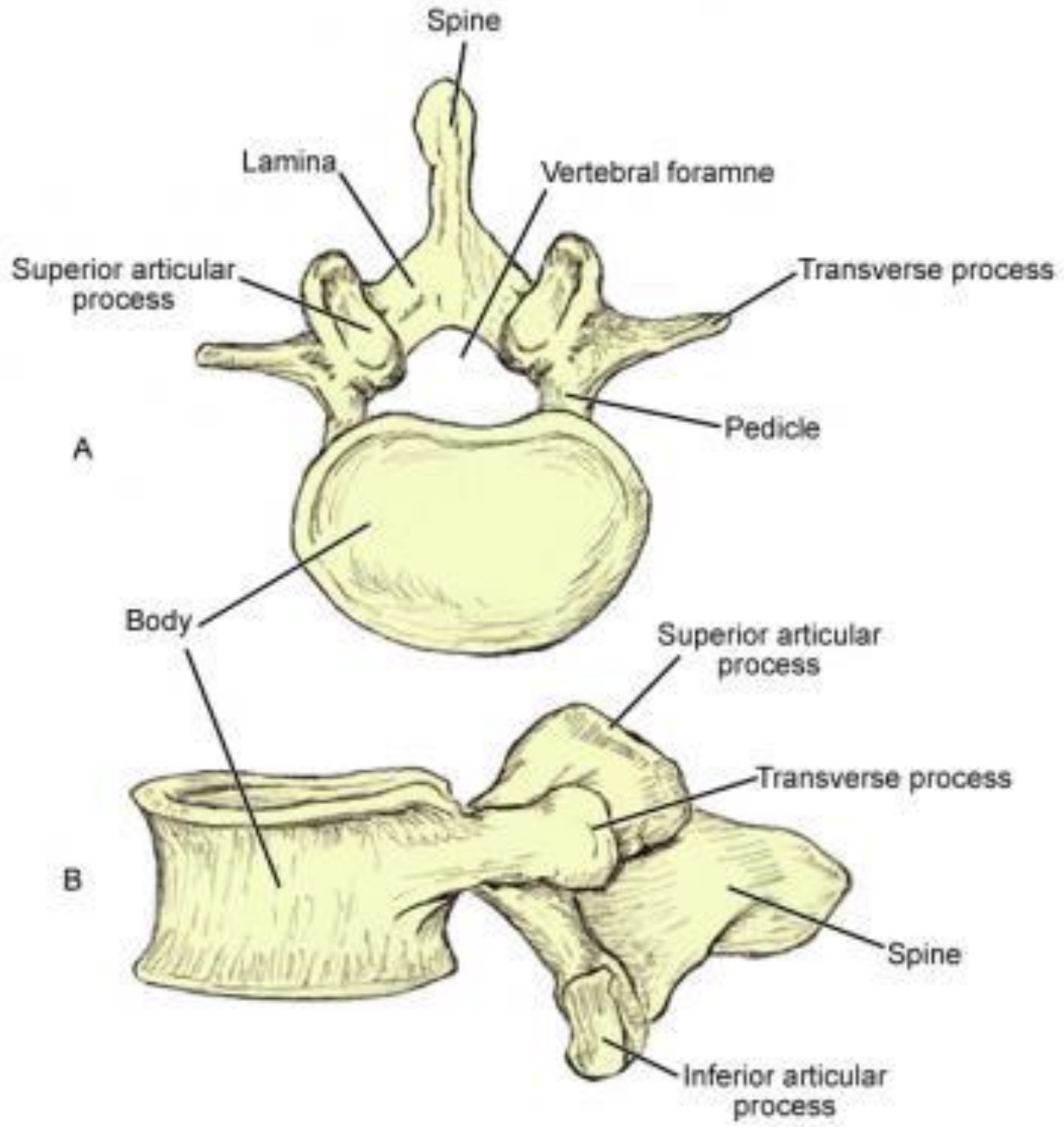
THE LUMBAR SPINE


Spine
Lamina
Vertebral foramne
Superior articular process
Transverse process
Pedicle
A
Body
Superior articular process
Transverse process
B
Spine
Inferior articular process

Review of anatomy

- The Lumbar spine is made up of 5 vertebrae
- Has a Lordotic Curve
- Disc are the largest because the support the most weight
- Transverse processes and spinous processes at the same level
- Ten facet joint in the lumbar spine (five pairs)
- Facet joints carry 20-25% of axial load, Unless disc degeneration is present, 70%
- Facet joints also provide 40% of torsional/shear strength

