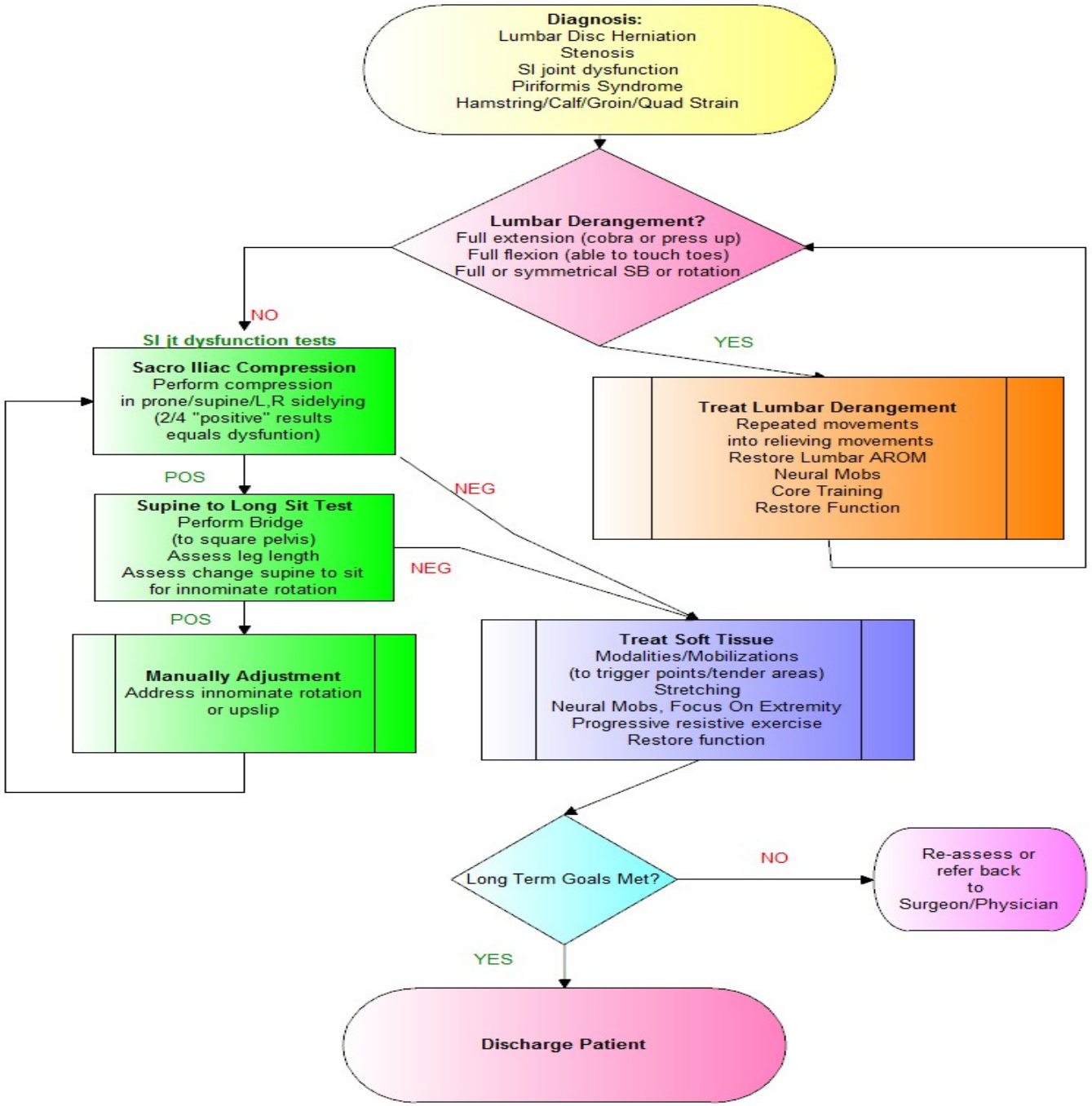
A PHYSICAL THERAPIST APPROACH TO LUMBAR AND CERVICAL SPINAL CONDITIONS

Robert Maroon PT

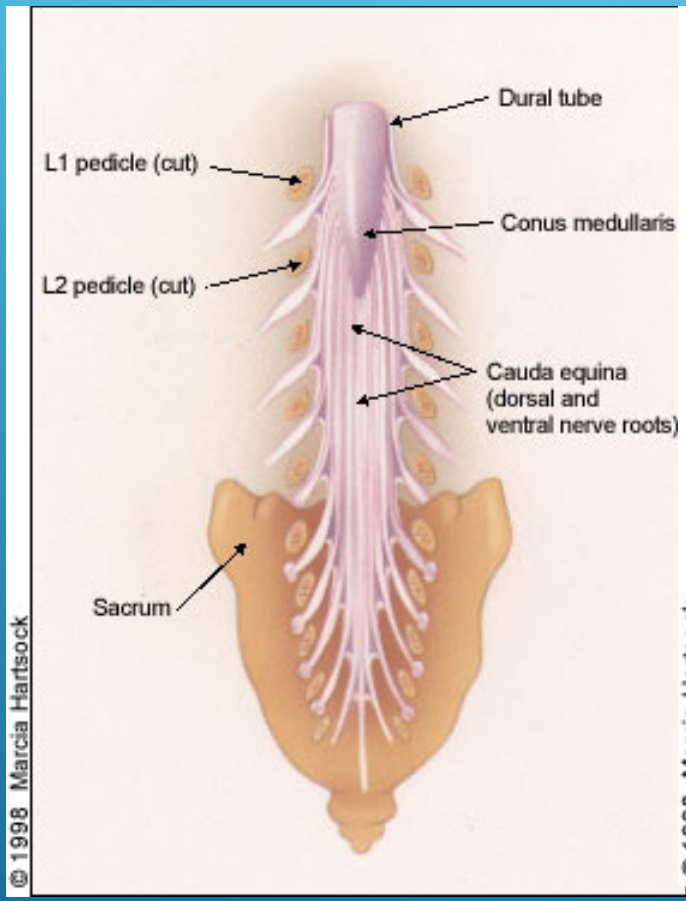
Erik Wijtmans, PT, MTC, CGIMS, CMTPT

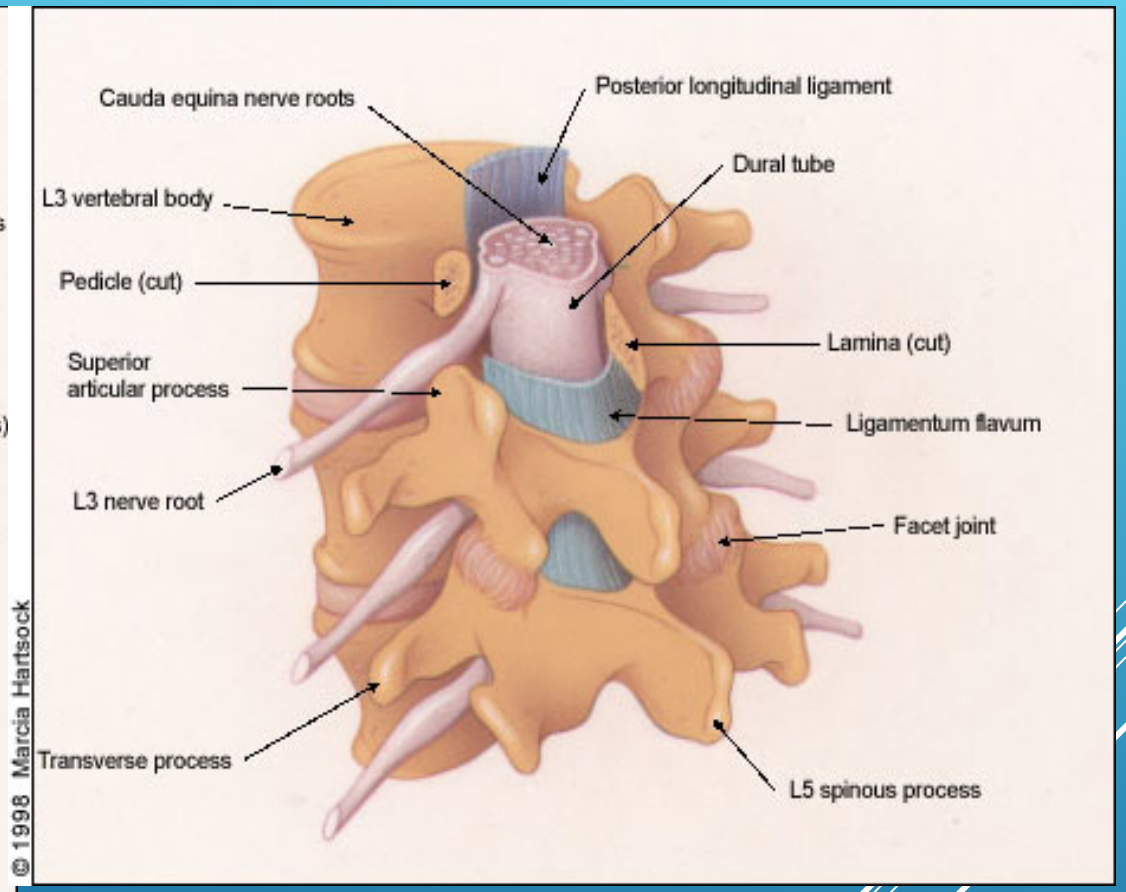
The Therapy Network

ALGORITHM


Diagnosis:
Lumbar Disc Herniation
Stenosis
SI joint dysfunction
Piriformis Syndrome
Hamstring/Calf/Groin/Quad Strain
Lumbar Derangement?
Full extension (cobra or press up)
Full flexion (able to touch toes)
Full or symmetrical SB or rotation
NO
YES
SI jt dysfunction tests
Sacro Iliac Compression
Perform compression
in prone/supine/L,R sidelying
(2/4 "positive" results
equals dysfuntion)
POS
NEG
Supine to Long Sit Test
Perform Bridge
(to square pelvis)
Assess leg length
Assess change supine to sit
for innominate rotation
NEG
POS
Manually Adjustment
Address innominate rotation
or upslip
Treat Lumbar Derangement
Repeated movements
into relieving movements
Restore Lumbar AROM
Neural Mobs
Core Training
Restore Function
Treat Soft Tissue
Modalities/Mobilizations
