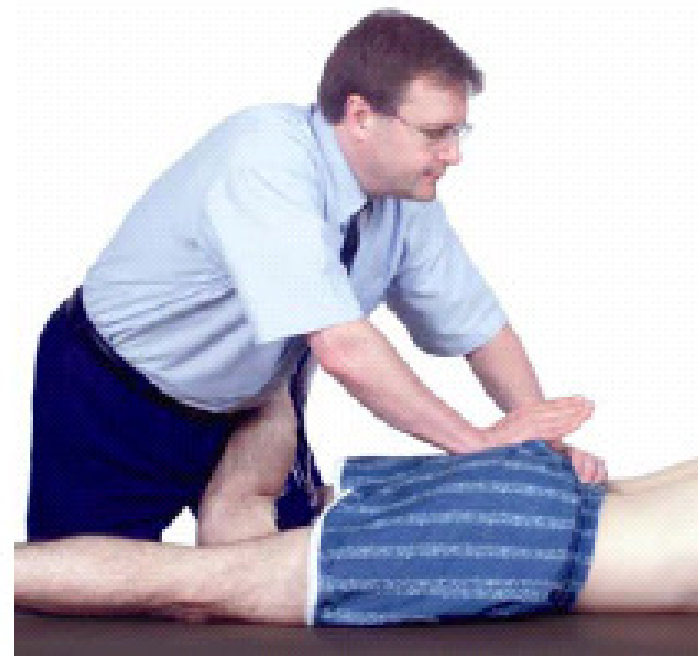
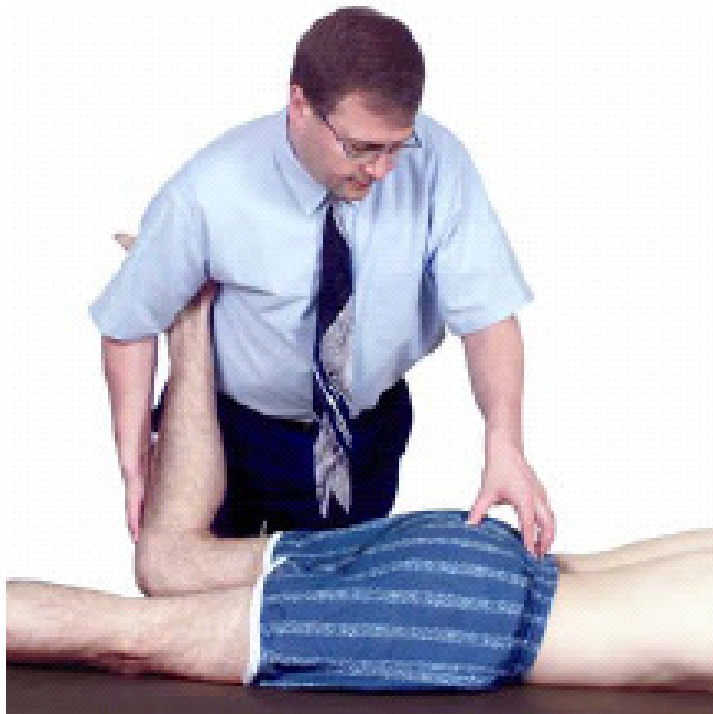
Lumbosacral Spring Test	
Negative (IT SPRINGS!)	Positive (It DOES NOT Spring!)
-Forward Torsion (R on R, L on L)	-Backward Torsion (R on L, L on R)
-Unilateral Flexion	-Unilateral Extension
-Bilateral Flexion	-Bilateral Extension
-Note: LS is considered neutral if you are able to Spring!	