Facet joints

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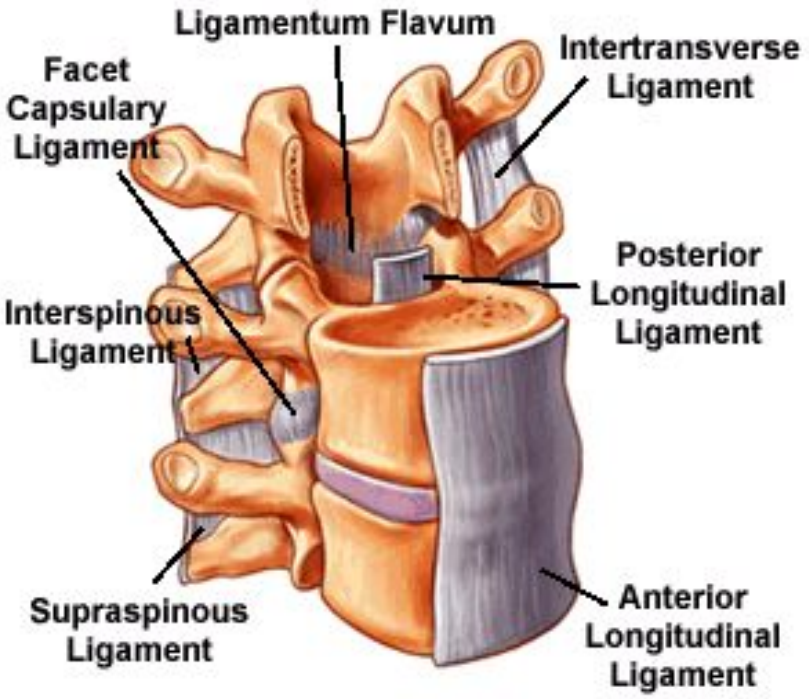
- Facet joints also provide 40% of torsional/shear strength
- Superior facets face medially and backwards
- Inferior facets face laterally and forwards
- The facet joints limit L/S rotation
  - Rotation is accomplished by a shearing force
- Transverse processes are at the same level as the spinous processes

Ligaments

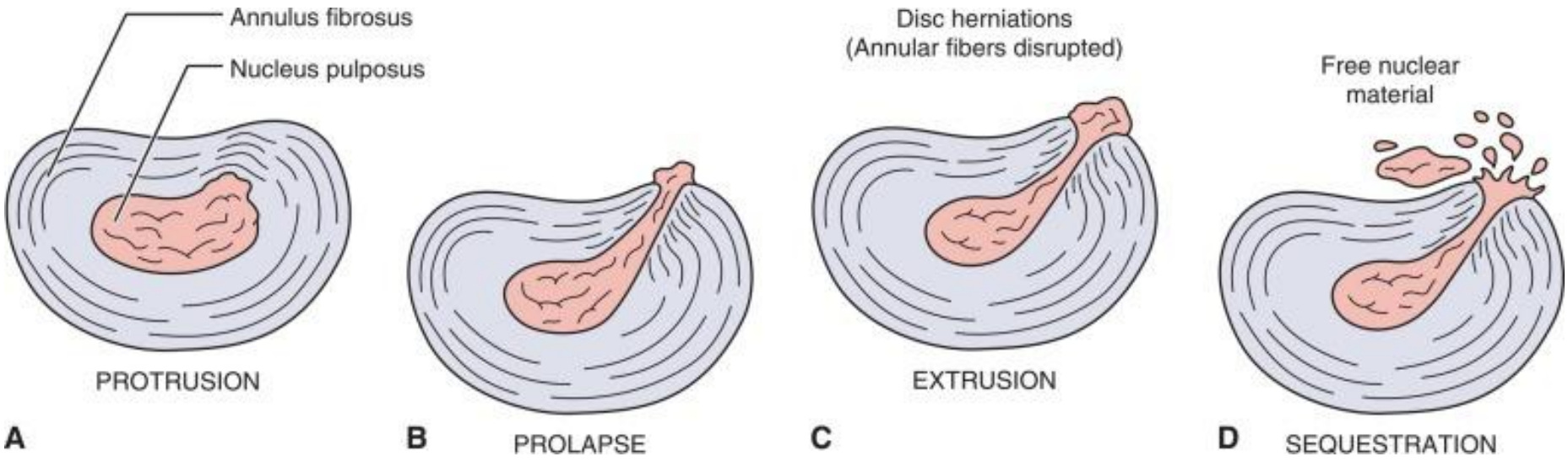
- Anterior and posterior longitudinal ligaments
- Ligamentum flavum
- Supraspinous and interspinous ligament
- Intertransverse ligament
- Iliolumbar ligament
  - Unique to L/S
  - Connects L5 TP to ilium and helps prevent anterior displacement of L5



Intervertebral disc anatomy

- 20-25% length of the L/S, comprised of 85-90% water
  - Body becomes less fluid as we age, resulting in a loss of height via shrinking discs
  - Adults are 1-2cm taller in the morning compared to the evening
    - Implications for excessive flexion in the morning?
- Functions:
  - Shock absorption
  - Distribution of load
  - Hold vertebra together
  - Allow movement btw the vertebra
  - Separate the vertebra to allow free passage of the nerve roots from the spinal cord through the intervertebral foramina
- Consists of the annulus fibrosus and nucleus pulposus
- Annulus fibrosus increases disc strength and accommodates torsion movements

