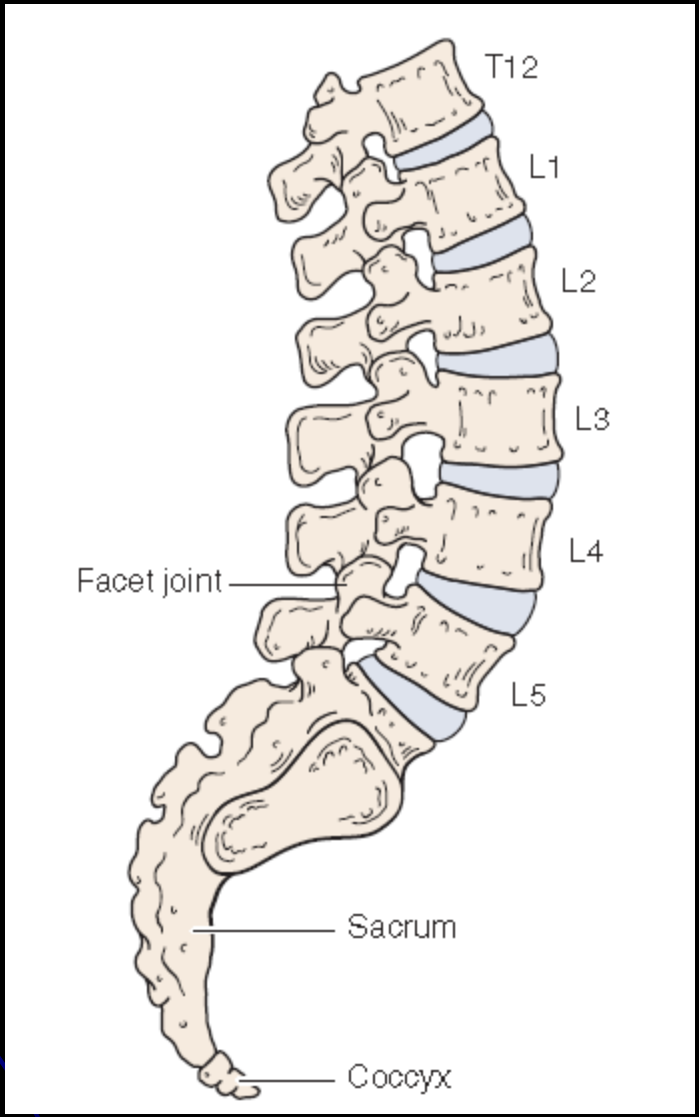
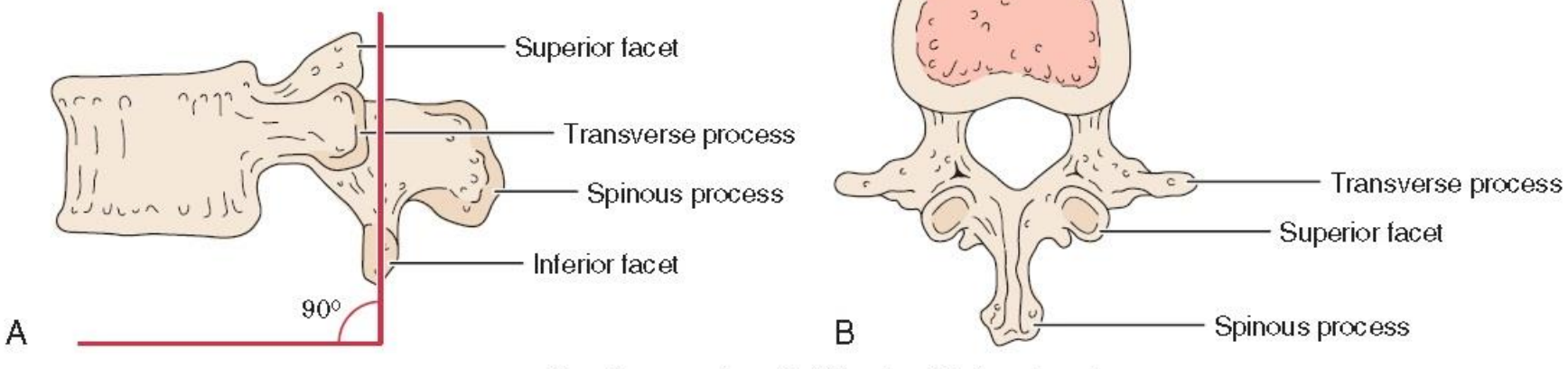
Lumbar Spine


T12
L1
L2
L3
L4
Facet joint
L5
Sacrum
Coccyx

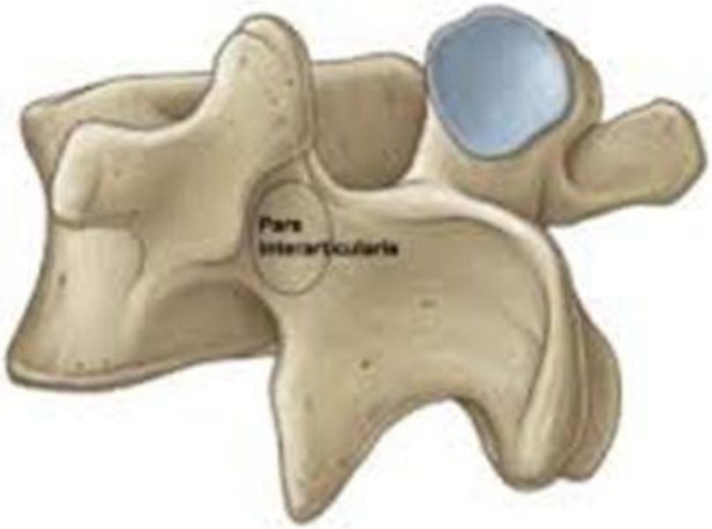


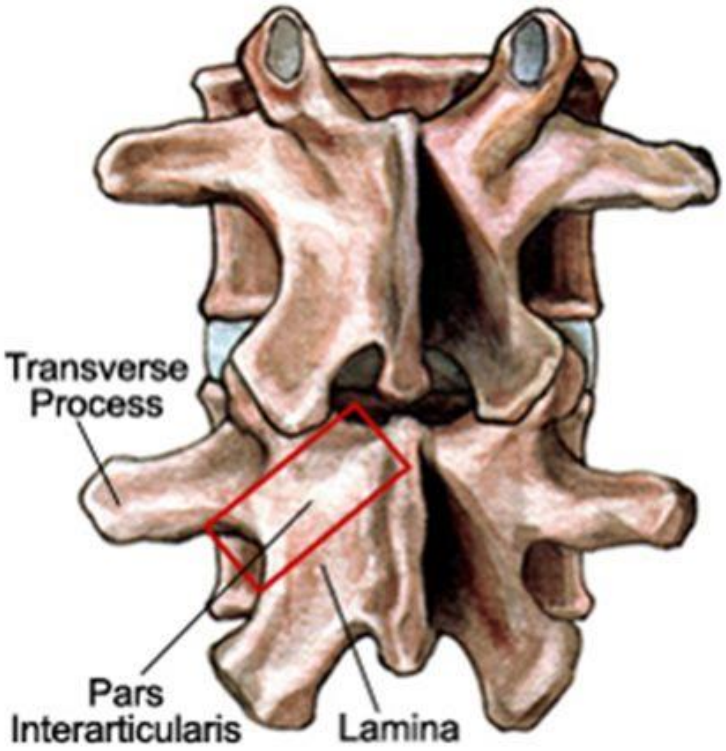
Lumbar vertebra. A, Side view. **B,** Superior view.

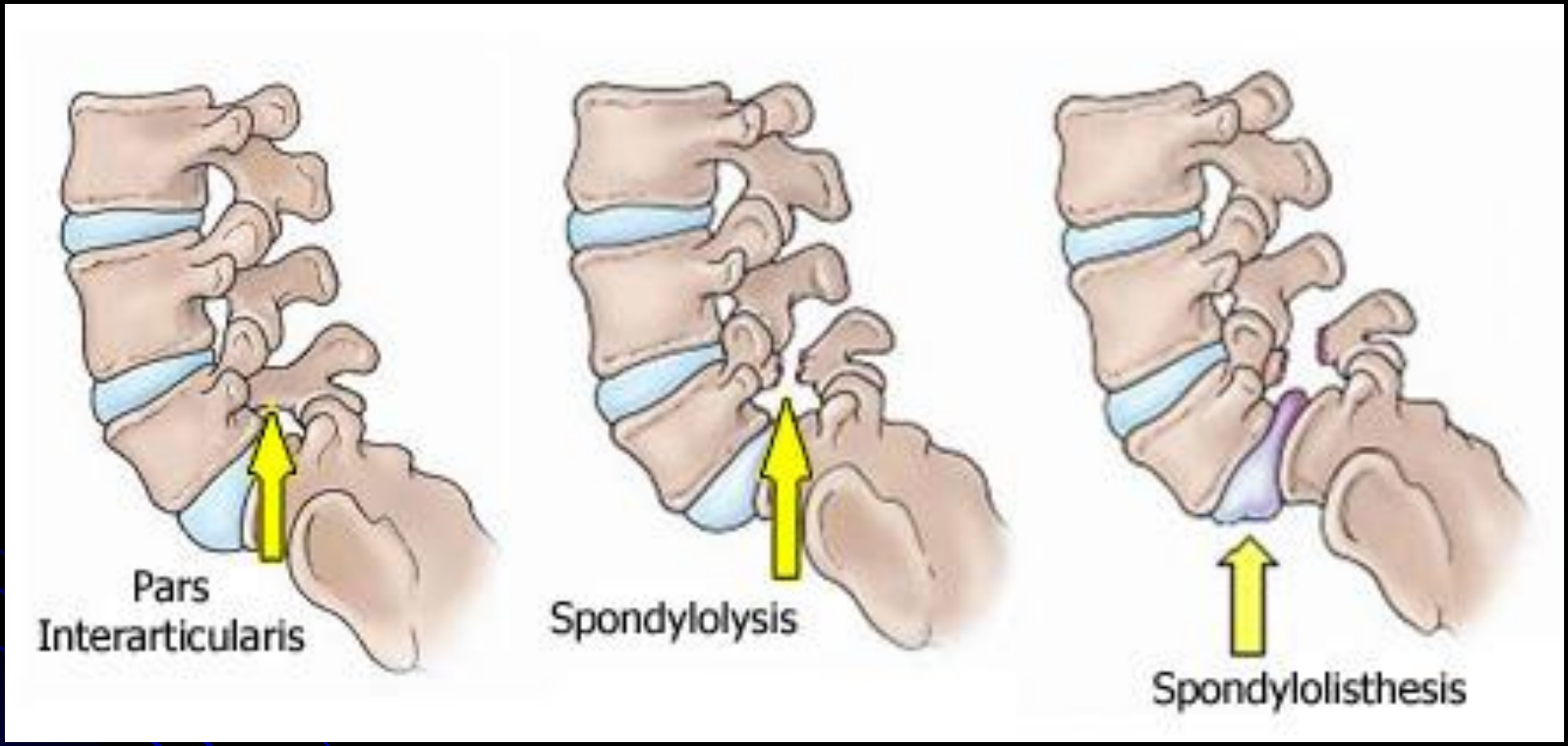
✓ Injury, degeneration, or trauma to the motion segment (the facet joints and disc) may lead to **spondylosis** (degeneration of the intervertebral disc), **spondylolysis** (a defect in the pars interarticularis or the arch of the vertebra), **spondylolisthesis** (a forward displacement of one vertebra over another), or **retrolisthesis** (backward displacement of one vertebra on another).