(to trigger points/tender areas)
Stretching
Neural Mobs, Focus On Extremity
Progressive resistive exercise
Restore function
Long Term Goals Met?
NO
Re-assess or
refer back
to
Surgeon/Physician
YES
Discharge Patient

ANATOMY REVIEW


Dural tube
L1 pedicle (cut)
Conus medullaris
L2 pedicle (cut)
Cauda equina
(dorsal and
ventral nerve roots)
Sacrum
© 1998 Marcia Hartsock


Cauda equina nerve roots
Posterior longitudinal ligament
Dural tube
L3 vertebral body
Pedicle (cut)
Lamina (cut)
Superior
articular process
Ligamentum flavum
L3 nerve root
Facet joint
Transverse process
L5 spinous process
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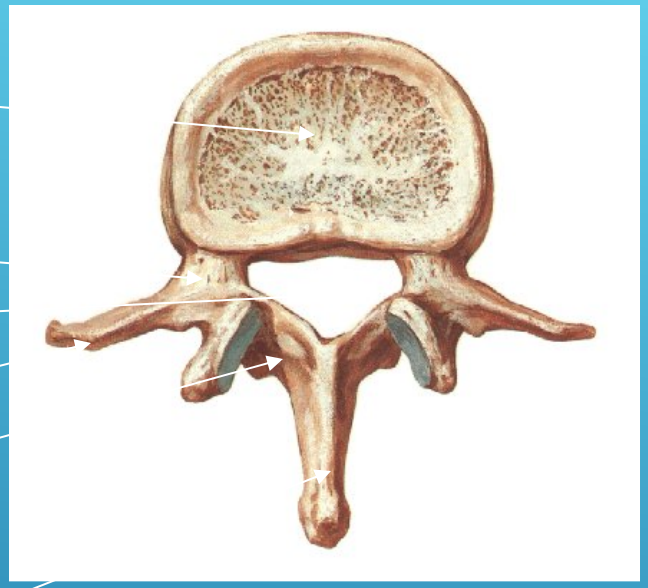
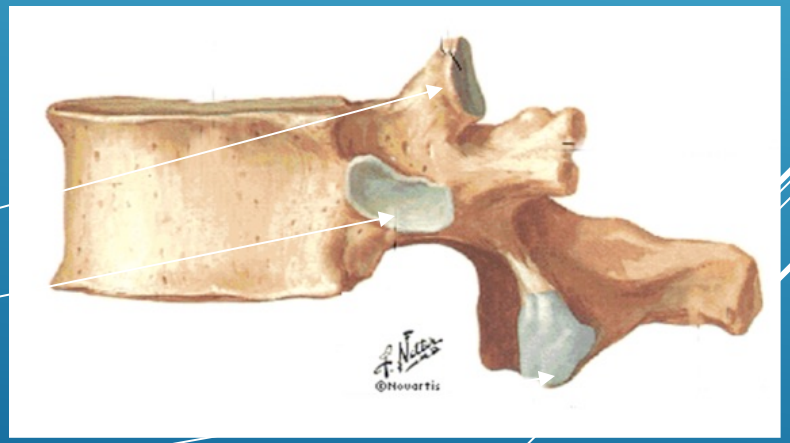
SPINAL ANATOMY

- Vertebral Body
- Pedicle
- Vertebral Foramen
- Transverse Process
- Lamina
- Spinous Process
- Superior Articular Process
- Costal Facet
- Inferior Articular Process





Anterior Longitudinal Ligament (ALL)

Vertebral Body

Ligamentum Flavum

Intervertebral Disc

Posterior Longitudinal Ligament (PLL)