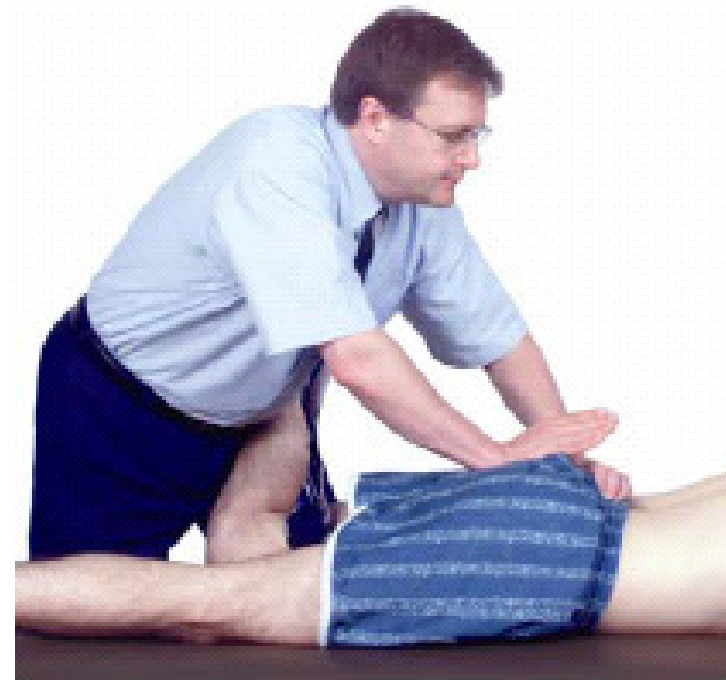
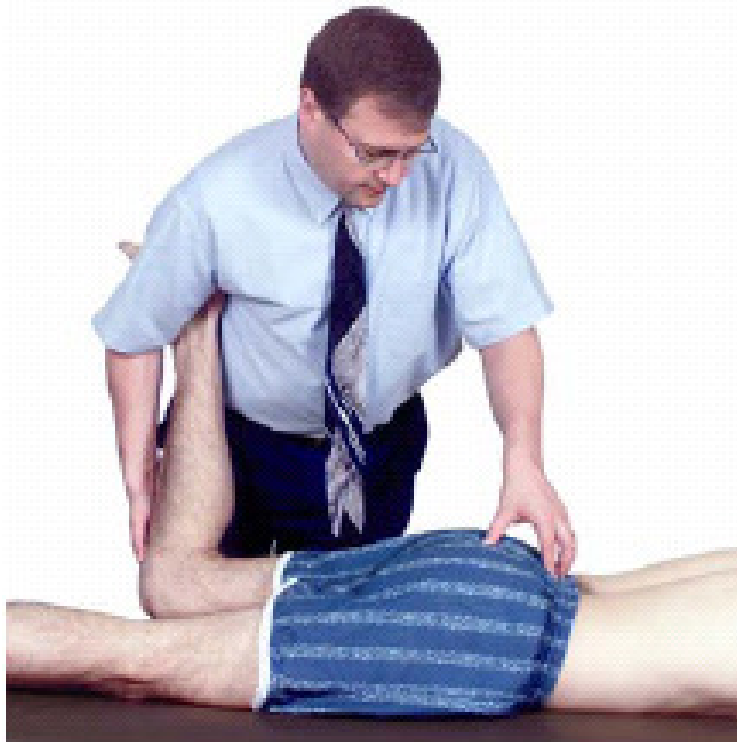
Reference:  
Savarese, OMT Review, 3<sup>rd</sup> Ed., Ch. 6