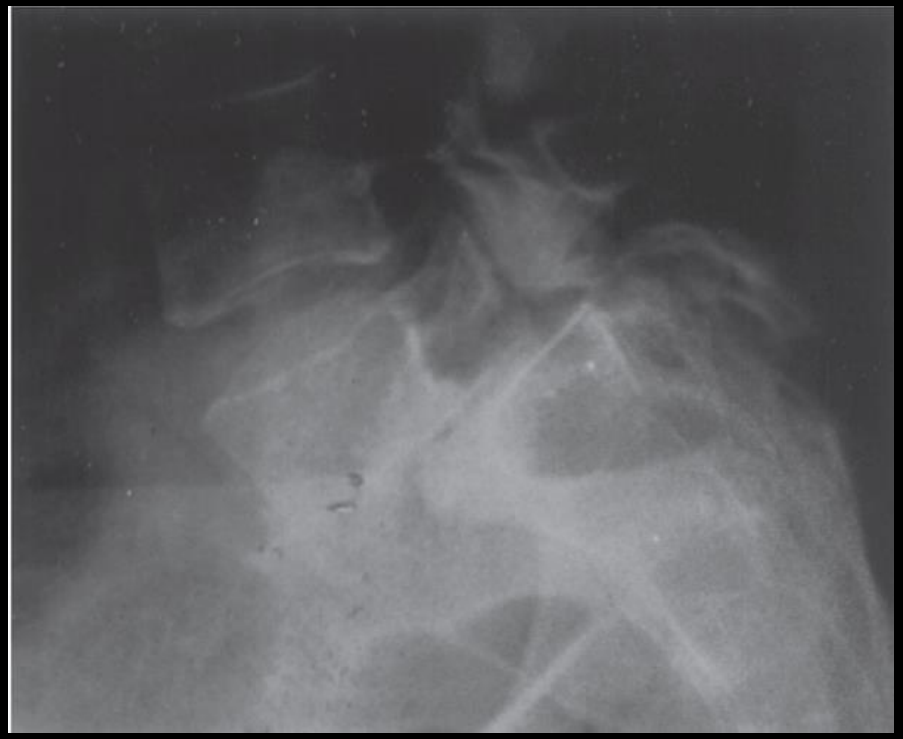
Normal Anatomy

- Pars interarticularis
  - Part of vertebra between inferior and superior articular process of the facet joint

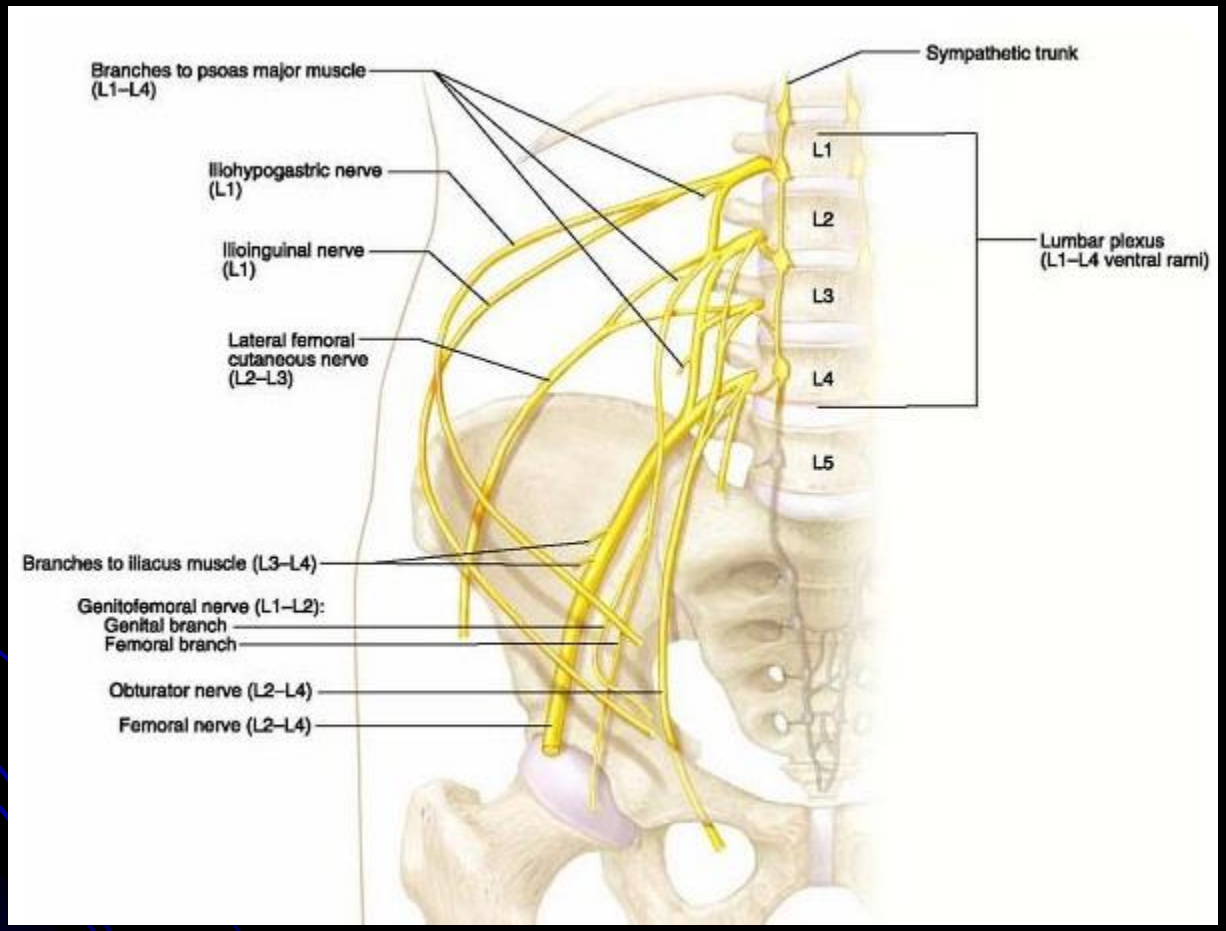




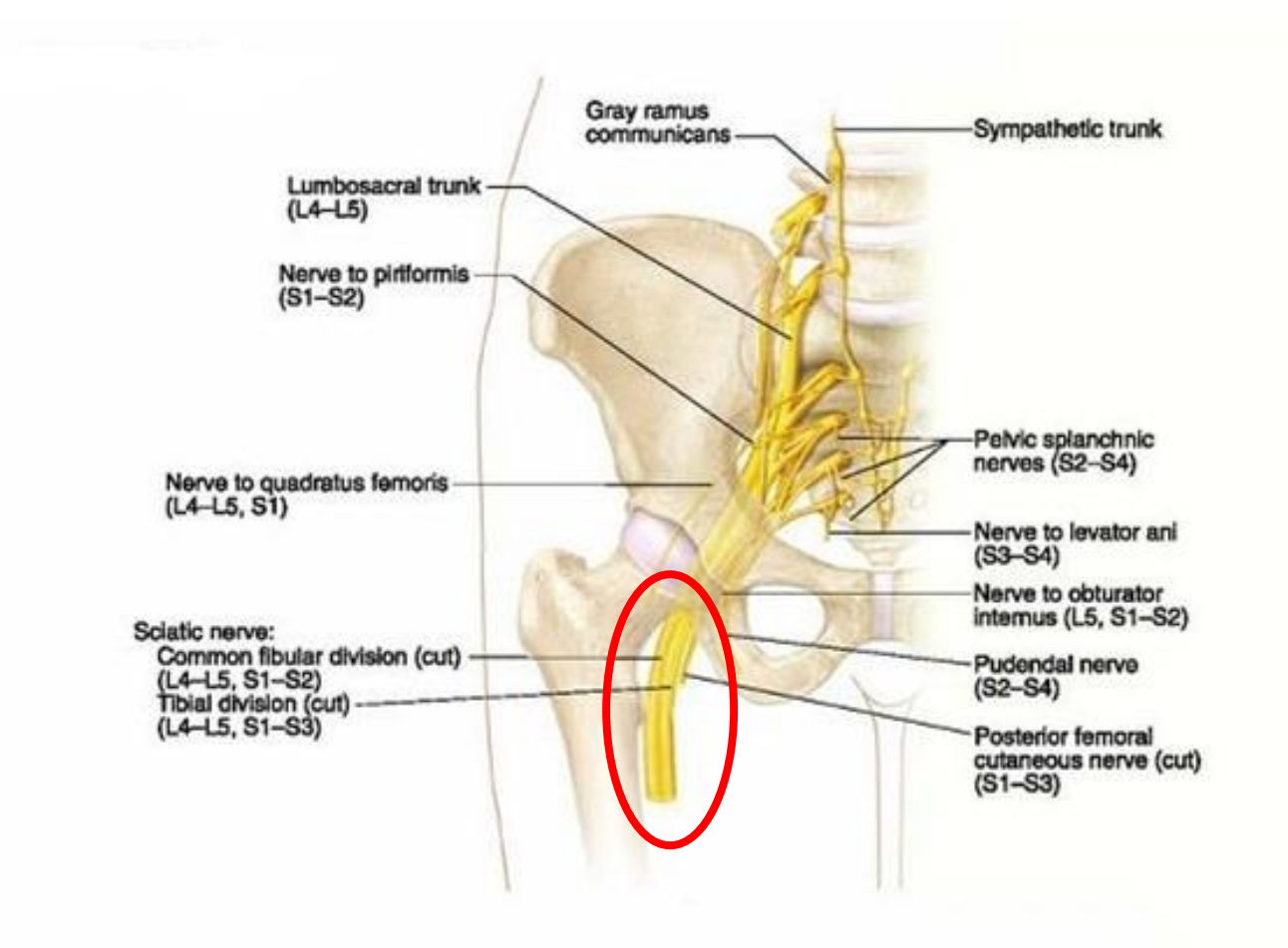

Pars
Interarticularis
Spondylolysis
Spondylolisthesis

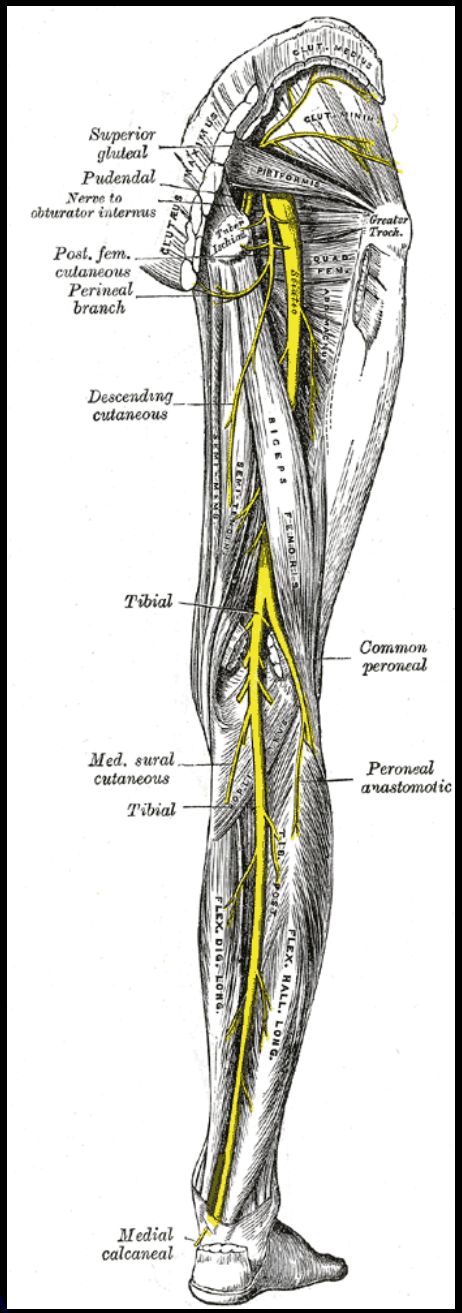


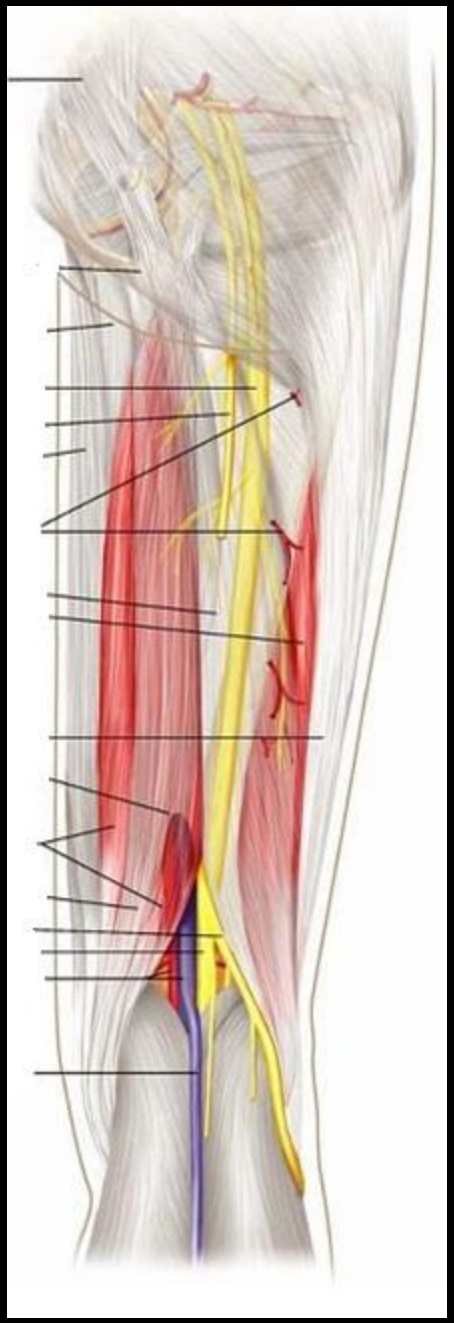
Lumbar plexus (L1, L2, L3, L4)