Vertebral Foramen

Facet Joint And Capsule

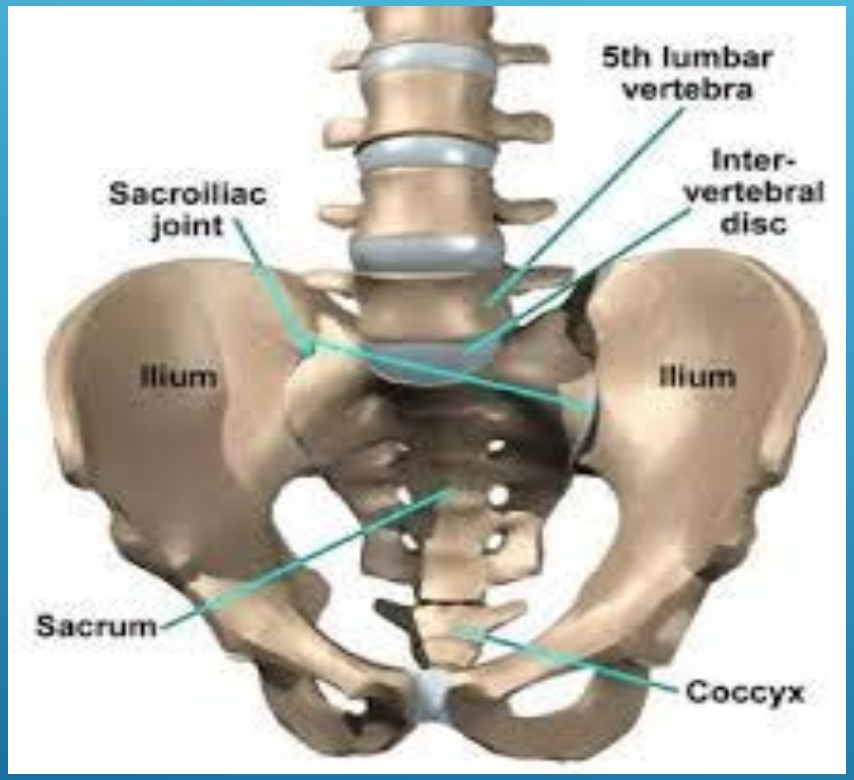
Transverse Process

Interspinous ligament

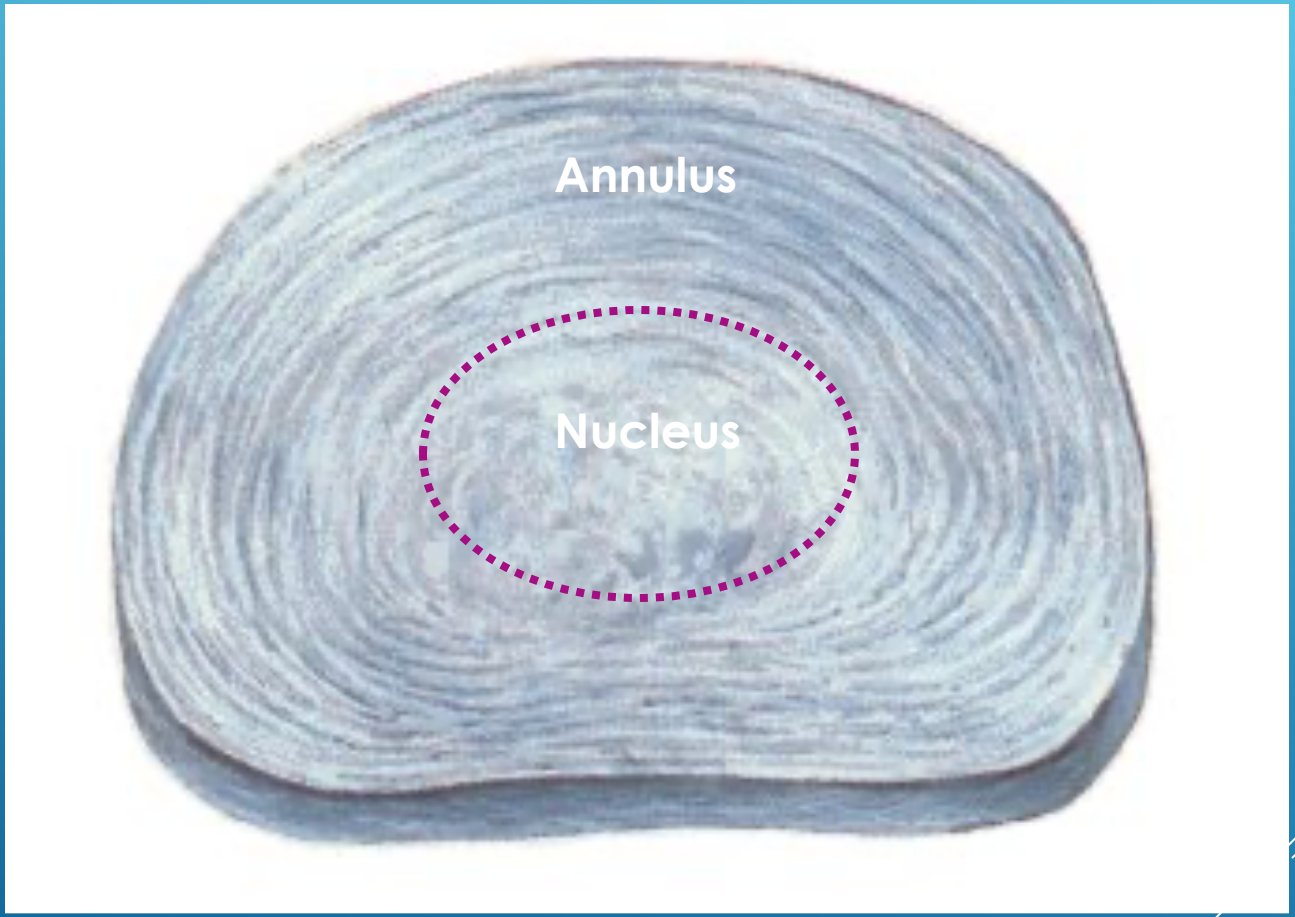
Supraspinous Ligament

Intervertebral Foramen

SACROILLIAC JOINT



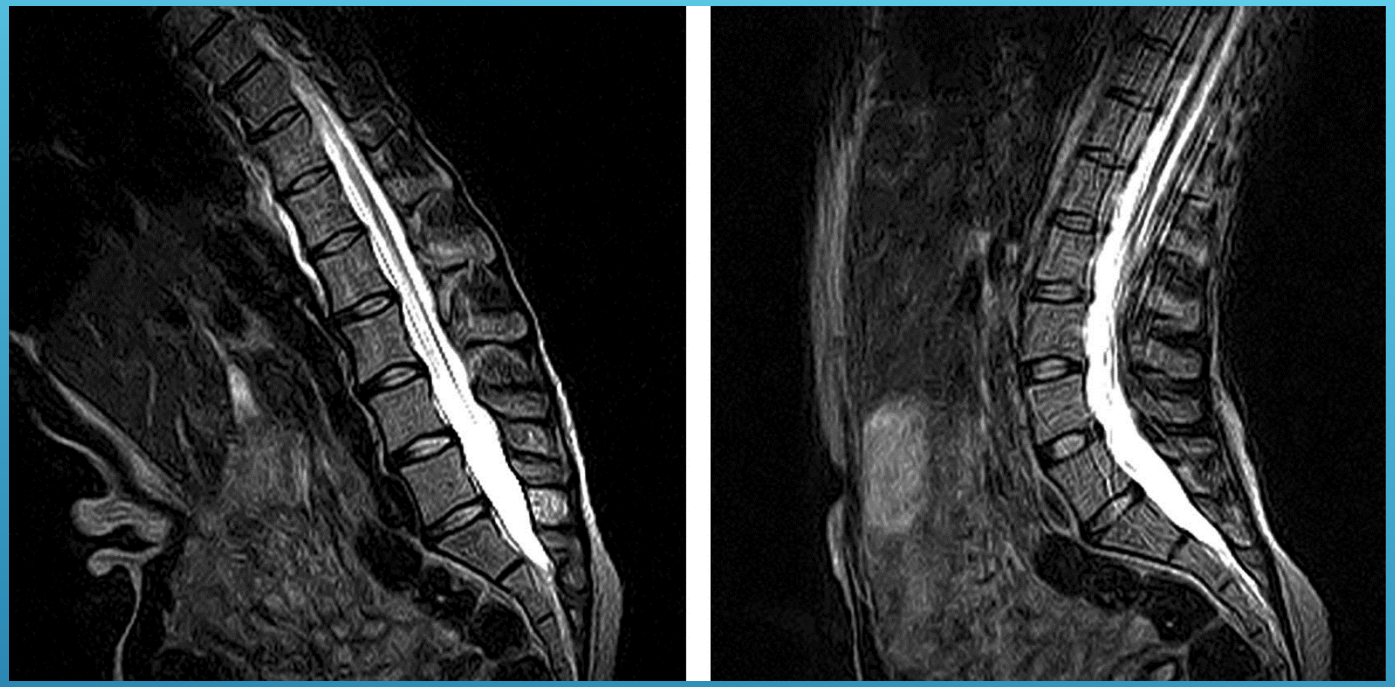
INTERVERTEBRAL DISC



SPINAL BIOMECHANICS REVIEW

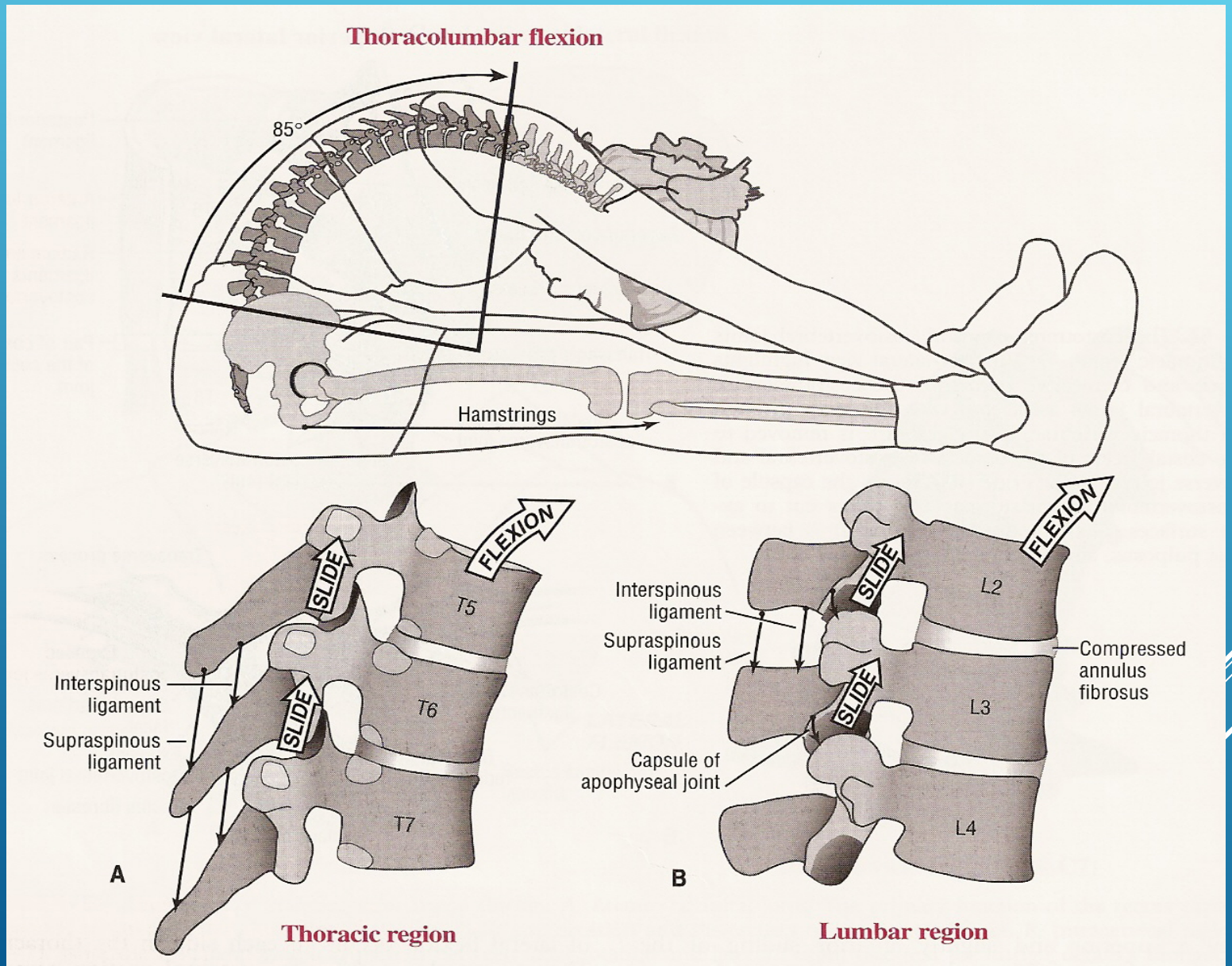
DISC BIOMECHANICS

- Spine (Phila Pa 1976). 1996 Dec 1;21(23):2753-7.
- **Migration of the nucleus pulposus within the intervertebral disc during flexion and extension of the spine.**
- Fennell AJ[1], Jones AP, Hukins DW.
- **CONCLUSIONS:**
- Flexion of an intervertebral disc in a living person tends to be accompanied by posteriorly directed migration of the nucleus pulposus within the disc. Extension tends to be accompanied by an anteriorly directed migration