Types of disc herniation

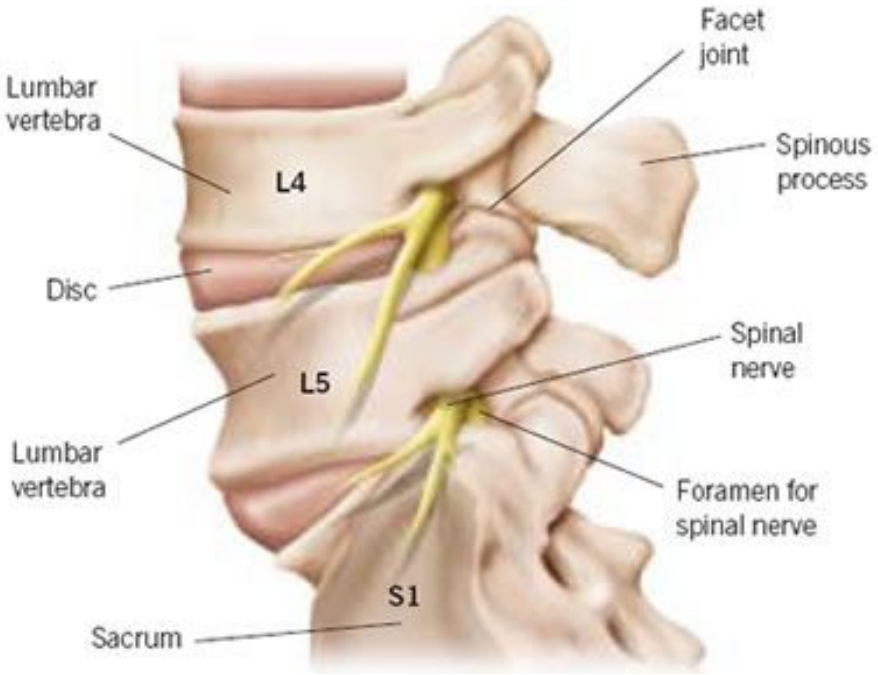


Nerve roots and vertebral segments

- Each nerve roots exits below its vertebra (example: L4 nerve root exists between L4-5)
- L5-S1 segment is the most common site of problems due to the amount of

load/stress this area takes

and the angle of the joint



- Resting position: midway between flexion and extension
- Close packed position: full extension
- Capsular pattern: side flexion and rotation equally limited, extension

Patient history

- Group read starting pg 633
- Create a list
- 23 questions in total.