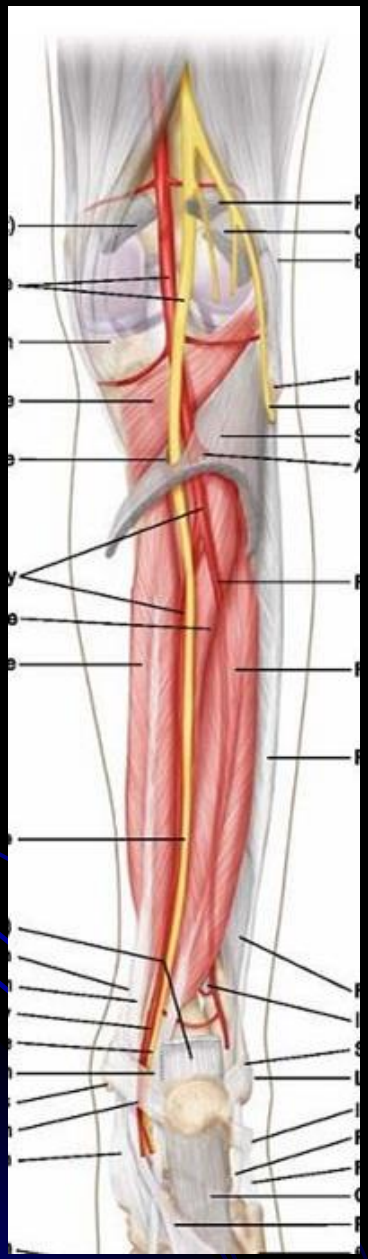


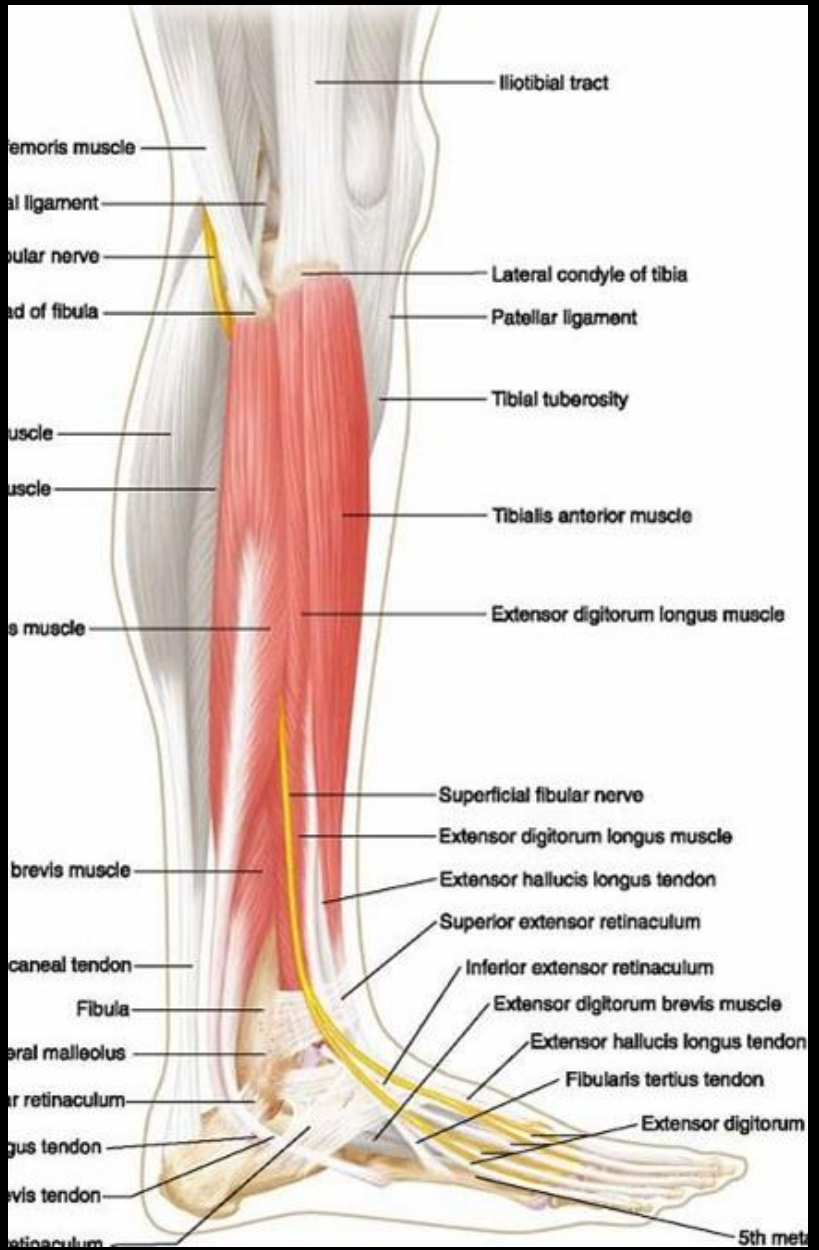
Lumbosacral Plexus (L4, L5, S1, S2, S3, S4)



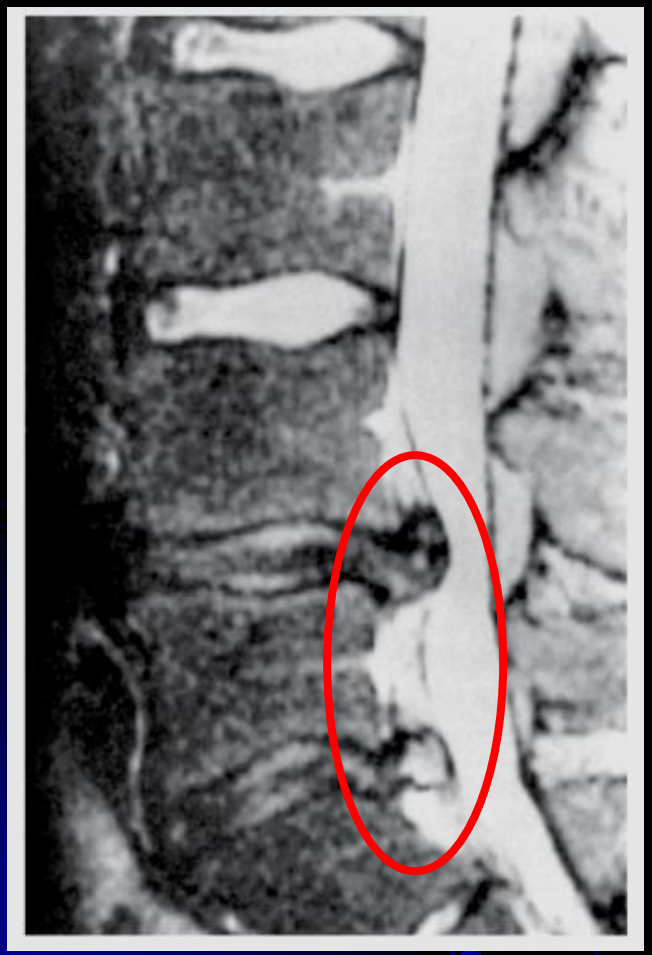

Superior gluteal
Pudendal
Nerve to obturator internus
Post. fem. cutaneous
Perineal branch
Descending cutaneous
Tibial
Med. sural cutaneous
Tibial
Medial calcaneal
Common peroneal
Peroneal anastomotic
Greater Troch.
BICEPS FEMORIS
FLEX. DIG. LONG.
FLEX. HALL. LONG.



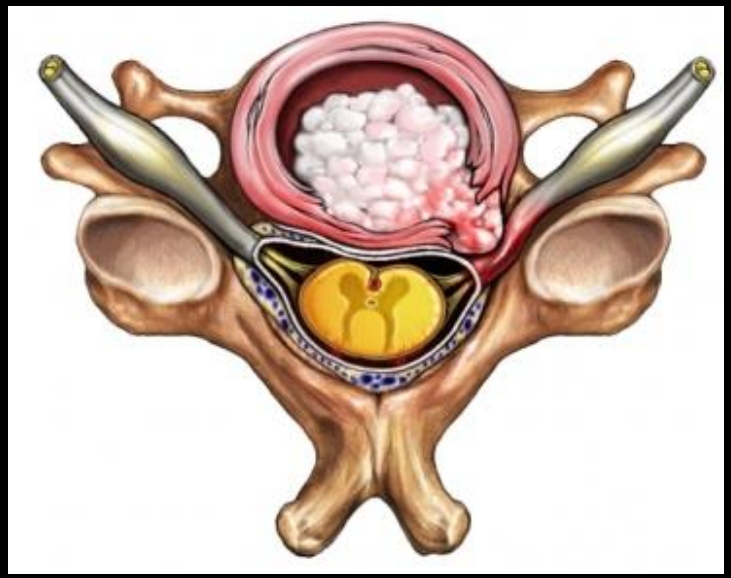


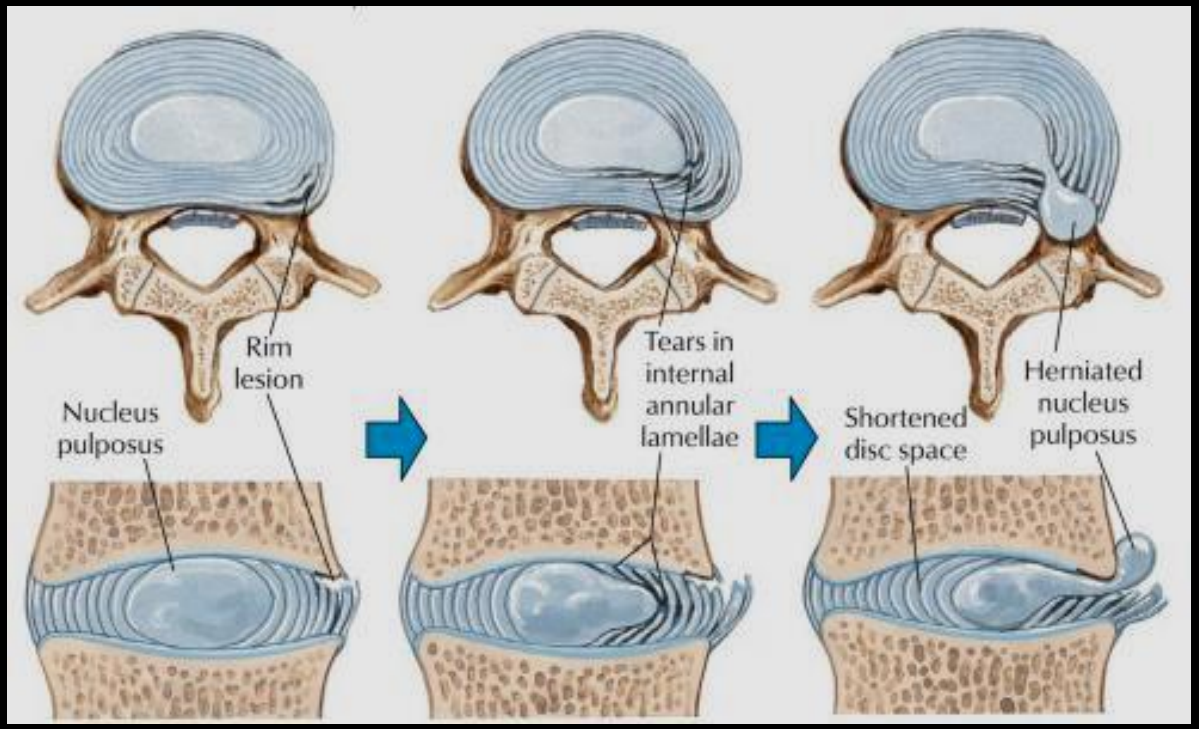

Iliotibial tract
emoris muscle
l ligament
ular nerve
d of fibula
Lateral condyle of tibia
Patellar ligament
Tibial tuberosity
uscle
uscle
Tibialis anterior muscle
s muscle
Extensor digitorum longus muscle
Superficial fibular nerve
Extensor digitorum longus muscle
brevis muscle
Extensor hallucis longus tendon
Superior extensor retinaculum
caneal tendon
Inferior extensor retinaculum
Fibula
Extensor digitorum brevis muscle
eral malleolus
Extensor hallucis longus tendon
r retinaculum
Fibularis tertius tendon
gus tendon
Extensor digitorum
vis tendon
5th met