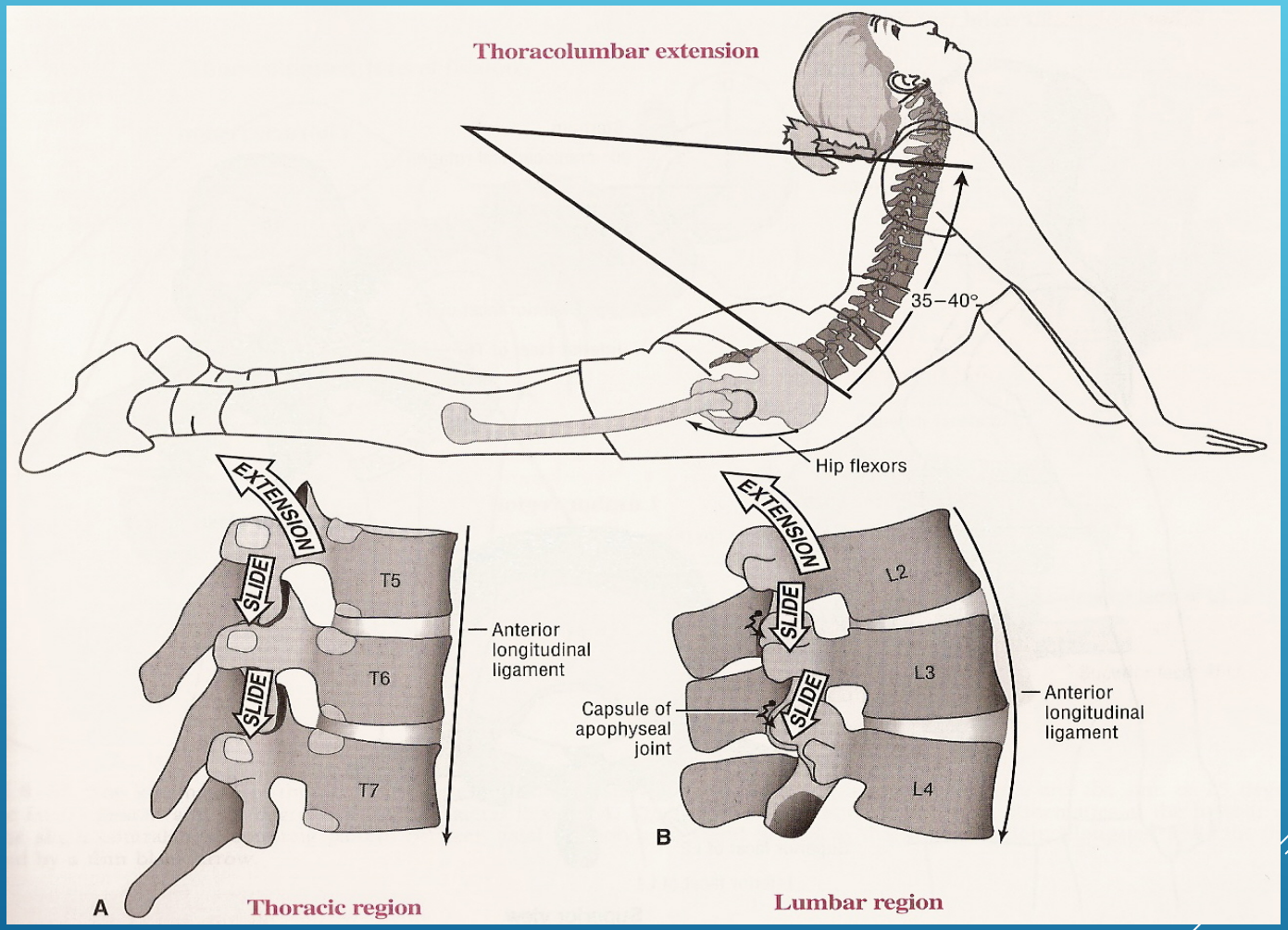


MIGRATION OF THE NUCLEUS WITH FLEXION AND EXTENSION

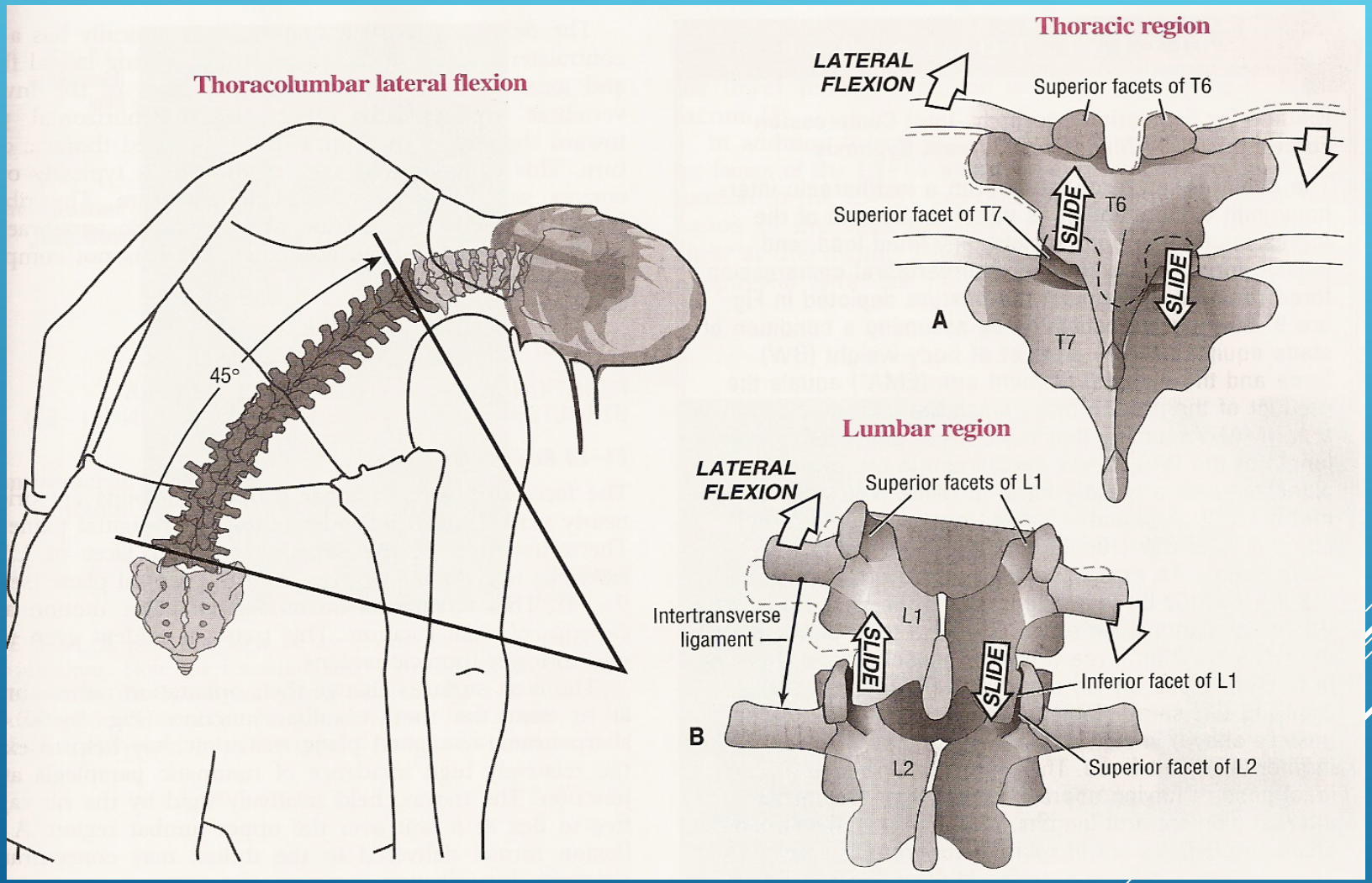
SPINAL BIOMECHANICS



SPINAL BIOMECHANICS



SPINAL BIOMECHANICS



SPINAL FLEXION

- Decreased stress on posterior elements
  - Facet joints
  - Opens IV foramen
- Increased stress on anterior elements
  - Posterior disc
  - Posterior spinal ligaments
  - Posterior musculature
  - Shifts Nucleus posterior

SPINAL EXTENSION

- Decreased stress on anterior elements
  - Posterior disc
  - Posterior spinal ligaments
  - Deforms nucleus pulposus anteriorly
- Increased stress on posterior elements
  - Anterior spinal ligaments
  - Anterior musculature
  - Closes IV foramen
  - Decreases Size of the canal
  - Increased pressure on the facet joints

SACRO-ILIAC JOINT BIOMECHANICS

- At one point there was hope that we could quantify the Biomechanics of this joint in clinical exams.
- As of this date all attempts to measure movements even using radiology have proven fruitless
- Attempts do continue, and there are many theories and unproven tests of SI joint movements.

THE MECHANICAL EVALUATION

MECHANICAL DIAGNOSIS AND THERAPY (MDT)

- *** "The McKenzie Method is not simply a set of exercises; it is a defined algorithm that serves to Identify the spinal pain generator so that it can be adequately treated."

MCKENZIE APPROACH

- Directional Preference
  - Allows one to Rule out and rule in different structures as pain generators using known biomechanical factors involving those structures, along with patient complaint patterns
  - Identifying the pain generator is by a preponderance of circumstantial evidence NOT by a smoking gun
  - It takes a detective

THE EVALUATION
PATIENT INTERVIEW

- Factors that help us distinguish pain generators
  - Age (Young more likely discogenic, pars defects, Older need to consider stenosis and facet joint)
  - Stresses to the spine (Flexion/Extension aggravators)
    - ADL, Work, Hobbies
  - Mechanism of injury (trauma, insidious)
  - Progression of injury (repeated episodes, gradual progression)

PATIENT INTERVIEW

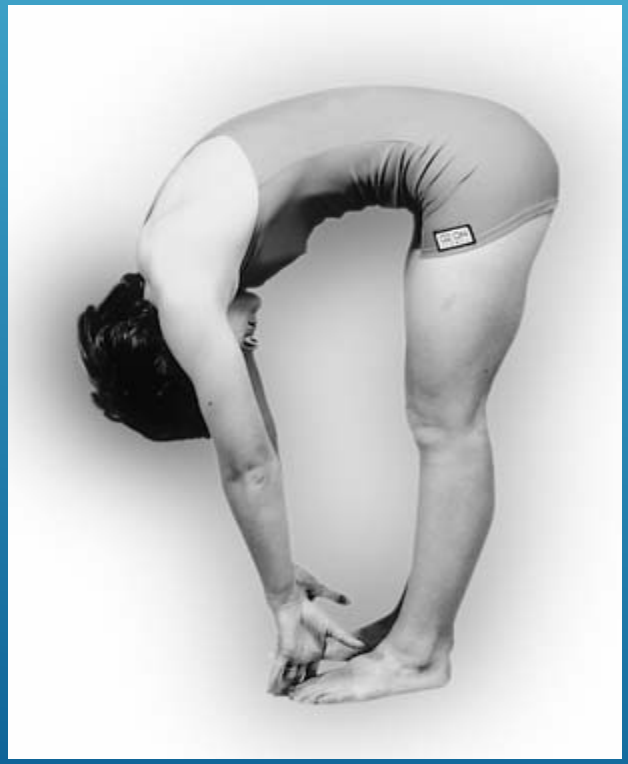
- Worse/Better Scenarios
  - Flexion pain patterns: Worse with sitting, bending and rising, better with walking and standing: implications are disc pain
  - Extension pain patterns: worse with standing, walking, Better with sitting and bending: implicates posterior structures: pars defects, stenosis, facet joints

PHYSICAL EXAM

- ROM: identifying a lack of motion in any direction, not concerned about pain yet
- Repeated End Range Movement tests
  - Have patient move into each direction repeatedly identifying changes in ROM, and pain location and intensity. Based upon these responses a directional preference can be identified.
- Special Tests