Patterns of back pain pg 635

Patterns of Back Pain

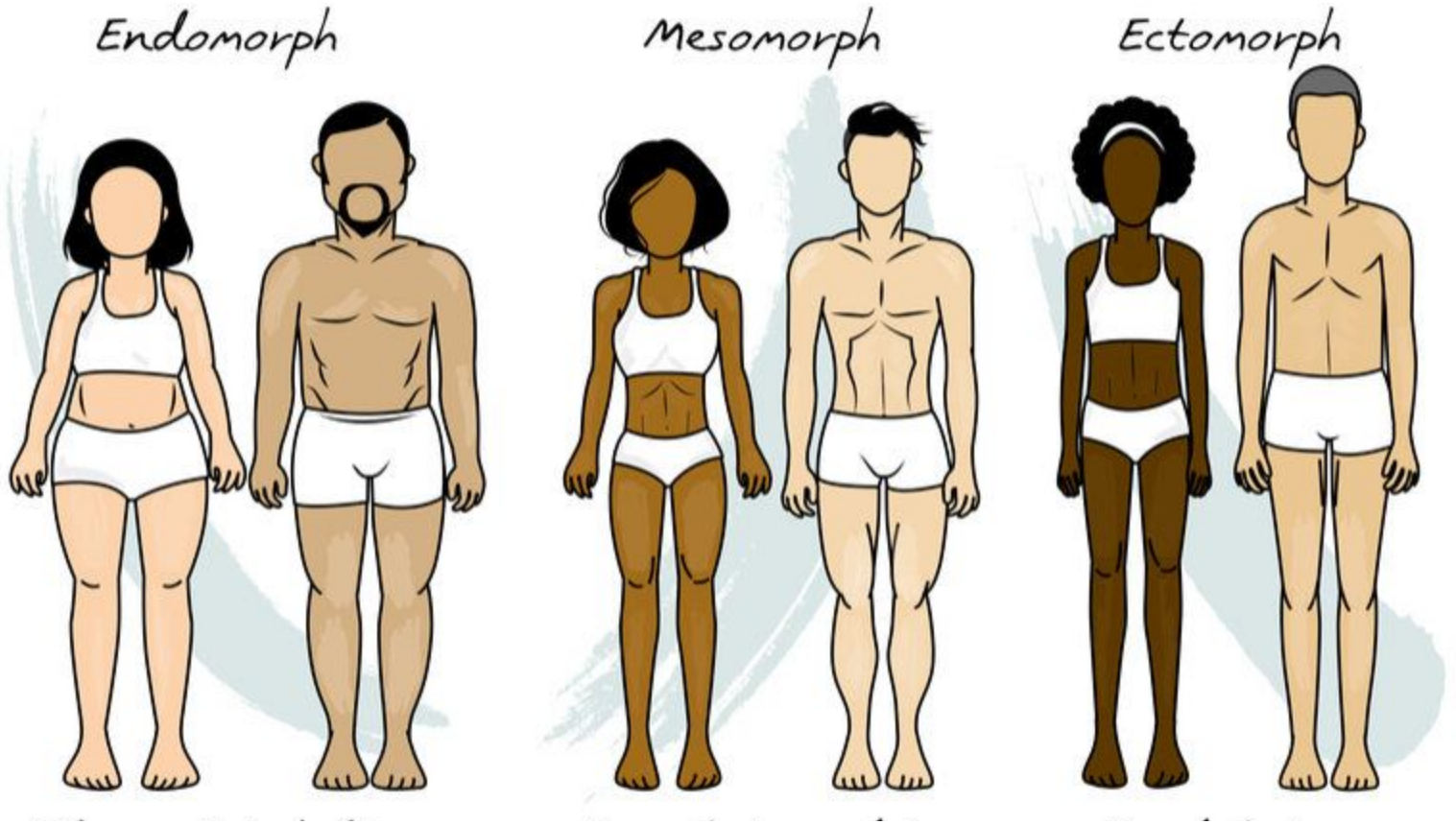
	Pattern	Where Pain Is Worst	Aggravating Movement	Relieving Movement	Onset	Duration	Probable Cause
Back Dominant Pain/ Mechanical Cause	1	Back/buttocks (>90% back pain) Myotomes seldom affected Dermatomes not affected	Flexion Stiff in morning	Extension	Hours to days	Days to months (sudden or slow)	Disc involvement (minor herniation, spondylosis), sprain, strain
	2	Back/buttocks Myotomes seldom affected Dermatomes not affected	Extension/ Rotation	Flexion	Minutes to hours	Days to weeks (sudden)	Facet joint involvement, strain
Leg Pain Dominant/ Nonmechanical Cause	3	Leg (usually below knee) Myotomes commonly affected (especially in chronic cases) Pain in dermatomes	Flexion	Extension	Hours to Days	Weeks to months	Nerve root irritation (most likely cause—disc hernation)
	4	Leg (usually below knee) (May be bilateral) Myotomes commonly affected (especially in chronic cases) Pain in dermatomes	Walking (extension)	Rest (sitting) and/or postural change	With walking	?	Neurogenic intermittent claudication (stenosis)

OBSERVATION

Observation

- Body type
- Gait
- Attitude
- Total spinal posture
- Markings
- Step deformity

Body type



Gait

- Does the gait appear to be normal?
- If its altered, is it altered due to a limb or is it altered to relieve symptoms?