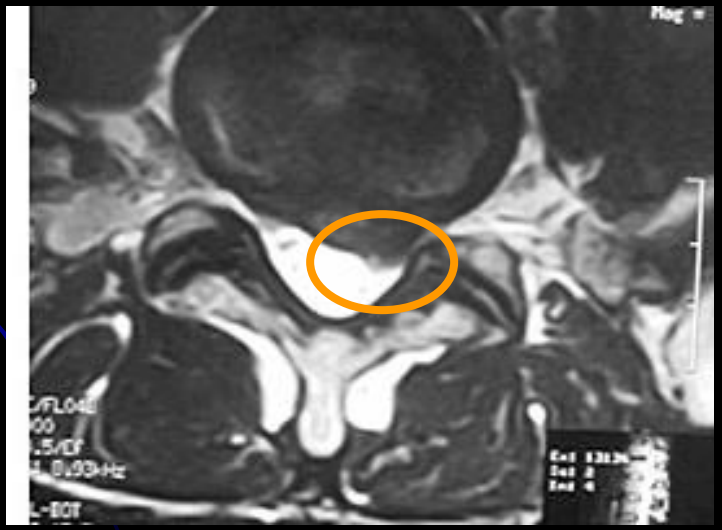
- دردی که از کمر به سمت پاها سرایت می کند به عنوان **درد سیاتیک** شناخته می شود.



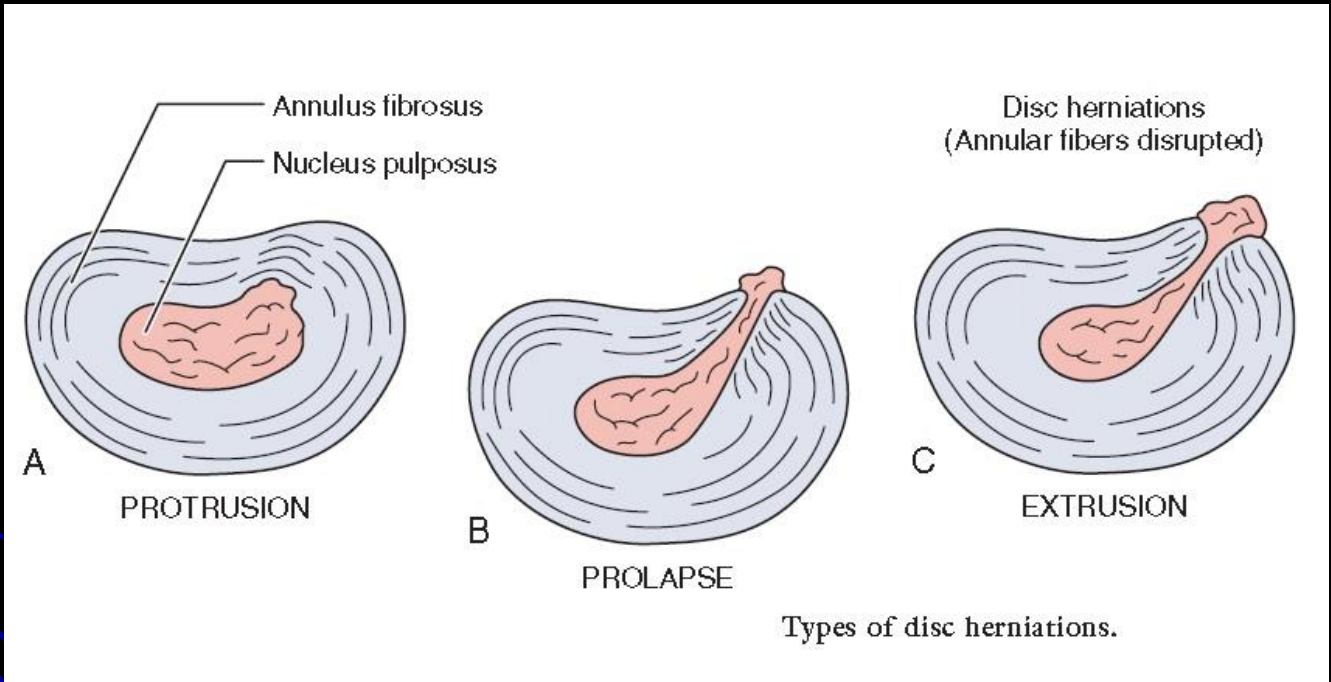
- **فتق دیسک** بین مهره ای یا همان **سر خوردن دیسک** به سمت ریشه های اعصاب نخاعی عصب سیاتیک علت این عارضه است.




Rim lesion
Nucleus pulposus
Tears in internal annular lamellae
Shortened disc space
Herniated nucleus pulposus



Injury to the disc



Types of disc herniations.

✓ The amount of pressure on the **neurological tissues** determines the severity of the neurological deficit.

✓ In general, **the L5–S1 segment** is the most common site of problems in the vertebral column because this level bears more weight than any other vertebral level.

PATIENT HISTORY

- Most of the examination commonly revolves around **differentiating** symptoms of a **herniated disc**, which refers radicular symptoms into the leg from other conditions (e.g., inflammatory reaction, sprains, strains, facet syndrome) more likely to cause **localized pain**.

✓ If there are **no radicular symptoms below the knee**, it often becomes difficult for the examiner to determine where in the **spine** the problem is, or the problem is truly in the **lumbar spine** or coming from problems in the **pelvic joints**, primarily the **sacroiliac joints**, or the **hips**.

1. What is the patient's age?

✓ For example, **disc problems** usually occur between the ages of **15 and 40 years**.

✓ **Osteoarthritis** and **spondylosis** are more evident in people **older than 45 years** of age, and **malignancy** of the spine is most common in people **older than 50 years of age**.

2. What is the patient's occupation?

✓ Back pain tends to be more prevalent in people with **strenuous occupations**.

✓ Patients who have **chronic low back pain** develop a **deconditioning syndrome,** which compounds the problem as it leads to decreased **muscle strength**, impaired motor control, and decreased **coordination and postural control**.

3. What is the patient's sex?

✓ **Lower back pain** has a higher incidence in **women**.

✓ The examiner should also keep in mind that stress on the lower back tends to be **15% to 20% higher in men** than in women.

4. What was the mechanism of injury?

- ✓ **Lifting** commonly causes low back pain

5. How long has the problem bothered the patient?

- ✓ **Acute** back pain lasts **3 to 4 weeks**.
- ✓ **Subacute** back pain lasts **up to 12 weeks**.
- ✓ **Chronic** pain is anything **longer than 3 months**.

6. Where are the sites and boundaries of pain?

✓ Have the patient **point to the location.**

Note whether the patient indicates a specific joint or whether the pain is more general.

✓ The **more specific pain**, the easier it is to **localize the area of pathology**.

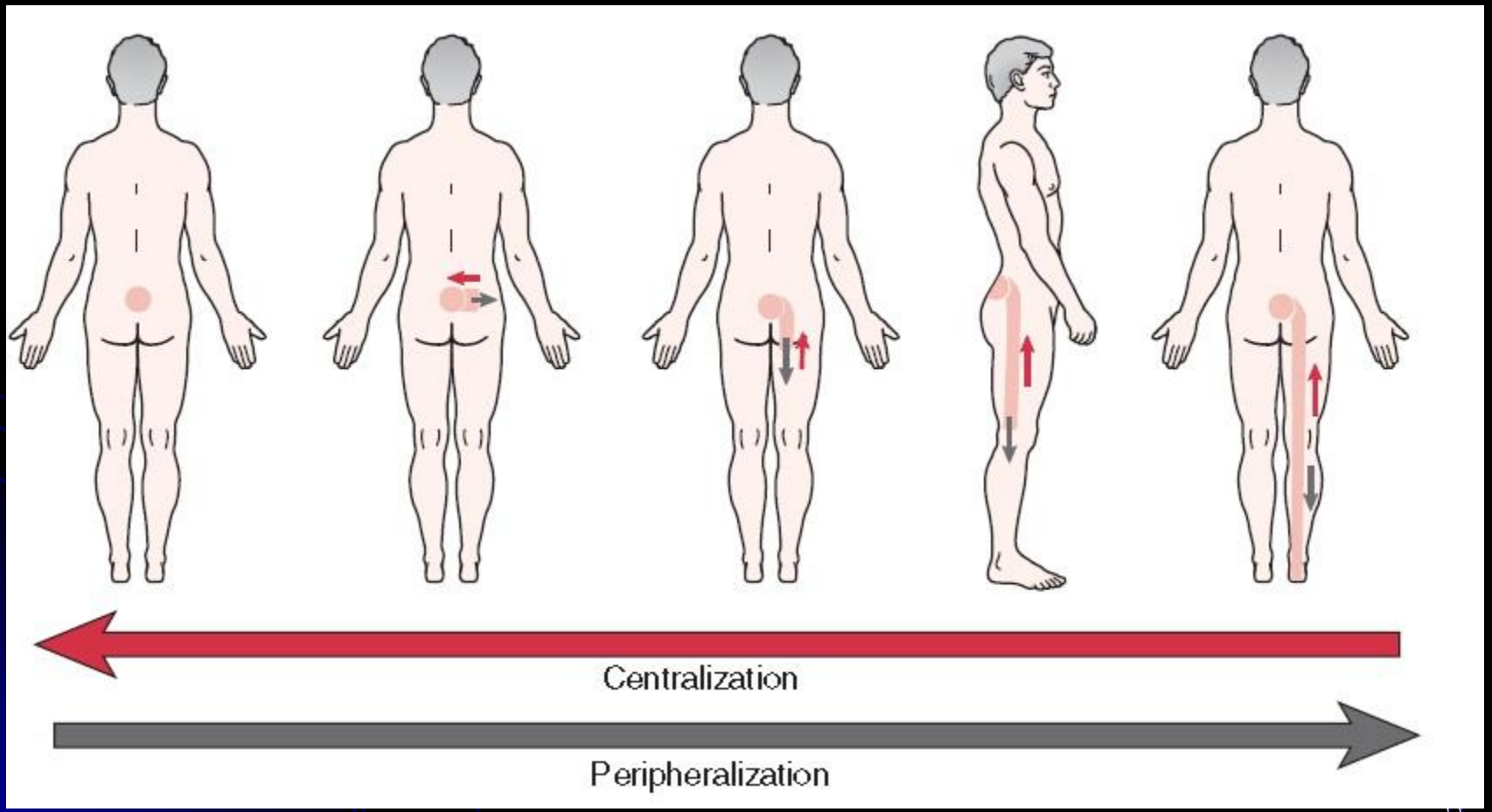
✓ **Unilateral pain** with no referral below the knee may be caused by injury to muscles (strain) or ligaments (sprain), the facet joint, or, in some cases, the **sacroiliac** joints.

✓ This is called **mechanical low back pain** (in older books it is called “lumbago”).