**A. Prone--direct method—respiratory force and/or LVMA (springing) (4526.11A)**

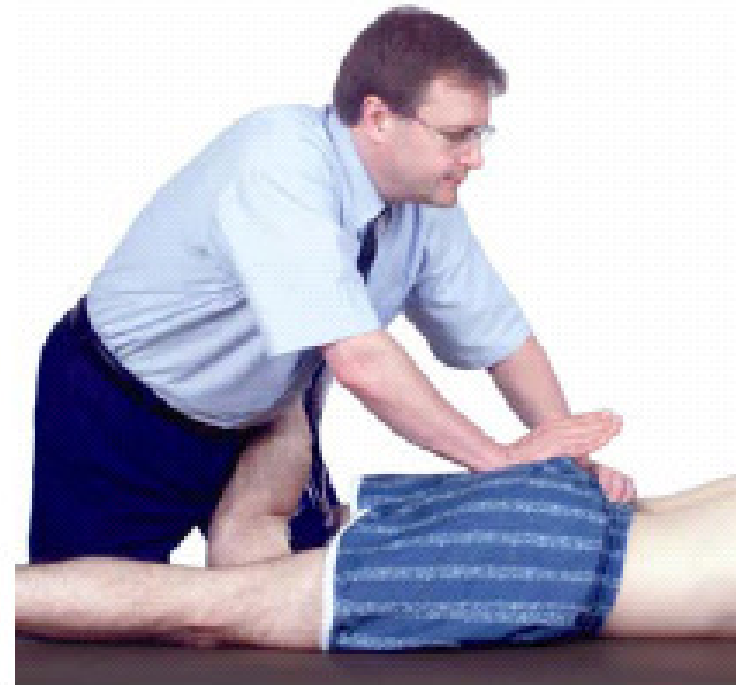
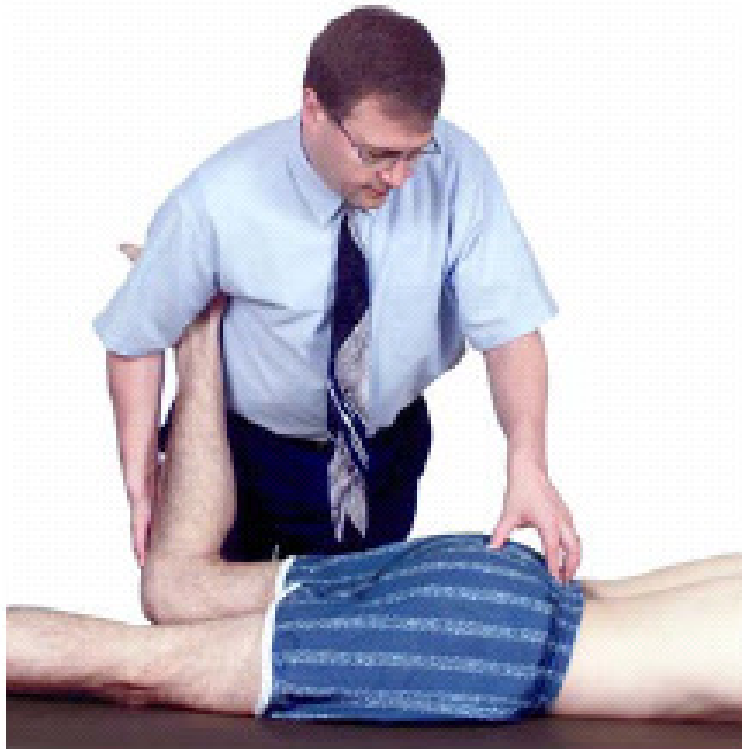
*Diagnosis:* Left unilateral sacral flexion

1. Patient is prone and the physician stands on the side of the dysfunction
2. Physician places his/her thumb or fingers over the left sacroiliac joint to monitor motion
3. Physician flexes the patient's knee, abducts and internally rotates the hip until gapping is palpated at the left sacroiliac joint. The knee is placed back onto the table at that point





4. Physician places his/her body against the patient's leg to maintain the internal rotation
5. Physician places right hypothenar eminence on the inferior aspect of the patient's left inferolateral angle and applies superior and anterior pressure to engage the restrictive barrier. The physician must avoid pressure on the patient's coccyx. He/she may reinforce the right hand with the left



6. Patient is instructed, "Take a very deep breath. . . deeper . . . now hold your breath and relax your muscles." This encourages the sacral base to move posteriorly
7. Low velocity, medium amplitude springing is applied superiorly and anteriorly to the ILA
8. Physician instructs the patient, "Let your breath out and take another very deep breath and hold it." Physician maintains the gain in sacral position and moves the sacrum to the new restrictive barrier
9. Steps 6-8 are repeated until the best motion is obtained (average is 3 times)
10. Recheck