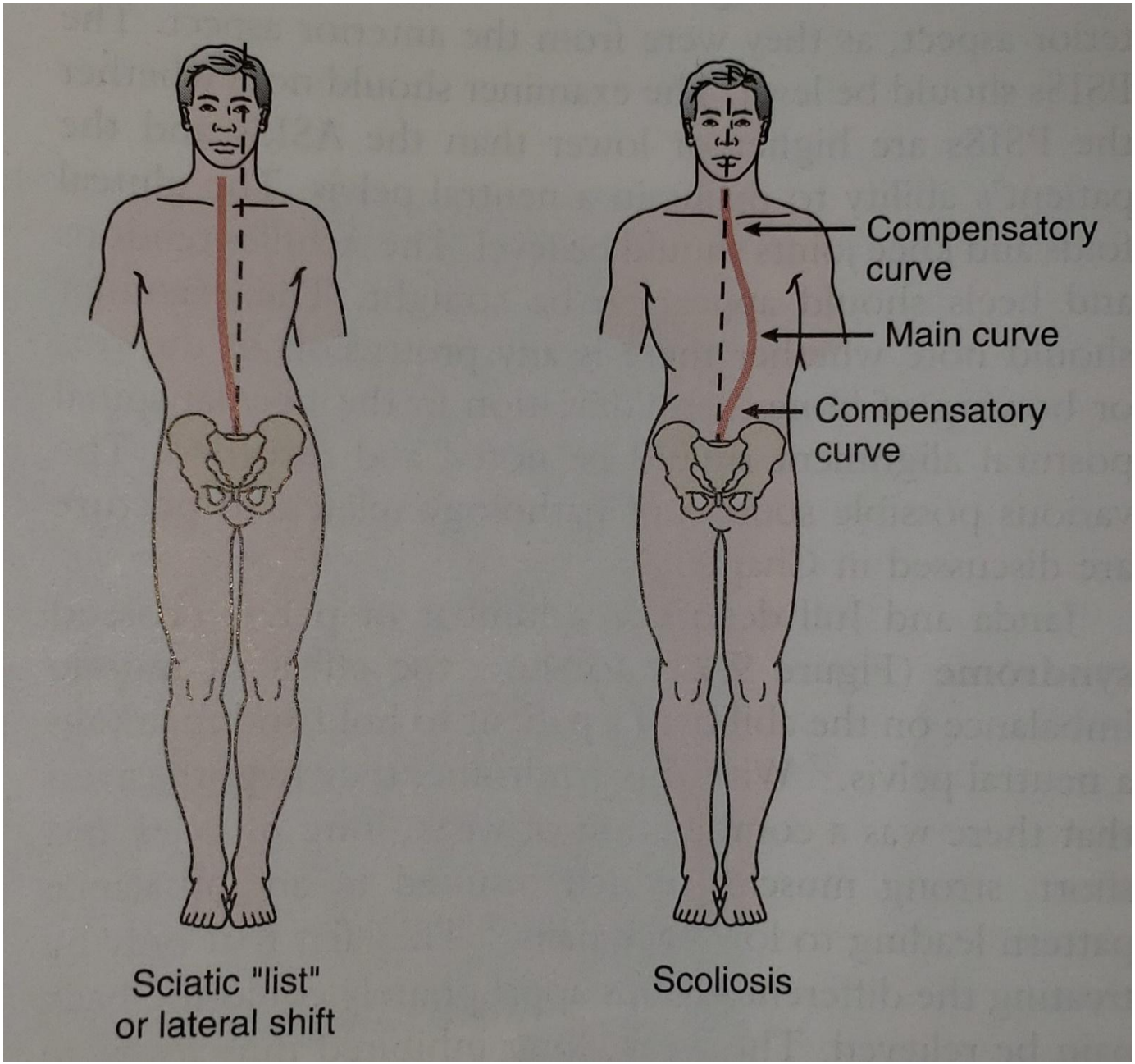
Attitude

- What is the patient's appearance?
- Are they tense, bored, lethargic, healthy looking, overweight?

Total spinal posture (TSP)

- Postural assessment
- Positioning of pelvis
  - Is the pelvis in a neutral position; if not what is restricting?
  - Can they hold the pelvis in a neutral position?
  - Can they hold a neutral pelvis during dynamic movement?

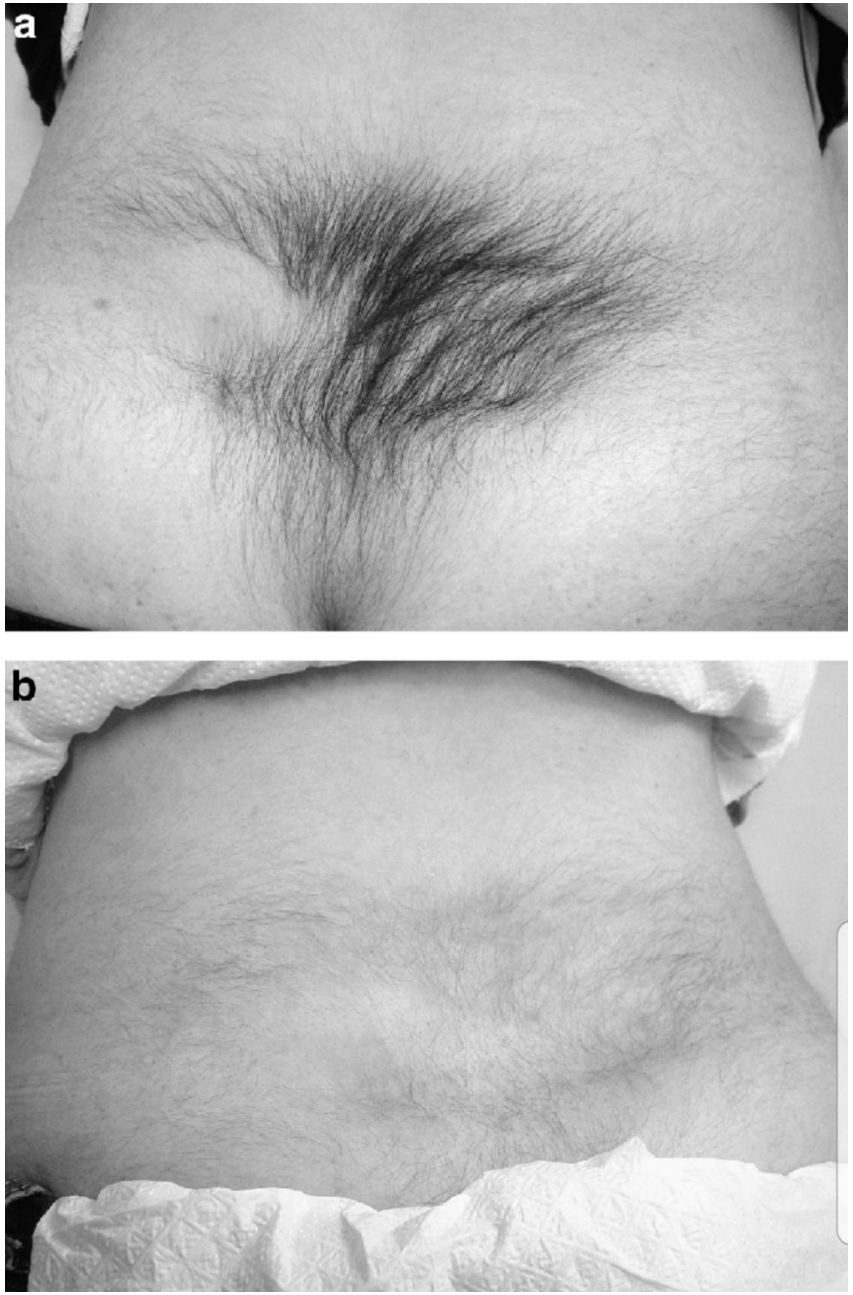
- Is the body straight according to plumb line?
  - Anterior, lateral view
- Are there any curves to the spine?
  - Anterior, posterior and lateral view.