REPETITIVE MOTION - LUMBAR

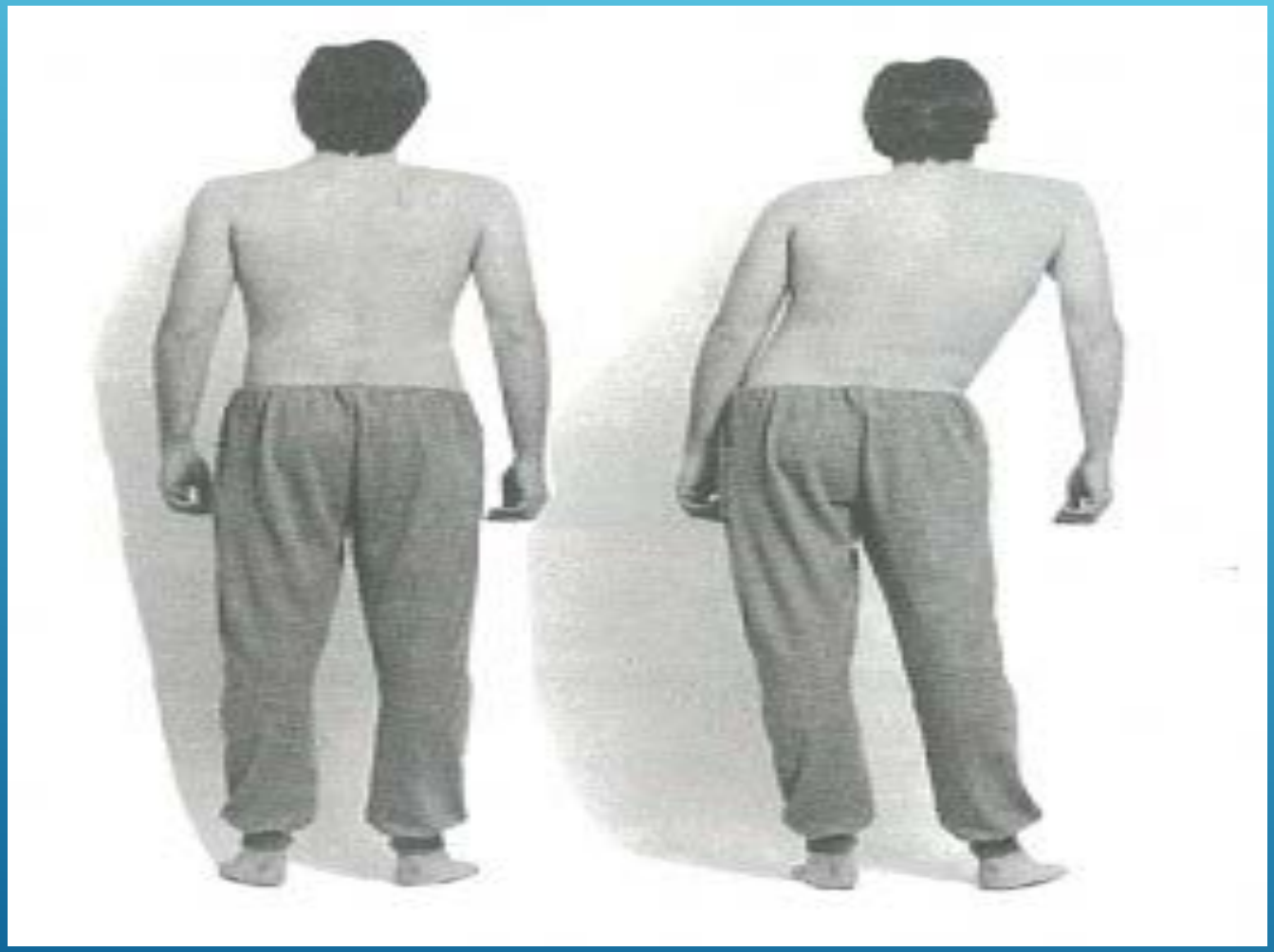
- Repetitive Flexion in Standing
  - With you feet hip distance apart
  - Keep your knees straight and bend forward as far as you can
  - Pause at bottom and return to standing

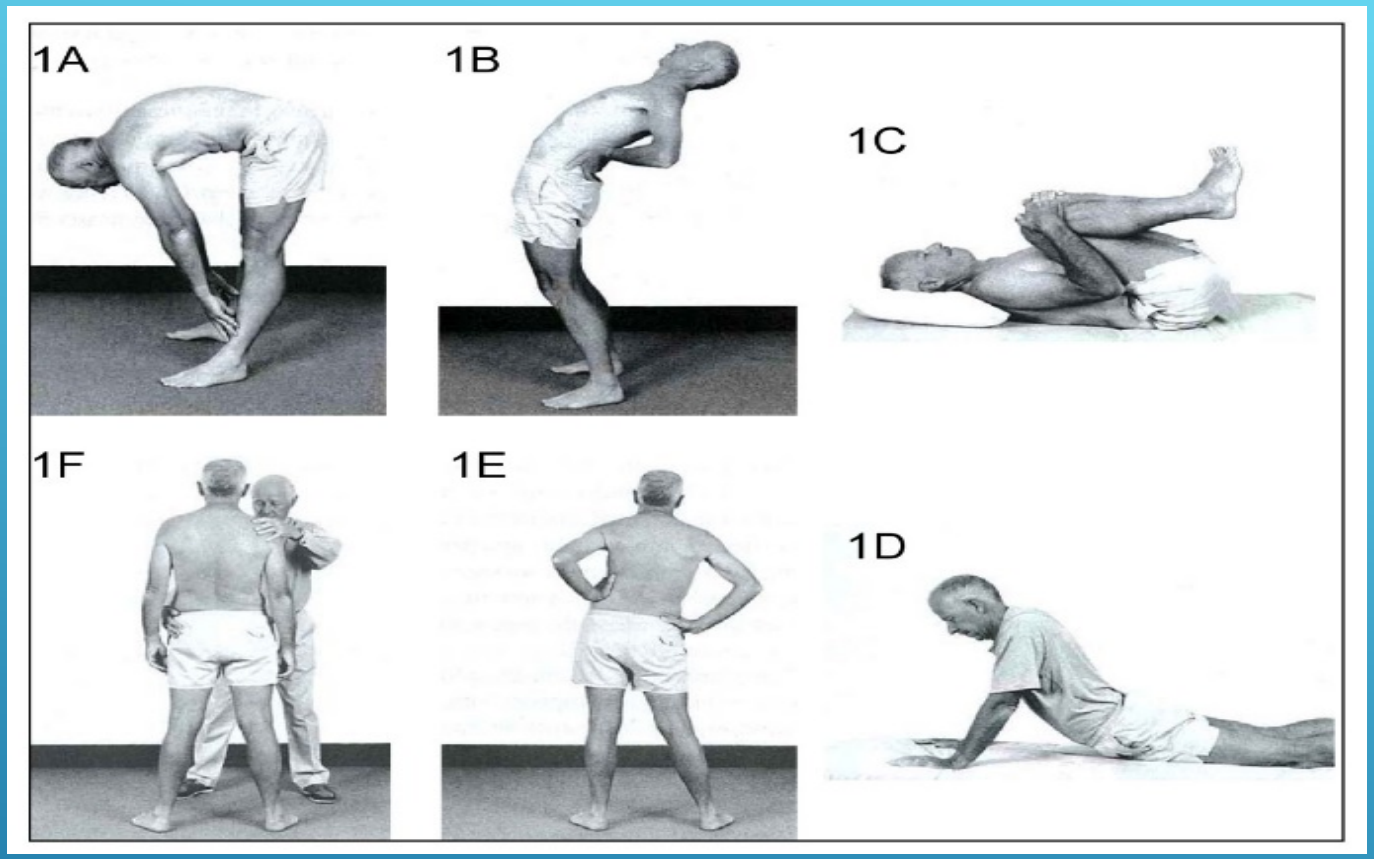


REPETITIVE MOTION - LUMBAR

- Repetitive Extension in Standing
  - With feet hip distance apart
  - Place your hands on you back for support
  - Lean back as far as you can
  - Return to standing

REPETITIVE MOTION SIDE GLIDING





SUMMARY OF REPEATED MOTION TEST POSITIONS

RESULT OF THE REPEATED MOVEMENT TEST

- Derangements
  - Looking for Directional Preference
    - Centralization of the symptoms
    - Rapid Increases in ROM
- Dysfunctions
  - Looking for Pain at End Range That does not change

CENTRALIZATION OF SYMPTOMS = DERANGEMENT

ABSENCE OF CENTRALIZATION NO DERANGEMENT

- Pain with End Range Flexion: Adverse Neural Tension
  - Neural Tension Testing
- Pain with End Range Extension: Posterior element issues
  - Stenosis, Pars defects, Facet Joint syndrome
- Pain with Transition
  - Also must look at the SI Joint