✓ **Pain** on standing that **improves** with walking and **pain** on forward flexion with no substantial muscle tenderness suggests **disc involvement**.

✓ Some authors feel the only definitive clinical diagnosis of **a disc problem** is **neurological pain extending below the knee** *but isolated back or buttock pain does not rule out the disc*.

7. Is there any radiation of pain? Is the pain centralizing or peripheralizing?



8. Is there any increase in pain with coughing? Sneezing? Deep breathing? Laughing?

✓ All of these actions increase the **intrathecal pressure** (the pressure inside the covering of the spinal cord) and would indicate the problem is in the lumbar spine and affecting the **neurological tissue**.

✓Classically, **disc pathology** causes increased pain on sitting, lifting, twisting, and bending.

9. Is paresthesia (a “pins and needles” feeling) or anesthesia present?

✓ A patient may experience a sensation or a lack of sensation if there is **pressure on a nerve root**.

10. Has the patient noticed any weakness or decrease in strength? Has the patient noticed that his/her legs have become weak while walking or climbing stairs?

✓ This may be the result of an injury to the **muscles** themselves or their **nerve supply**.

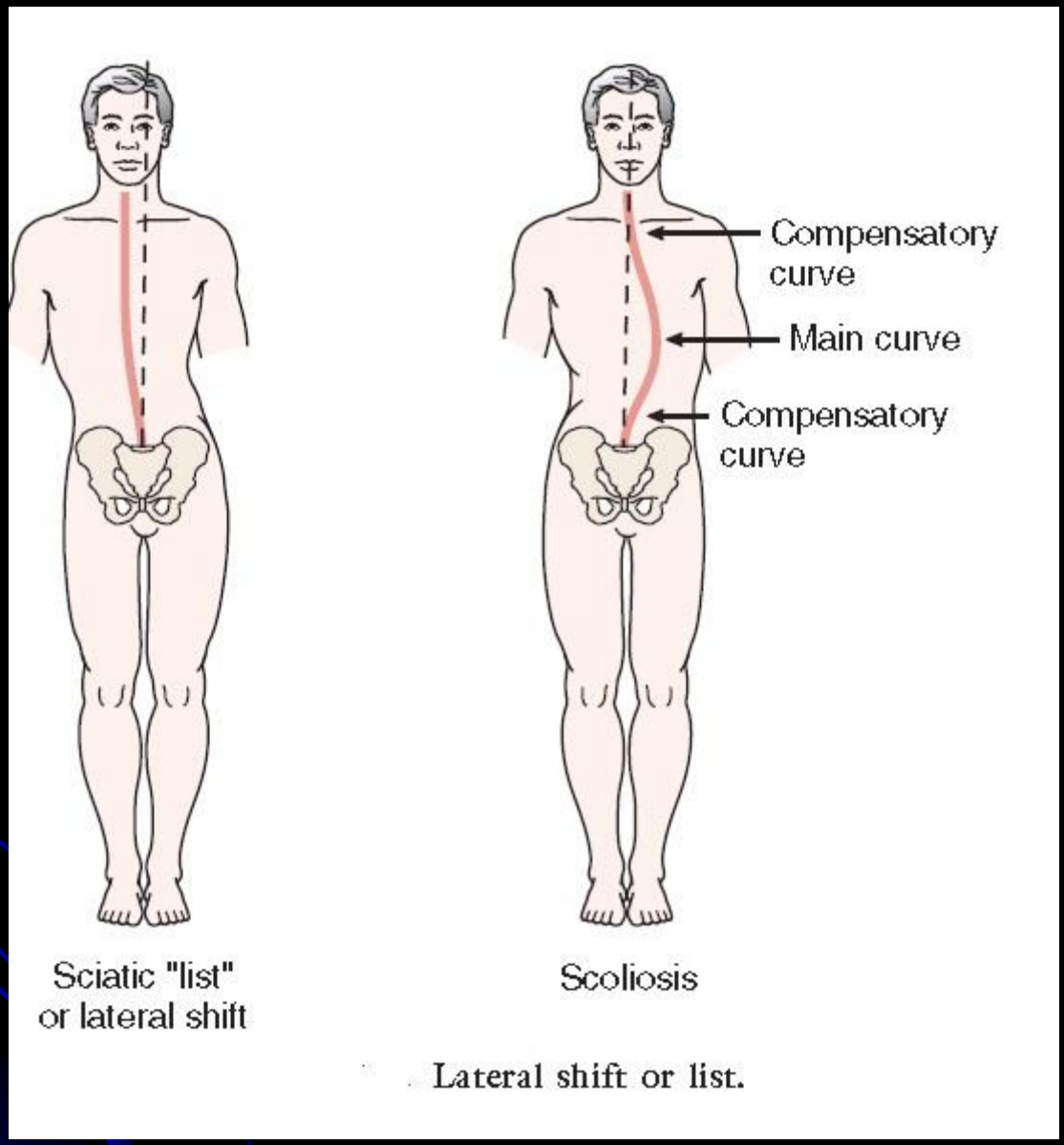
OBSERVATION

- The patient must be suitably undressed so that the body is exposed as much as possible.

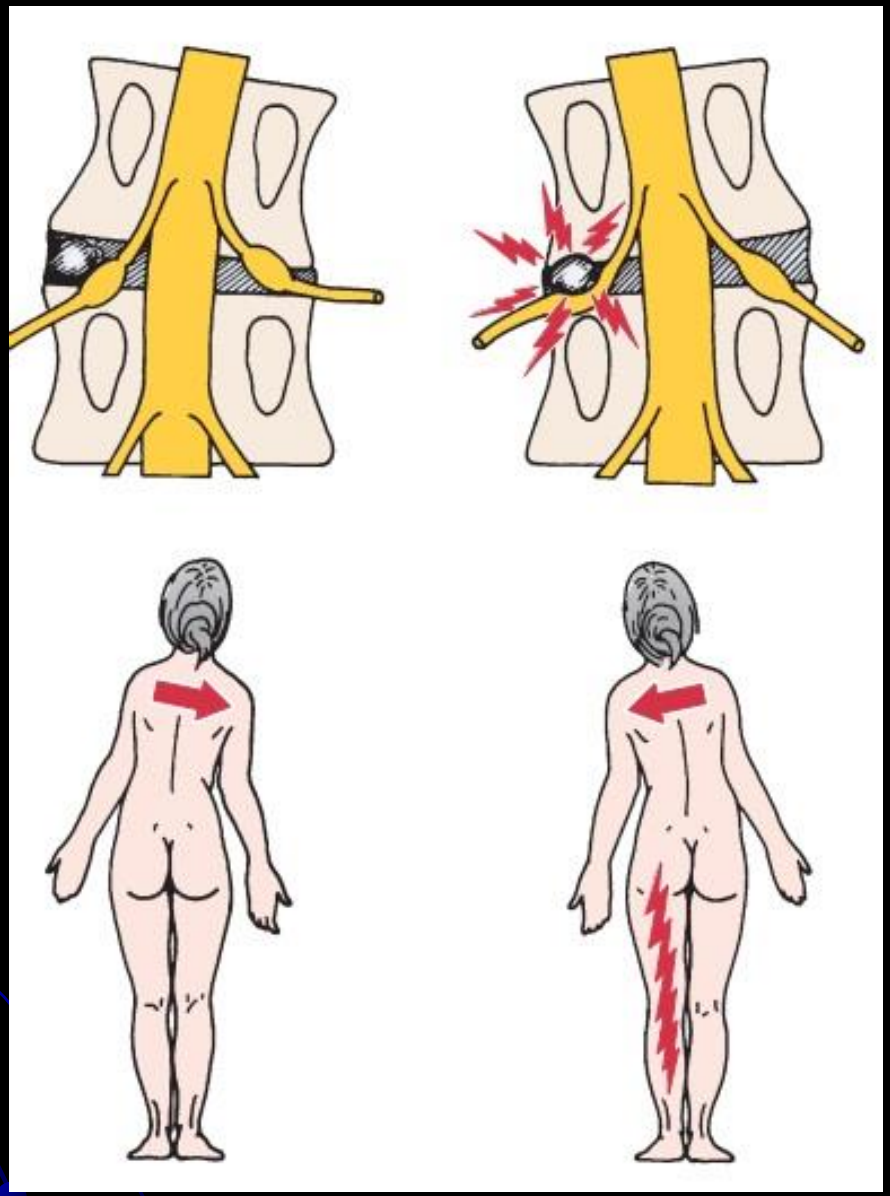
Total Spinal Posture

Does the patient show a lateral shift or list?

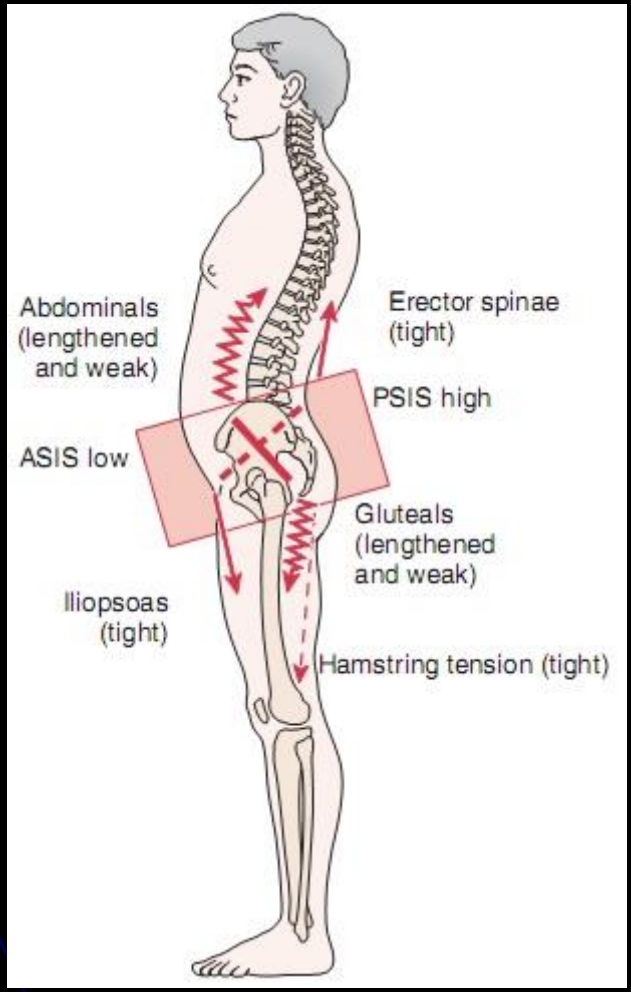
- The straight shift is more likely to be caused by **mechanical dysfunction** and **muscle spasm** and is likely to disappear on lying down or hanging.



Lateral shift or list.



The pelvic crossed syndrome



EXAMINATION

Active Movements

- The active movements of the thoracic spine are usually done with the **patient standing**.
- The greatest motion in the lumbar spine occurs between the L4 and L5 vertebrae and between L5 and S1.