Compensatory curve
Main curve
Compensatory curve
Sciatic "list" or lateral shift
Scoliosis

Markings

- A faun's beard may indicate a spina bifida occulta or diastematomyelia
- Unusual skin markings or presence of skin lesions at midline may indicate neurological anomalies

Faun's beard



Step deformity

- The lumbar spine may indicate spondylolisthesis.
- The “step” occurs because of the SP of 1 vertebrae becomes prominent when either the vertebrae above or the affected vertebrae slips forward on the one below.

MOVEMENTS

AROM

During all ROM for lumbar spine you will have your clients place their hands behind their head to isolate the lumbar spine

- Flexion- 40-60°
- Extension- 20-35°
- Lateral flexion- 15-20°
- Rotation- 3-18°
- Sustained postures (if necessary)
- Repetitive motions (if necessary)
- Combined movements (if necessary)

PROM

- Flexion- tissue stretch
- Extension- tissue stretch
- Lateral flexion- tissue stretch
- Rotation- tissue stretch

RIM

- Forward flexion
- Extension
- Lateral flexion
- Rotation

Optional

- Dynamic abdominal endurance
- Double straight leg lower
- Dynamic extension endurance
- Isotonic horizontal side support
- Internal/external abdominal oblique test

Myotomes

- L2- hip flexion
- L3- knee extension
- L4- ankle dorsiflexion
- L5- great toe extension
- S1- ankle plantar flexion, ankle eversion, hip extension
- S2- knee flexion

- https://www.youtube.com/watch?v=ACkxtr2emWw

Lumbar Root Syndromes

Root	Dermatome	Muscle Weakness	Reflexes/Special Tests Affected	Paresthesias
L1	Back, over trochanter, groin	None	None	Groin, after holding posture, which causes pain
L2	Back, front of thigh to knee	Psoas, hip adductors	None	Occasionally front of thigh
L3	Back, upper buttock, front of thigh and knee, medial lower leg	Psoas, quadriceps—thigh wasting	Knee jerk sluggish, PKB positive, pain on full SLR	Inner knee, anterior lower leg
L4	Inner buttock, outer thigh, inside of leg, dorsum of foot, big toe	Tibialis anterior, extensor hallucis	SLR limited, neck-flexion pain, weak knee jerk; side flexion limited	Medial aspect of calf and ankle
L5	Buttock, back and side of thigh, lateral aspect of leg, dorsum of foot, inner half of sole and first, second, and third toes	Extensor hallucis, peroneals, gluteus medius, ankle dorsiflexors, hamstrings—calf wasting	SLR limited to one side, neck-flexion pain, ankle jerk decreased, crossed-leg raising—pain	Lateral aspect of leg, medial three toes
S1	Buttock, back of thigh, and lower leg	Calf and hamstrings, wasting of gluteals, peroneals, plantar flexors	SLR limited	Lateral two toes, lateral foot, lateral leg to knee, plantar aspect of foot
S2	Same as S1	Same as S1 except peroneals	Same as S1	Lateral leg, knee, heel
S3	Groin, inner thigh to knee	None	None	None
S4	Perineum, genitals, lower sacrum	Bladder, rectum	None	Saddle area, genitals, anus, impotence

ORTHOPEDIC TESTS

Diagnosis

- https://www.youtube.com/watch?v=_jrVkJigWGM
- Lumbar Spine Dysfunction Part 2 - YouTube

Neurological dysfunctions

- Slump test
- Well leg straight leg
- Valsalva maneuver

Muscle length test

- 90-90 straight leg raise test
- Ober’s test
- Rectus femoris test
- Thomas test