## UNILATERAL SACRAL EXTENSION

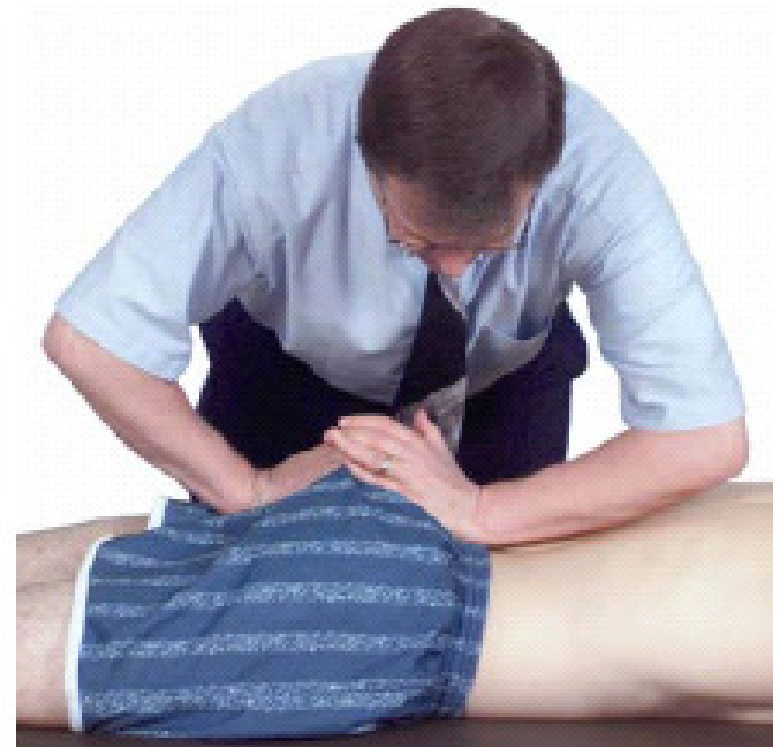
Diagnostic findings: (Left unilateral sacral extension as an illustration)

- Tissue texture changes over the dysfunctional sacroiliac joint
- Iliac crests are equal
- Left base is posterior
- Left ILA is substantially superior
- Left ILA is slightly anterior
- Left sulcus is shallow
- Left sacrotuberous ligament is loose
- ASIS compression test is positive on the left
- Motion of the left base is restricted
- Motion of the left ILA is present but limited
- Motion of the right base and ILA may be altered
- Tenderness to palpation over the sacroiliac joints

**A. Prone--direct method—LVMA (springing) (4527.11A)**

*Diagnosis: Left unilateral sacral extension*

1. Patient is prone and the physician stands at the side of the table
2. Physician places the heel of the caudad hand on the inferior aspect of the ischial tuberosity and the hypothenar eminence of the other hand on the sacral base
3. Physician carries the ischial tuberosity superiorly and the sacral base anteriorly and inferiorly to the restrictive barrier
4. Low velocity, moderate amplitude springing is applied directing both hands toward each other
5. Recheck