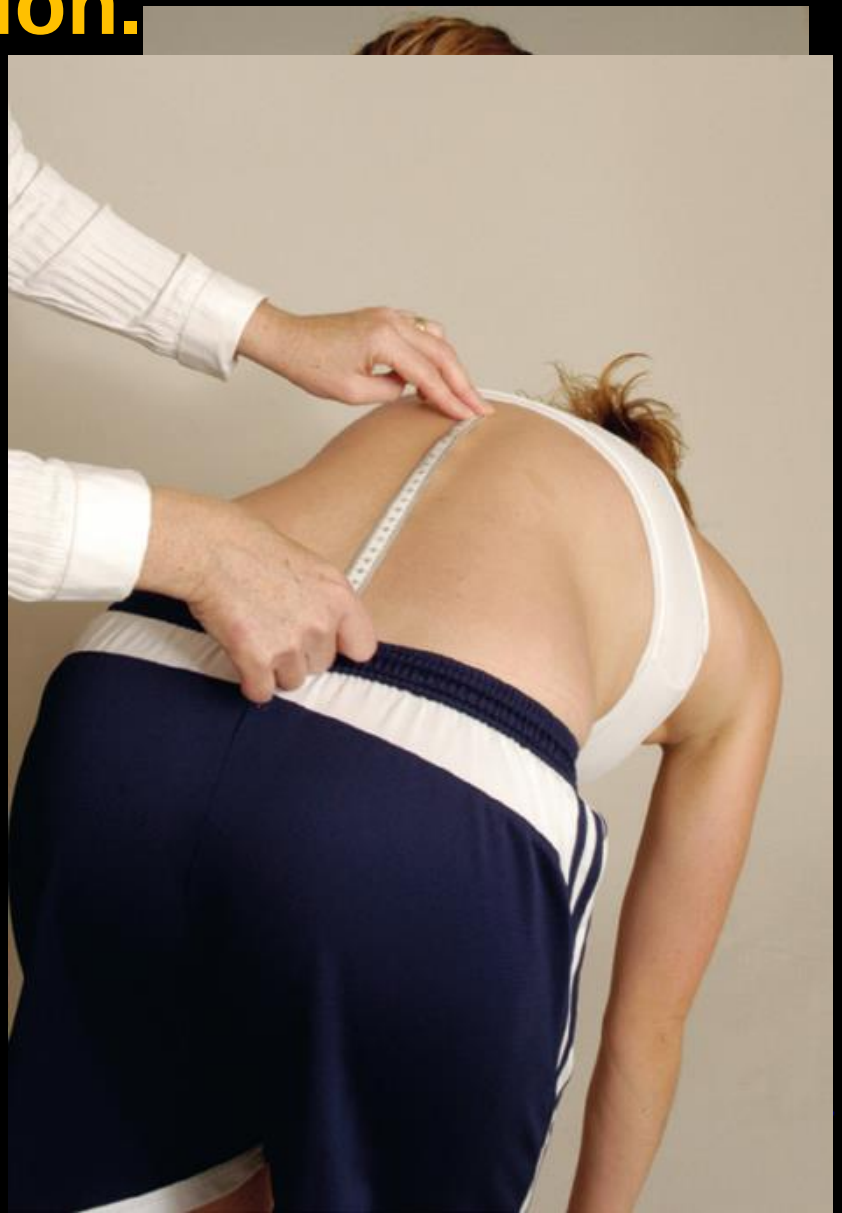
Active Movements of the Lumbar Spine

- Forward flexion (40° to 60°)
- Extension (20° to 35°)
- Side (lateral) flexion, left and right (15° to 20°)
- Rotation, left and right (3° to 18°)

Tape measure for determining forward flexion.

Measure from the **T12**

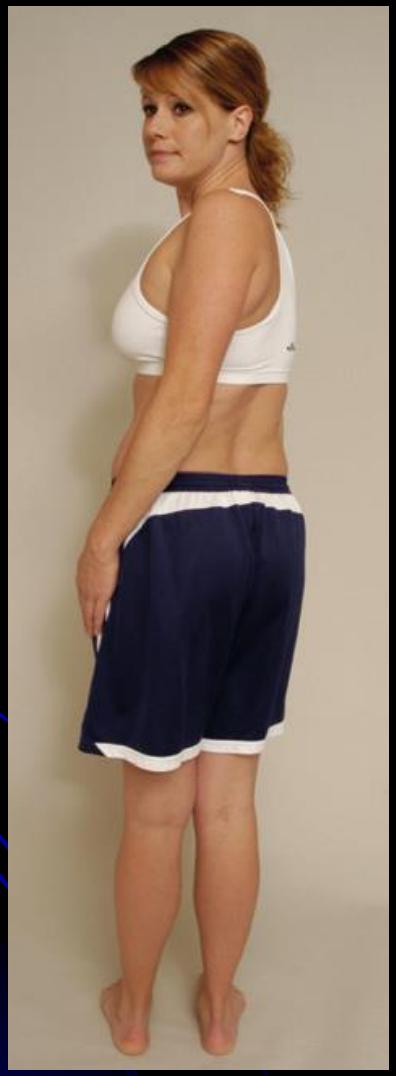
to the **S1**.

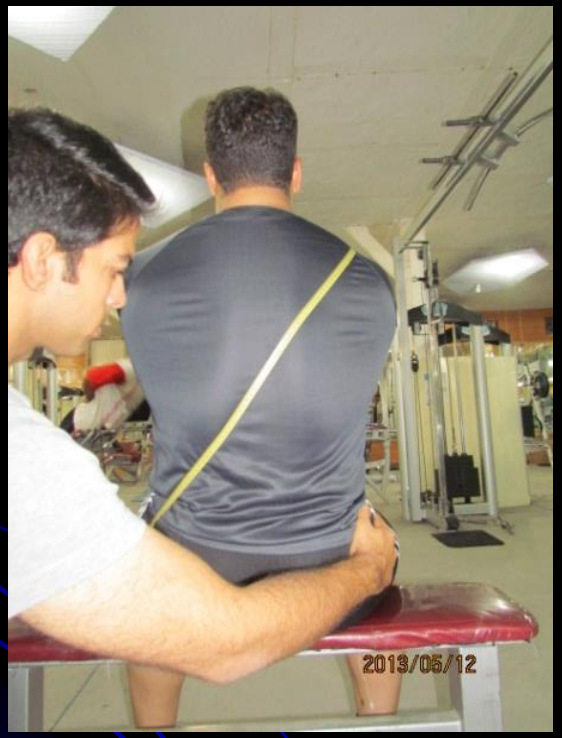


✓ On forward flexion, the lumbar spine should move from its **normal lordotic curvature** to at least a **straight or slightly flexed curve.**

Tape measure for determining extension.

Rotation

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Side flexion

Trendelenberg test

Resisted Isometric Movements

Dynamic Abdominal Endurance Test.

- The patient tucks in the chin and curls the trunk to touch the line with the fingers and repeats as many curls as possible.

McGill's isometric abdominal test.

- The patient's feet are held securely and the back rest is lowered away from the patient's back while the patient maintains the 60 position as long as possible.

Dynamic Extensor Endurance Test.

- The number of repetitions possible before cheating (holding breath, altered mechanics) or fatigue occurs is recorded as the score.

Biering-Sorensen fatigue test

- Subject had arms by the side, and the time the patient was able to hold the straight position before fatigue was recorded (i.e., the patient could not hold the position).

Dynamic Horizontal Side Support (Side Bridge) Test.

- The patient repeats the movement as many times as possible in a dynamic test

Side Bridge Test.

- The patient holds this position for as long as possible in an isometric test.

Class work 2

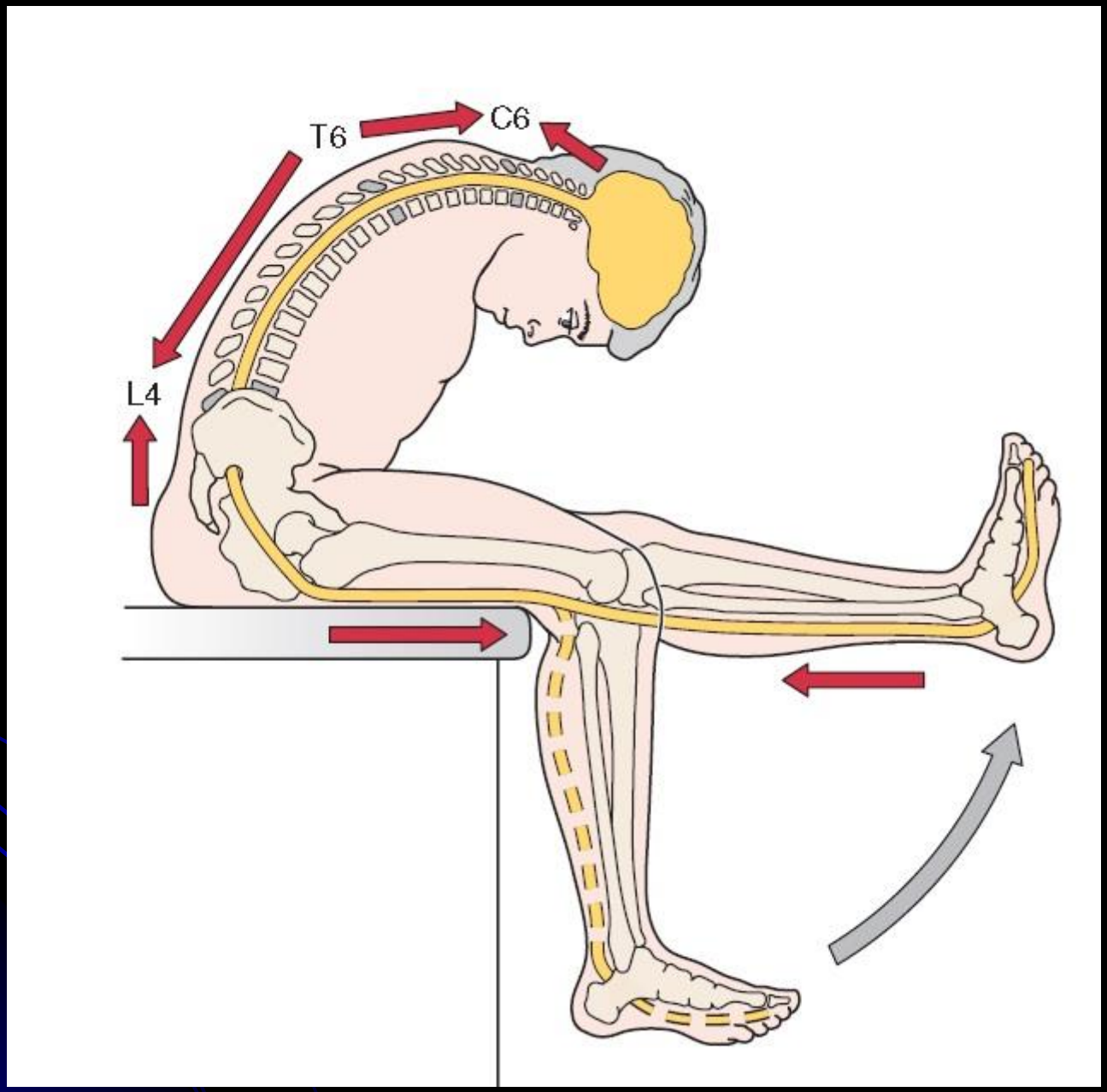
- **Functional Assessment of lumbar spine**

1. The Quebec Back Pain Disability Scale
2. Roland-Morris Disability Questionnaire
3. Oswestry Disability Index
4. Hendler 10-Minute Screening Test

Special Tests

Tests for Neurological Dysfunction

- Neurodynamic tests check the **mechanical movement of the neurological tissues** as well as their sensitivity to **mechanical stress** or **compression**.