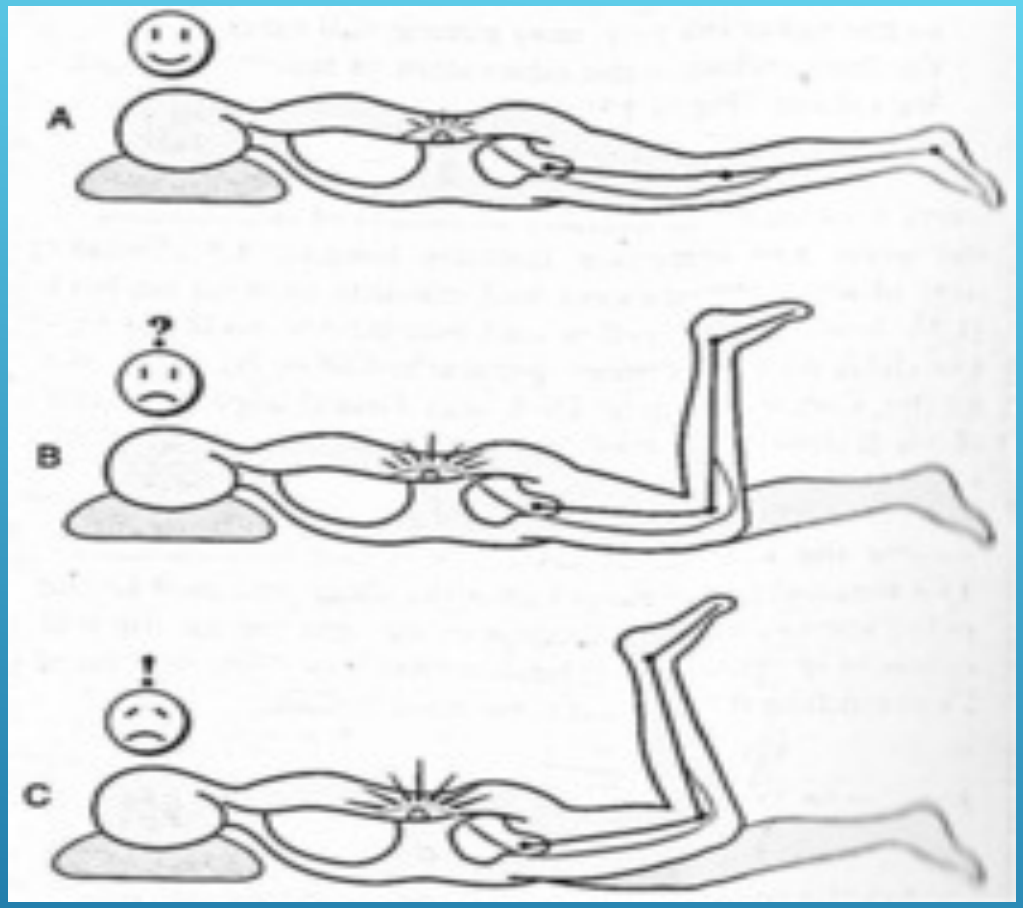
PAIN WITH EOR FLEXION ADVERSE NEURAL TENSION

- When the nerve root is irritated by HNP often times the nerve becomes hyper sensitive.
- This is identified by neural tension testing.
- While the testing is done at evaluation, a positive test may become negative after reduction of the derangement. In which case treatment is not necessary
- ** I do this Testing even with + centralization

ADHERENT NERVE ROOT

- HNP with Radiculopathy that is not effectively addressed with 8-12 weeks can develop into an Adherent Nerve Root.
- This is identified by positive Tension Tests that do not improve as the derangement improves
- Treated by Neural mobilizations

SITTING SLUMP TEST: SCIATIC NERVE



FEMORAL NERVE TENSION TEST

FEMORAL NERVE TENSION TEST

PAIN WITH END OF RANGE EXTENSION

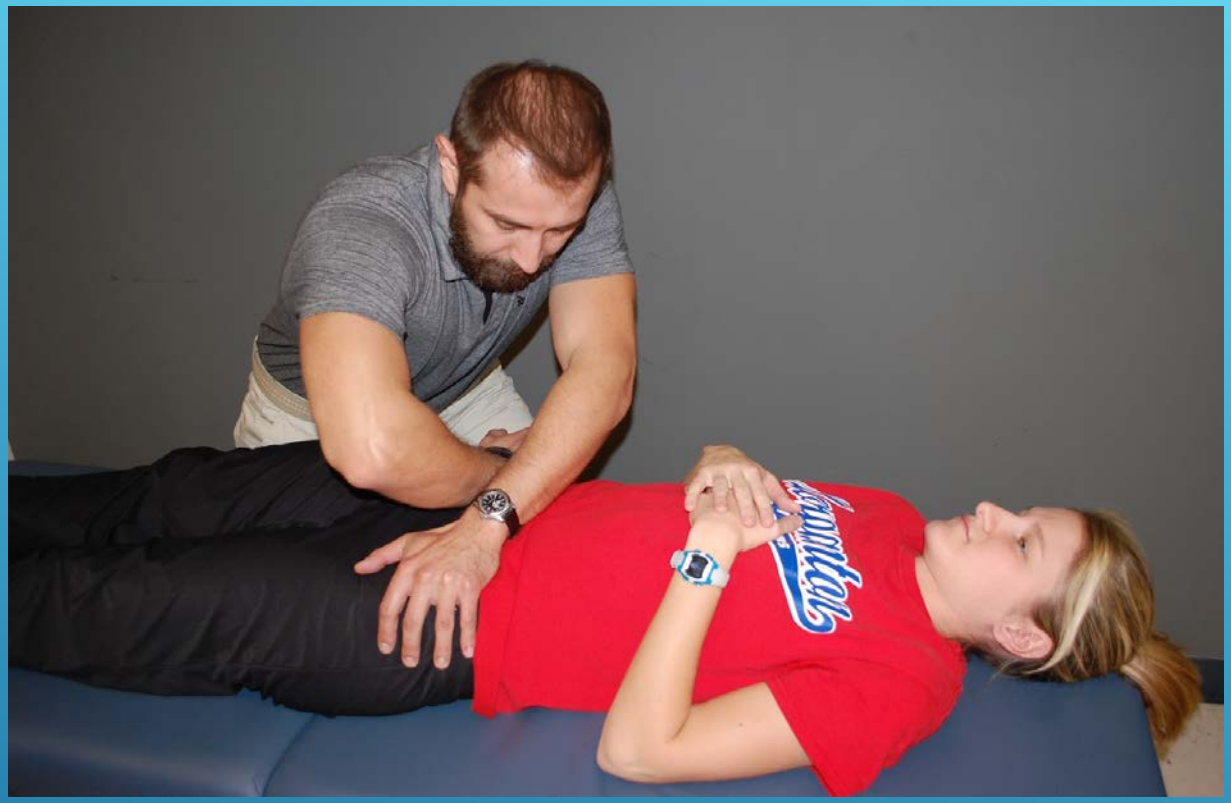
- Facet Joint
  - Quadrant Test
  - Segmental test: compression vs Gapping
  - Very local pain
- Stenosis
  - Radicular Pain
- Spondylolysis/Listhesis
  - Step off
  - Flexion/extension films
- SI Joint tests

FACET JOINT TESTING

- Quadrant Test:
  - Standing position:
    1. The therapist fixes the opposite ilium from the side being tested with one hand.
    2. The other hand grabs the shoulder from the patient and leads the patient to extension, ipsilateral sidebending and ipsilateral rotation (3D extension movement).
    4. Hold this position for three seconds.