Reflexes of the lumbar spine

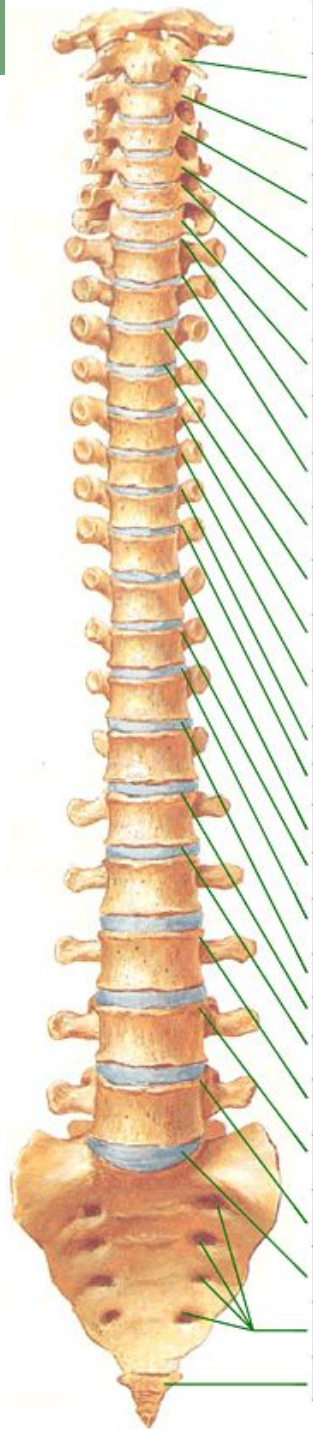
- Patellar L3-L4
- Medial hamstring L5-S1
- Lateral hamstring S1-S2
- Posterior tibia L4-L5
- Achillies S1-S2

Referral Pain of Lumbar Spine

- Iliocostalis- below T12 ribs lateral to spine down to buttock
- Longissimus- beside spine down to gluteal fold
- Multifidus- lateral to spine, sacrum to gluteal cleft, posterior leg, and lower abdomen
- Abdominals- below xiphisternum and along anterior rib cage down along inguinal ligament to genitals
- Serratus posterior inferior- lateral to spine in T9-T12 posterior rib cage