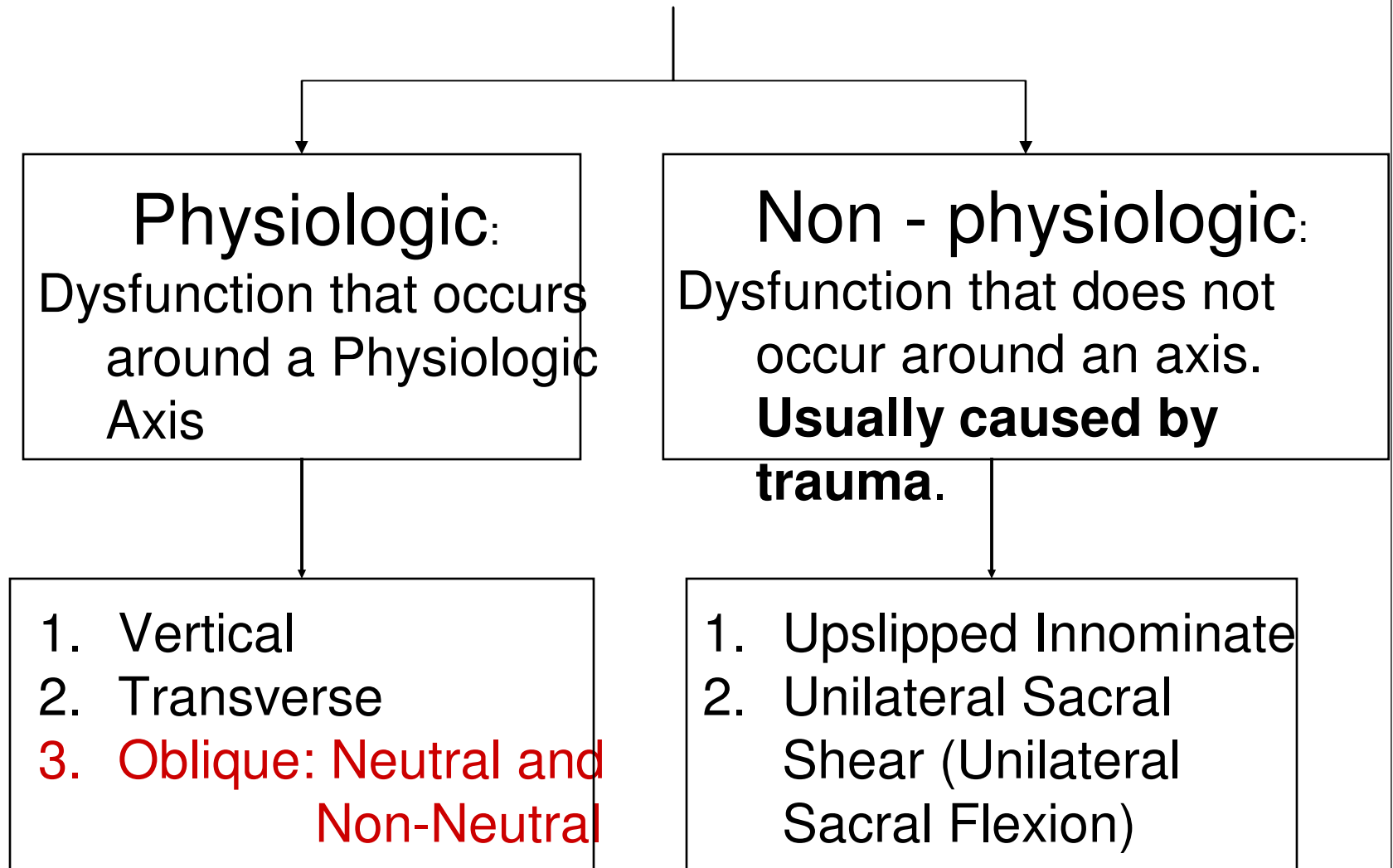
THANK YOU



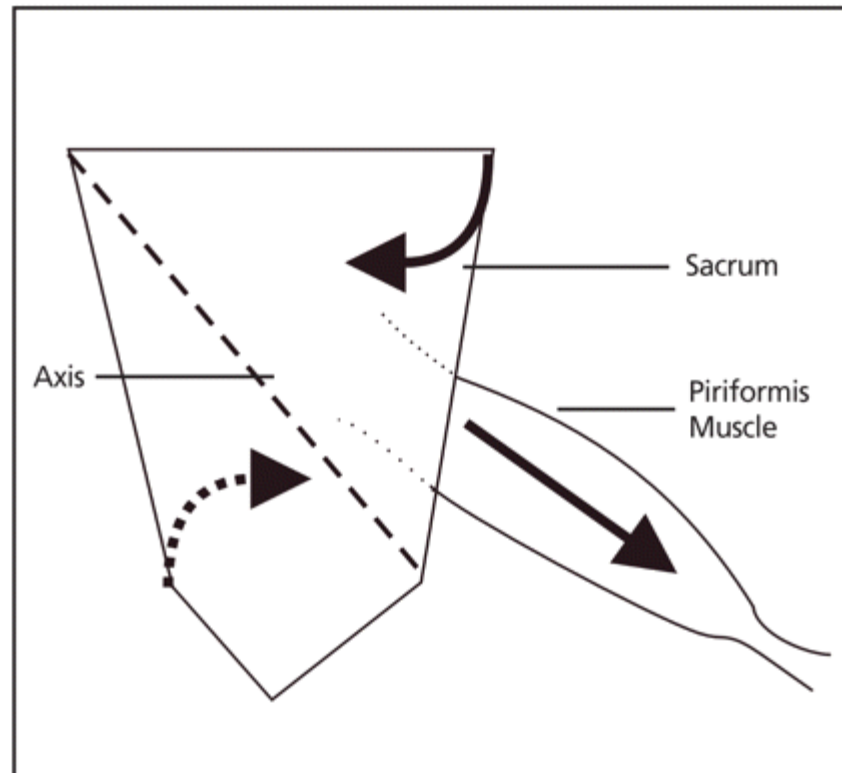


# Sacral Somatic Dysfunction

(AKA Sacroiliac Dysfunction)