T6
C6
L4

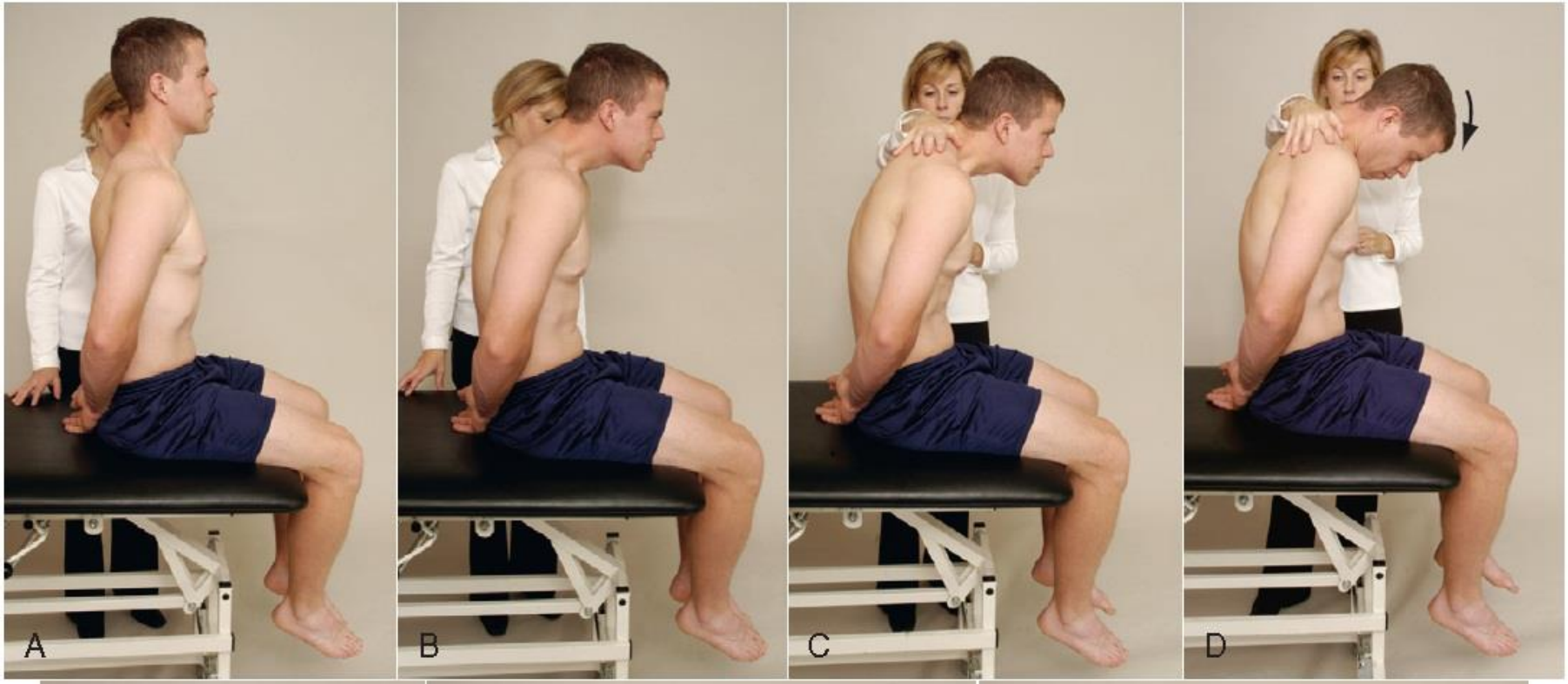
Prone Knee Bending (Nachlas) Test.

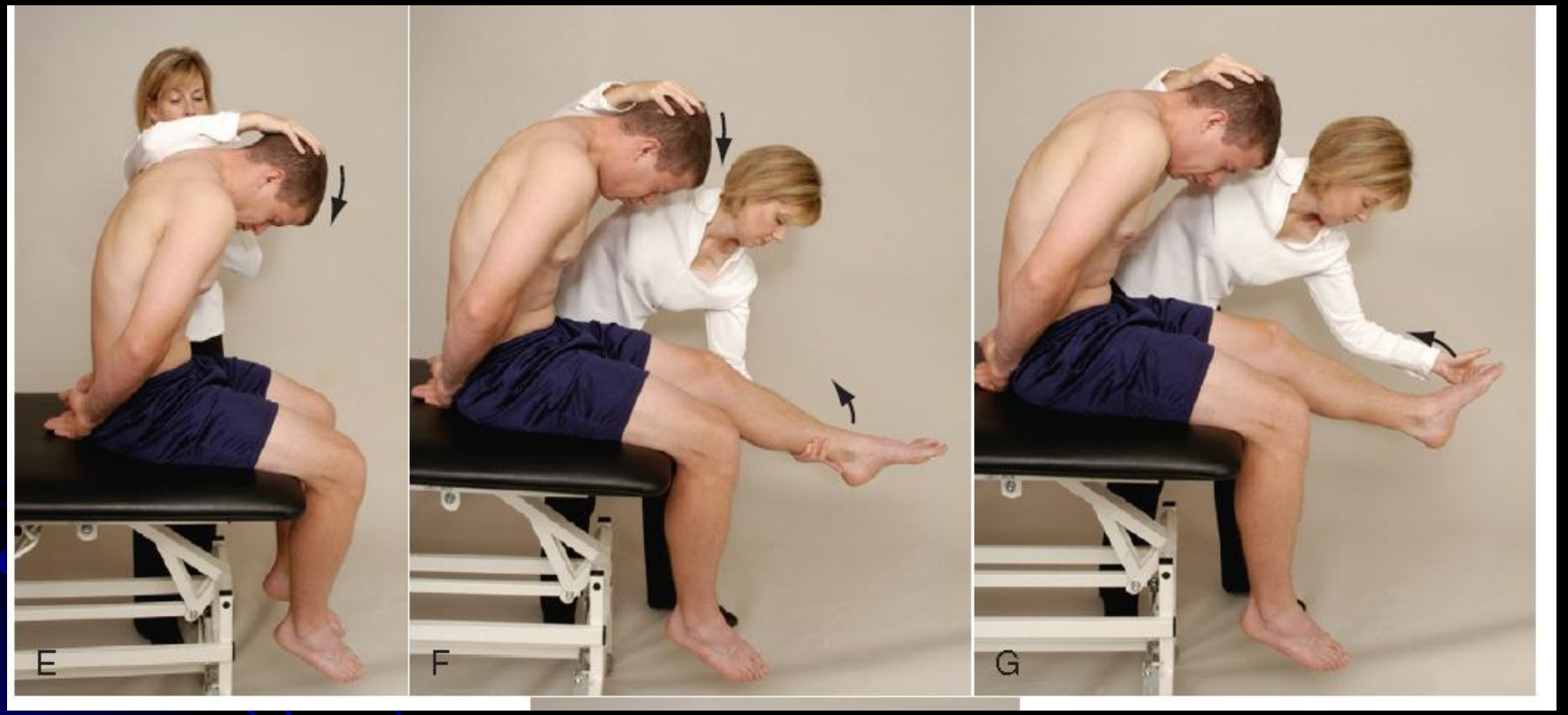
- The patient **lies prone** while the examiner passively **flexes the knee** as far as possible so that the patient's heel rests against the buttock.

✓ Unilateral neurological pain in the lumbar area, buttock, posterior thigh or sometimes the anterior thigh may indicate an **L2** or **L3 nerve root lesion**.

Slump test ®

- The slump test has become the **most common neurological test** for the lower limb.
- The examination is performed in sequential steps.


A
B
C
D


E
F
G

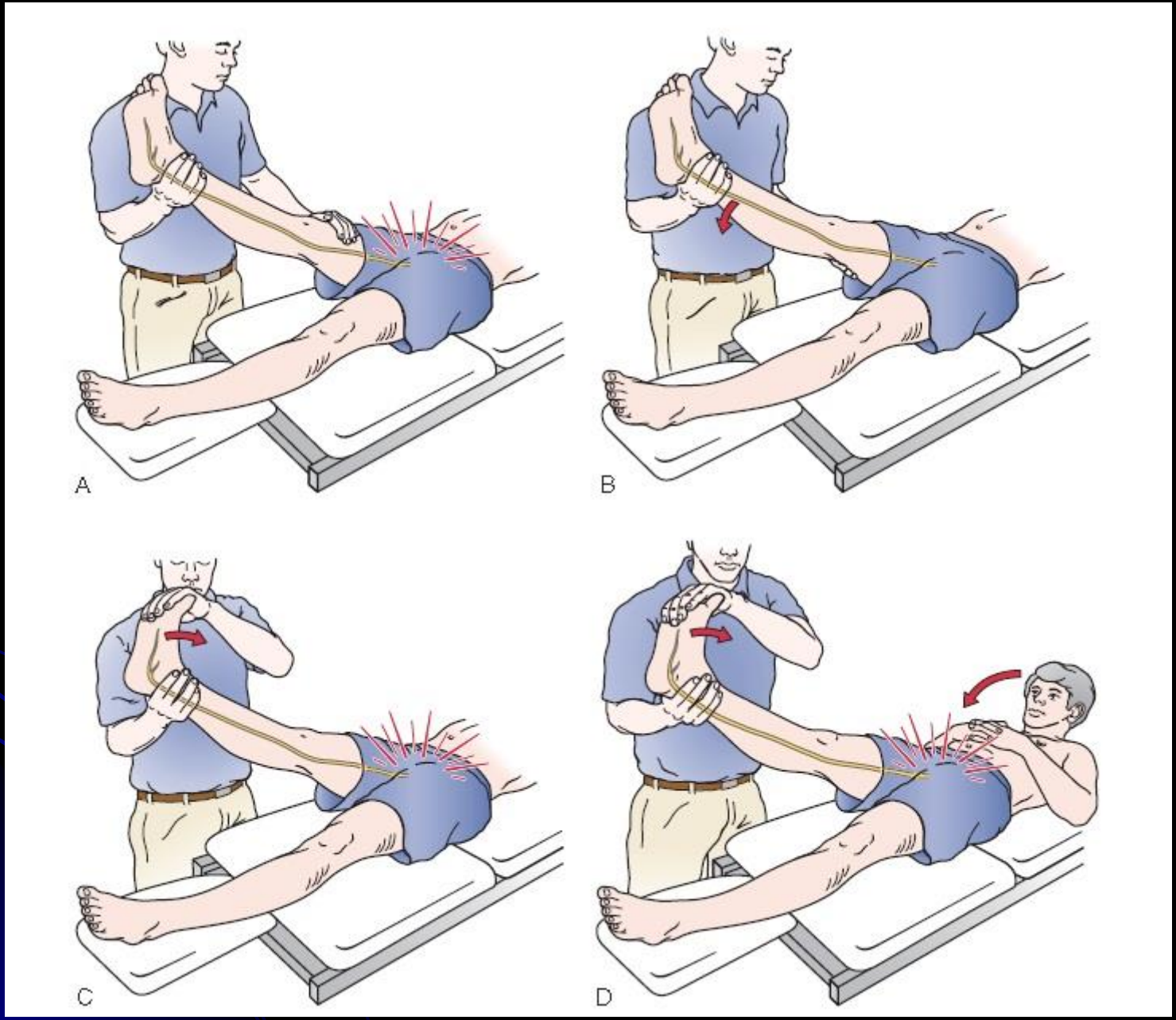
- ✓ If the positioning of the patient increases the patient’s symptoms, then the test is considered positive for increased tension in the neuromeningeal tract.

Straight Leg Raising Test. ®

✓ Also known as **Lasègue's test**, the straight leg raising test is done with the patient completely relaxed.

✓ "Back pain only" patients who have a disc prolapse have smaller, more **central prolapses**.

✓ If **pain is primarily in the leg**, it is more likely that the pathology causing **the pressure on neurological tissues is more lateral**.

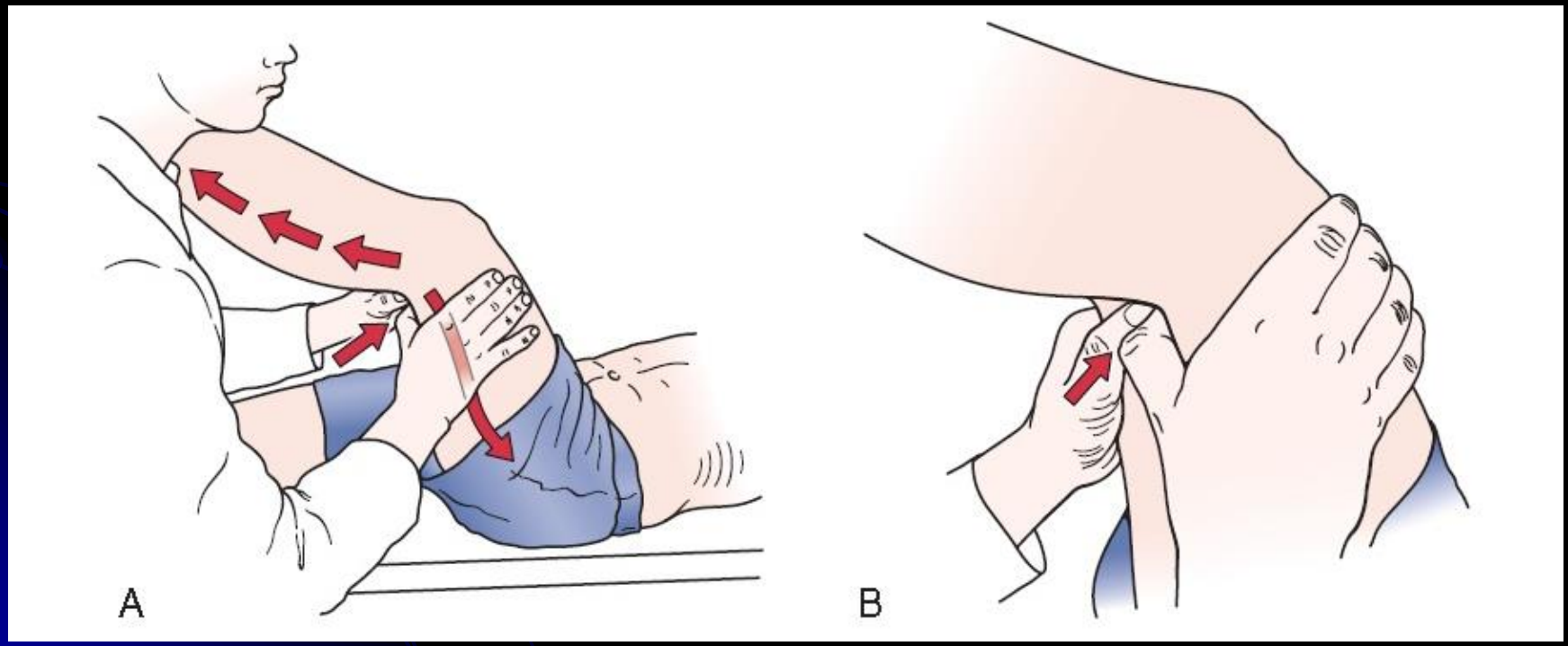

A
B
C
D

“Bowstring” Test (Cram Test or Popliteal Pressure Sign). ®

- The examiner carries out a straight leg raising test, and pain results.
- While maintaining the **thigh** in the same position, the examiner **flexes the knee** slightly (20°), reducing the symptoms.