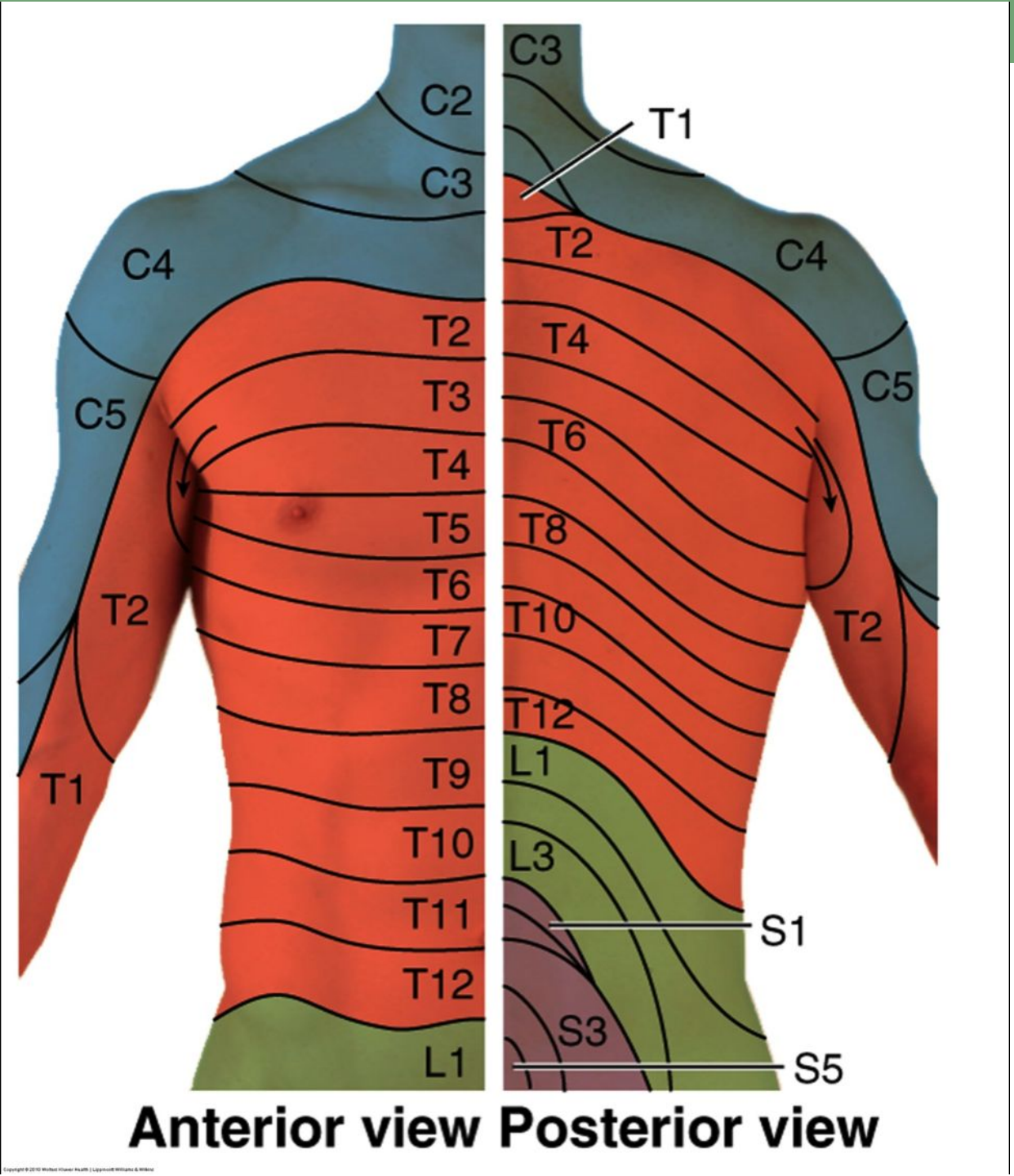
Peripheral nerve injuries

- Lumbosacral tunnel syndrome
  - Compression of the L5 nerve root as it passes under the iliolumbar canal. Usual cause ifs trauma (inflammation), osteophytes, or a tumor. Symptoms are primarily sensory (L5 dermatome) and pain. minimal to no effect on L5 myotome.



Spinal Bone	Nerve Supply	Common Warning Signs
C1	Blood supply to the head, pituitary gland, scalp, bones of the face, brain, inner ear and middle ear.	• Headaches •insomnia •high blood pressure • Migraines • chronic fatigue • dizziness
C2	Eyes, ears, sinuses, tongue, forehead	• Sinusitis • ear aches • pain around the eyes • Vision problems • hearing problems
C3	Cheeks, outer ear, face bones, teeth, facial nerves.	• Neuralgia • pimples • eczema
C4	Nose, lips, mouth, Eustachian tube	• Hay fever • runny nose • hearing loss • Adenoids
C5	Vocal cords, neck, glands, pharynx	• Sore throat • laryngitis • hoarseness
C6	Neck muscles, shoulders, tonsils	• Stiff neck • arm pain • tonsillitis • Persistent cough
C7	Thyroid gland, shoulder bursa, elbows	• Bursitis • colds • thyroid conditions
T1	Forearms, hands, wrists, fingers, esophagus, trachea	• Arm and hand pain • difficulty breathing • shortness of breath • asthma
T2	Heart, coronary arteries	• Heart conditions • chest conditions
T3	Lungs, bronchial tubes, pleura, chest	• Bronchitis • pleurisy • pneumonia • congestion
T4	Gallbladder	• Gallbladder conditions • jaundice • shingles
T5	Liver, solar plexus, circulation	• Liver conditions • blood pressure conditions • poor circulation
T6	Stomach	• Indigestion • heartburn • dyspepsia
T7	Pancreas, duodenum	• Ulcers • gastritis
T8	Spleen	• Lower resistance
T9	Adrenal glands	• Allergies • chronic fatigue
T10	Kidneys	• Kidney problems • hardening of the arteries • fatigue • nephritis
T11	Kidneys, ureters	• Skin conditions • eczema • pimples
T12	Small intestines, lymph circulation	• Rheumatism • gas pains
L1	Large intestines, inguinal rings	• Colitis • diarrhea • hernia
L2	Appendix, abdomen, thigh	• Cramps • varicose veins • leg pain
L3	Sex organs, uterus, bladder, knees	• Menstrual pains • irregular periods • miscarriages • impotency • knee pain
L4	Prostate gland, lower back	• Back pain • difficulty, painful or frequent urination
L5	Lower back, buttocks, thighs, legs, feet, sciatic nerve, large intestine	• Back pain • leg pain •constipation
Sacrum	Hip bones, buttocks	• Sacroiliac conditions • back pain • hip pain
Coccyx	Rectum, anus	• Hemorrhoids • tail bone pain

Dermatomes


C2
C3
C4
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
C5
T2
T1
C3
T1
T2
T4
T6
T8
T10
T12
L1
L3
S1
S3
S5
C4
C5
T2
Anterior view
Posterior view

JOINT PLAY

Flexion, Extension and Side flexion

- Patient is sidelying.
- Examiner flexes both knees to the patients the chest by flexing the hips.
- While palpating between the SP of the Lspine with one hand (finger above and below the SP), passively flex and release the patients hips.
- Side flexion and extension are performed in similar manors only substituting flexion for extension or side flexion.

PAUVP, TVP, PACVP

- See thoracic notes for method, start L5-L1