# Piriformis Movement



## SACRAL MARGIN POSTERIOR (HORIZONTAL PLANE - VERTICAL AXIS)

### Diagnostic findings:

- Tissue texture changes over the sacroiliac joints and related musculature
- PSIS's are level
- ILA's are level superiorly/inferiorly
- Tenderness to palpation over the sacroiliac joints and related musculature

### Sacrum, rotated around a midline vertical axis

- On the posterior side
  - entire sacral margin is posterior
  - base is posterior
  - ILA is posterior
  - sulcus is shallow
  - sacrotuberous ligament is tight
  - anterior springing at the superior and inferior poles is restricted
- On the anterior side
  - entire sacral margin is anterior
  - base is anterior
  - ILA is anterior
  - sulcus is deep
  - sacrotuberous ligament is relaxed
  - anterior springing at the superior and inferior poles is present

# The only Vertical Axis Diagnosis is...

**Name:** Sacral Margin Posterior

For **Left** Sacral Margin Posterior:

**Landmarks:**

Sacral Base: L Posterior

Sacral Sulcus: L Shallow

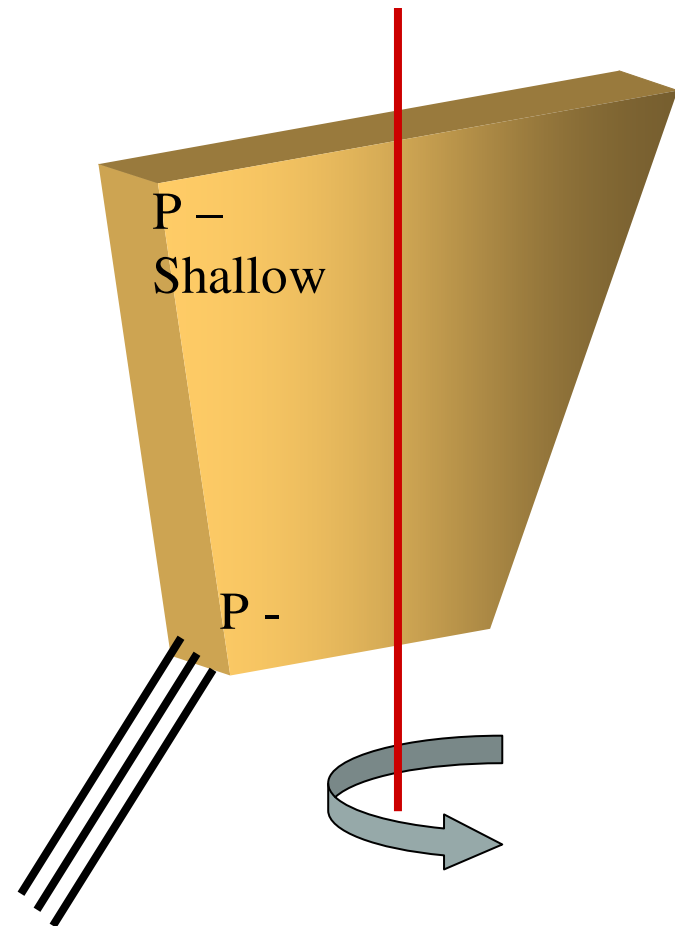
ILA: L Posterior

STL: L Tight

**Motion:**

Sacral Base: L –

ILA: L –



# Sacral Margin Posterior cont...

For **right** sacral margin posterior:

## Landmarks:

Sacral Base: R posterior

Sacral Sulcus: R shallow

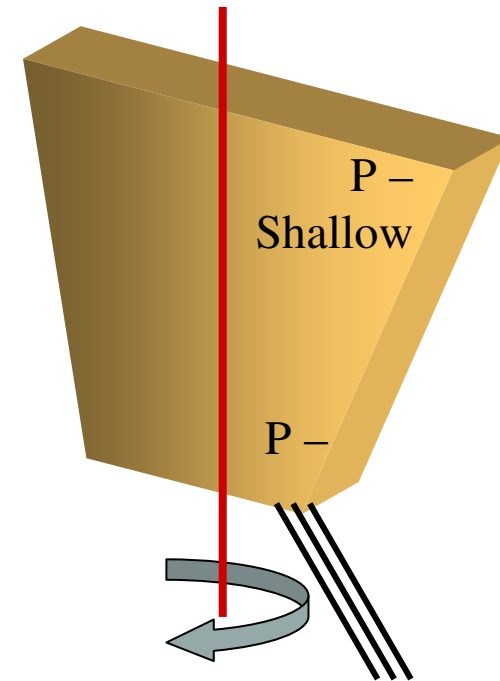
ILA: R posterior

STL: R tight

## Motion:

Sacral Base: R -

ILA: R -



Right Sacral Margin Posterior

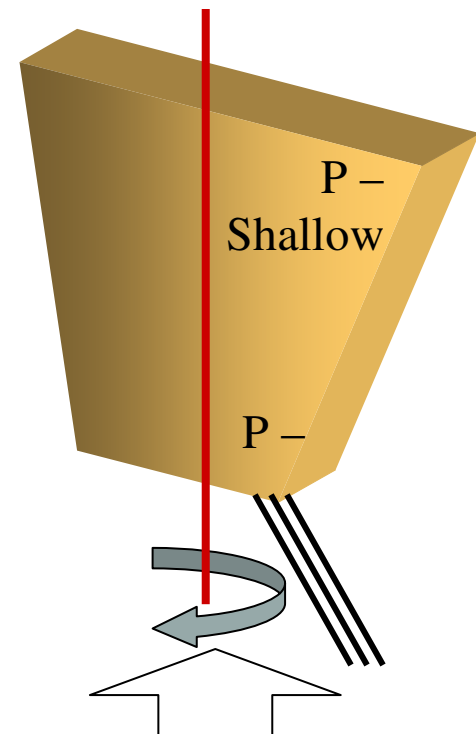
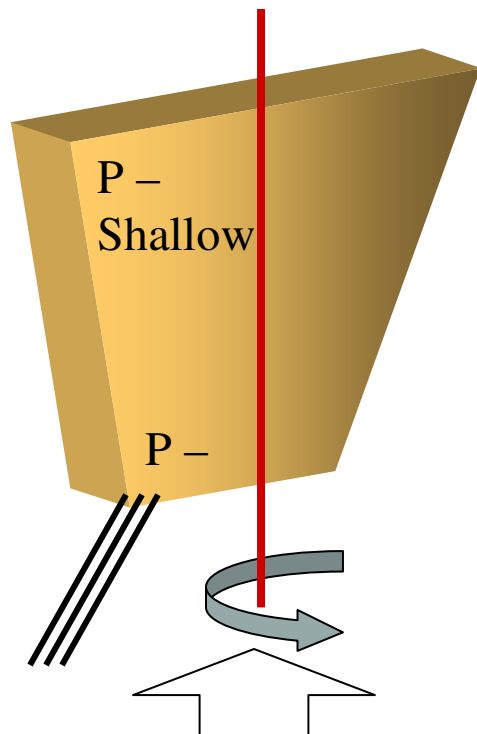
# Sacral Margin Posterior:

(ILA's are level superiorly/inferiorly)

On the posterior side:

- Entire sacral margin is posterior
  - Base is posterior
  - ILA is posterior
  - Sulcus is shallow
  - Sacrotuberous ligament is tight
  - Anterior springing at the superior and inferior poles is restricted

Sacral Margin Posterior can occur on either side of a Vertical axis, but it is always named for the posterior side!



**B. Seated--direct method—ME (isometric) and/or HVLA (4523.11B)**

*Diagnosis: Sacral Margin Posterior*

1. Patient sits straddling the table near the end and the physician stands behind and to the side opposite the posterior margin
2. Patient places the hand on the side of the dysfunction behind his/her neck and grasps his/her elbow with the opposite hand
3. Physician reaches across the patient's chest and grasps the patient's arm on the opposite side. The physician's other hand monitors the posterior margin
4. Patient is instructed, "Sit up straight" and the physician rotates the patient's body away from the posterior margin to the restrictive barrier





5. Patient is instructed, "Without bending to the side, try to turn your body away from me"
6. Physician has the patient maintain the force long enough to sense that the patient's contractile force is localized at the lumbosacral junction (typically 3-5 seconds)
7. Patient is instructed to gently cease the directive force as the physician simultaneously ceases his/her counterforce
8. Physician waits for the tissues to relax completely (about 2 seconds) and then rotates the body and sacrum to the new restrictive barrier
9. Steps 5-8 are repeated until the best motion is obtained (average 3 times)
10. Recheck