✓ **Thumb or finger pressure** is then applied to the popliteal area to reestablish the painful radicular symptoms.

✓The test indicates tension or pressure on the **sciatic nerve**



Tests for Lumbar Instability

- Lumbar instability implies that during movement, the **patient loses the ability to control the movement** for a brief time (milliseconds), or it may mean the **segment is structurally unstable**.

Passive Lumbar Extension Test.®

- The patient lies prone and relaxed.
- The examiner passively lifts and extends both extremities at the same time to about 1 foot (30 cm) from the bed.
- While maintaining the extension, the examiner gently pulls the legs.

✓ The test is considered positive if, in the extended position, the patient complains of **strong pain in the lumbar region**, very **heavy feeling in the low back**, or it feels like **the low back is "coming off"** and the pain disappears when the legs are lowered to the start position.

✓ Numbness or prickling sensation **are not** positive signs.

Pheasant Test.

- The patient lies prone.
- With one hand, the examiner gently applies **pressure** to the posterior aspect of the lumbar spine.
- With the other hand, the examiner passively **flexes the patient's knees** until the heels touch the buttocks

✓ If this hyperextension of the spine causes the **patient to feel pain**, the test is considered positive and **indicates an unstable spinal segment**.

Prone Segmental Instability Test ®

- The patient lies prone with the body on the examining table and the legs over the edge resting on the floor.
- The examiner applies pressure to the posterior aspect of the lumbar spine while the patient rests in this position.
- The patient then lifts the legs off the floor, and the examiner again applies posterior compression to the lumbar spine.


A
B

- ✓ If pain is elicited in the resting position only, the test is positive, because the muscle action masks the instability.

Tests for Joint Dysfunction

One-Leg Standing (Stork Standing) Lumbar Extension Test ®

- The patient **stands on one leg** and **extends** the spine while balancing on the leg.
- The test is repeated with the patient standing on the opposite leg.

✓ A positive test is indicated by **pain in the back** and is associated with a **pars interarticularis stress fracture** (**spondylolisthesis**).

✓ If the stress fracture is unilateral, standing on the ipsilateral leg causes more pain.

✓ If **rotation** is combined with extension and pain results, this indicates possible **facet joint pathology** on the side to which rotation occurs.

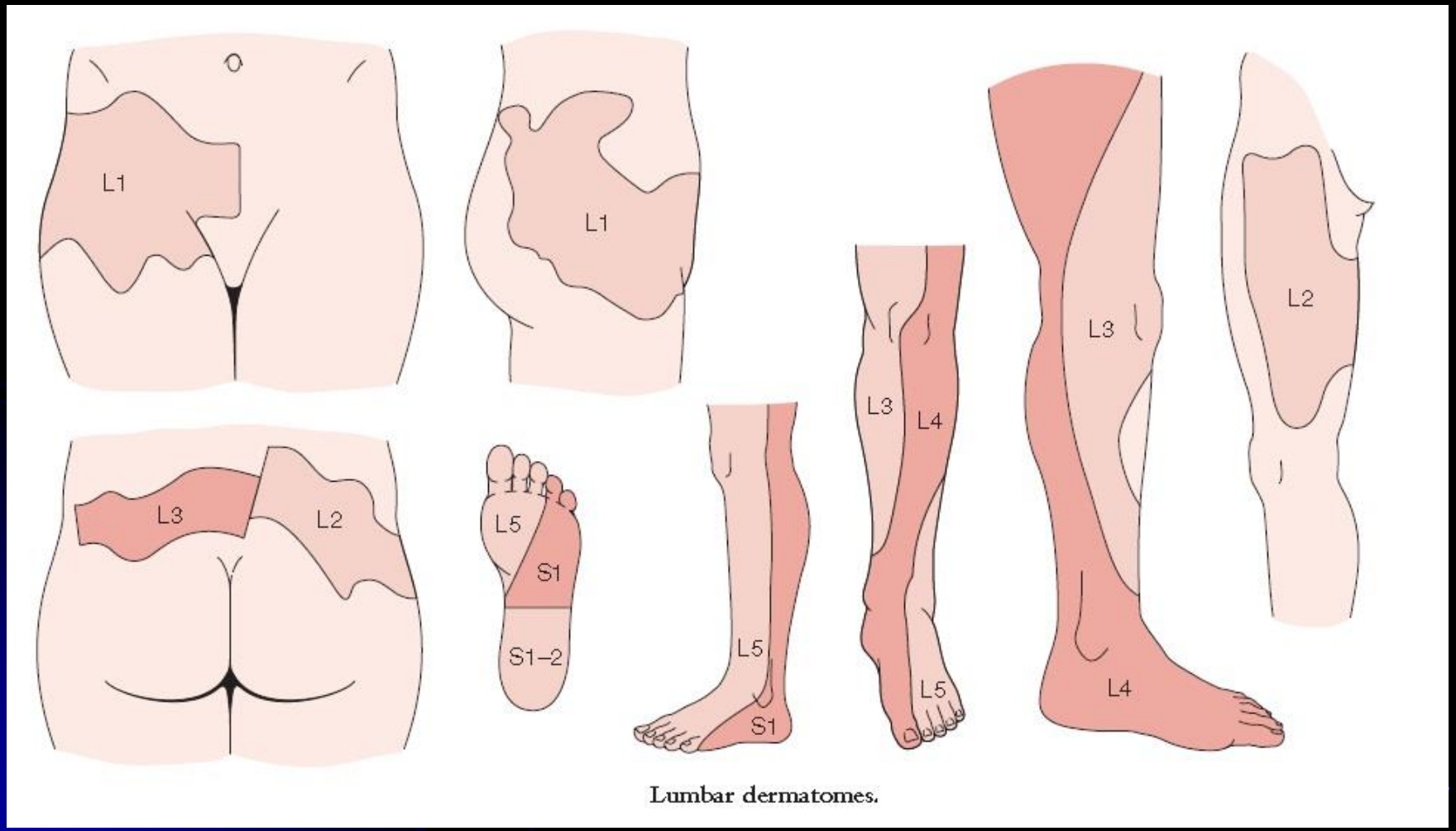
Quadrant (Extension Quadrant) Test. ®

- The patient **extends the spine** while the examiner controls the movement by holding the patient's shoulders.
- **Overpressure** is applied in extension while the patient side flexes and rotates to the side of pain.

✓ The position causes maximum narrowing of the intervertebral foramen and **stress** on the **facet joint** to the side on which rotation occurs.

✓ The test is positive if symptoms are produced.

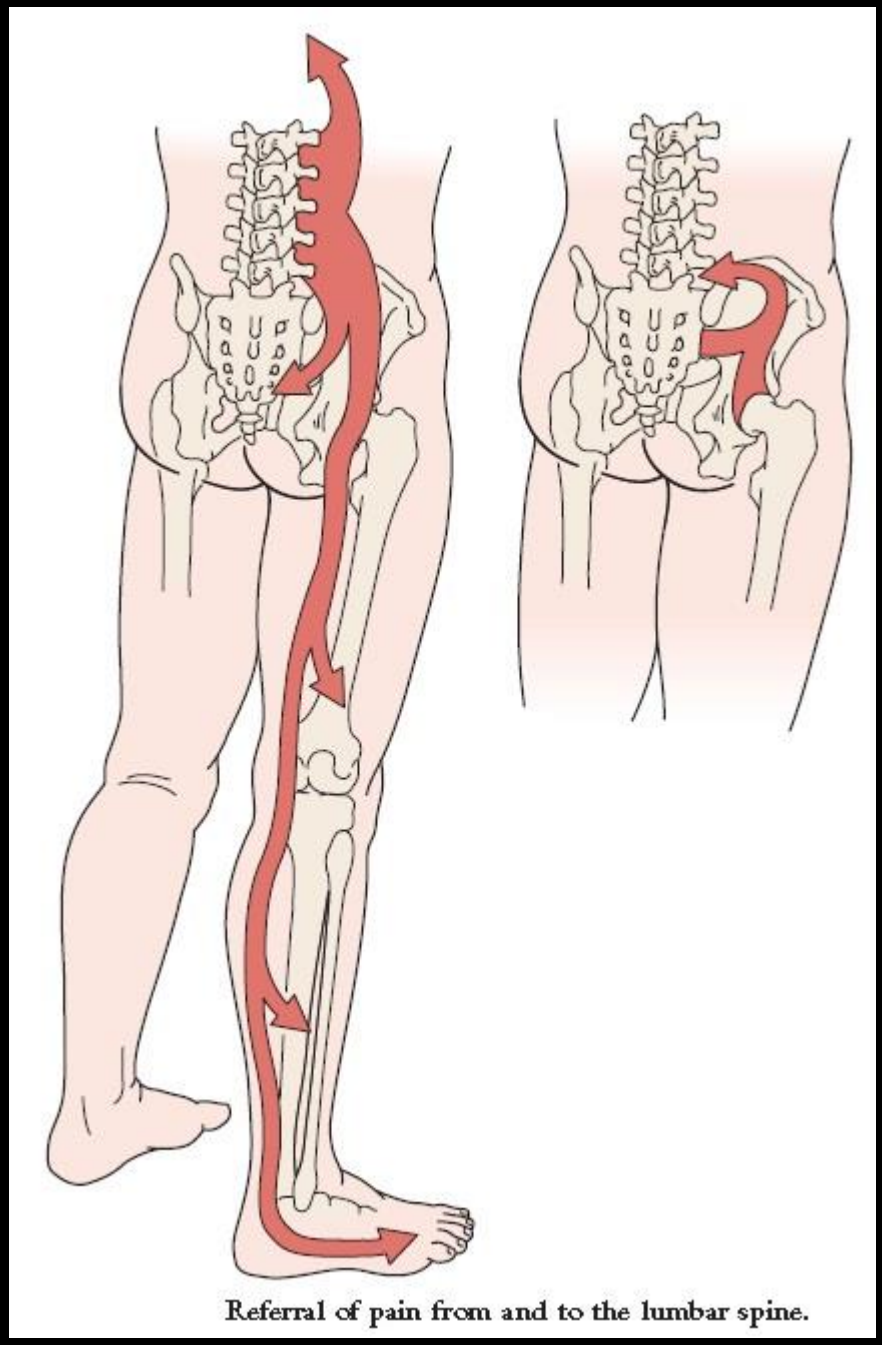
Dermatomes



Lumbar dermatomes.

✓ Pain may be referred from the **lumbar spine** to the sacroiliac joint and down the **leg as far as the foot**.

✓ Seldom is pain referred up the spine.



Referral of pain from and to the lumbar spine.