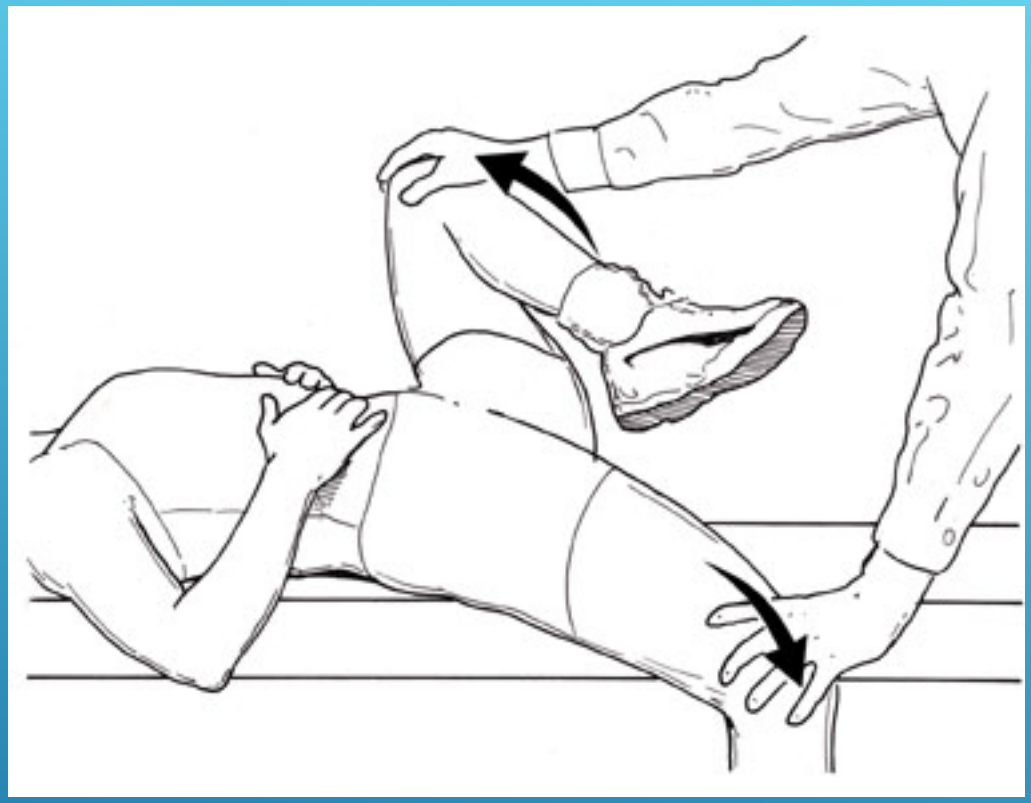
SI JOINT TESTING

- 3/5 positive test
- Absence of Centralization
- Movement testing is not effective



SI DISTRACTION TEST

SI COMPRESSION TEST



GAENSLEN'S TEST

THIGH THRUST TEST

SACRAL THRUST TEST

EFFECTIVENESS OF MECHANICAL DIAGNOSIS

A PROSPECTIVE STUDY OF CENTRALIZATION OF LUMBAR AND REFERRED PAIN

A PREDICTOR OF SYMPTOMATIC DISCS AND ANULAR COMPETENCE

SPINE 1997;22:1115-1122

- **Conclusion.** The McKenzie assessment process reliably differentiated discogenic from nondiscogenic pain ($P < 0.001$) as well as competent from an incompetent anulus ($P < 0.042$) in symptomatic discs and was superior to magnetic resonance imaging in distinguishing painful from nonpainful discs.

SACRO-ILIAC JOINT

- **A Clinical Review: Evidence Based Diagnosis and Treatment of the Painful Sacroiliac Joint.**
- **Laslett, Mark.**
  JMMT. 2008. 16(3):142-154
  - SIJ pain provocation tests (distraction, compression, thigh thrust, Gaenslen's, and sacral thrust), when combined with the absence of centralization, are valid for predicting SIJ pain (77% probability). In those with pregnancy related pelvic girdle pain, this increases to 90% probability.
  - Despite their short comings, controlled blocks under flouroscopic guidance ARE the best available reference standard for identifying intra-articular SIJ pain.

EXAM RESULTS AND TREATMENTS

DISC : EXAM RESULTS AND TREATMENT

- Disc: patient interview
  - Used to be only younger but with active seniors not the case any longer
  - History of periodic episodes, come on suddenly, go away quickly, normal in between but worsening over time
  - Worse with sitting, rising, and bending
  - Better with walking and standing

DISC: EXAM RESULTS AND TREATMENTS

- Physical exam
  - Rom: loss of motion to flexion but especially extension
  - RMT: Flexion makes them worse, either by increasing or producing the symptoms or by peripheralizing the symptoms. Symptoms tends to stay worse even after the movement has stopped
  - Extension: ROM gradually increases with repetition. Symptoms improve either by lessening or by centralizing to the back. Tend to stay better after the movement stops

DISC: TREATMENT

- Disc:
  - Movement into the directional preference. In case of Disc: most likely into extension or some modified version of extension
  - Increasing levels of force into the direction until achieving end range or even beyond end range to achieve reduction of the derangement
  - Patient must maintain this reduction through the use of Home Extension Program, sitting posture
  - Stability program to address atrophy of the multifidus (Moody study)
  - Return to function: guide the patients return to all activities

DISC: PROGNOSIS

- Expectation:
  - With discogenic pain, we expect patients to be 80% better with 5 visits
  - If they are not better, either we are not achieving reduction, or there is a chemical response to the pain and patient may need a ESI in conjunction with therapy
  - While the patient feels better quickly, this conditions takes 12 weeks minimum to heal

ALEXANDER AH, JONES AM, ROSENBAUM JR D H:; NONOPERA-TIVE MANAGEMENT OF HERNIATED NUCLEUS PULPOSUS: PATIENT SELECTION BY THE EXTENSION SIGN-LONG TERM FOLLOW-UP. OR-THOPAEDIC REVIEW; 21;181-188, 1992.

- Patients who had a confirmed lumbar herniated disc with loss of leg strength and/or sensation, achieved a successful non-operative resolution with MDT if they could centralize their symp-toms and achieve full passive extension (a press-up). The results showed that 91% of persons who achieved this were able to avoid surgery at 5 year follow-up.

KOPP ET AL IN 1986

- Kopp et al in 1986 reported on 67 Navy personnel with sciatica, neural deficits, and loss of their extension range-of-motion who were admitted to consider disc surgery due to lack of response to treatment. they tested all 67 patients with some extension movements and positioning upon admission to the hospital. For 34, there was either a pain reduction or they were at least no worse with this testing. Those 34 were prescribed extension exercises to be performed several times a day while remaining in the hospital. All 34 (100%) regained their full lumbar extension range and eliminated all symptoms within 2-5 days. None required surgery.

STENOSIS: EXAM RESULTS AND TREATMENT

- Stenosis
  - Patient interview:
    - Older, gradual onset, gradual worsening
    - Worse with extension activities, Standing and walking
    - Better with flexion activities, sitting and bending
    - Better if walking while leaning forward on the grocery cart

STENOSIS: EXAM RESULTS AND TREATMENT

- Exam:
  - ROM: may be limited but extension will be painful
  - RMT: Flexion will be better. Can do this all day long without issues
  - Extension will be worse, with each repetition but may not be worse as a result and is quickly relieved by bending or sitting
  - No Centralization, Directional preference is flexion

STENOSIS: TREATMENT

- Stenosis
  - Sitting flexion regularly throughout the day
  - Spinal stability exercises emphasizing flexion
  - Proprioceptive training to endorse flexion of the spine even though the patient is doing extension activity (standing and walking). This is very hard to do!!!
  - Myofascial release of the spinal extensors and the hip flexors (which become spinal extendors in standing)
  - Neural mobilization for desensitization

STENOSIS: PROGNOSIS

- If we can get patients walking 50% further, (time wise) that is a good outcome
- Not nearly as good as Disc pain
- Needs constant up grading of program (every few years) to address continuing decrease in muscular performance as people age

SACRO-ILIAC JOINT: EXAM RESULTS AND TREATMENT

- In the absence of centralization the SI joint should be considered
  - Usual complaint pattern is unilateral Pain not usually above the level of L5
  - Pain to rise, sit, turn in bed
  - Some history of trauma in the past or chronic pain except in young women
  - 3/5 + tests

SACRO-ILIAC TREATMENT

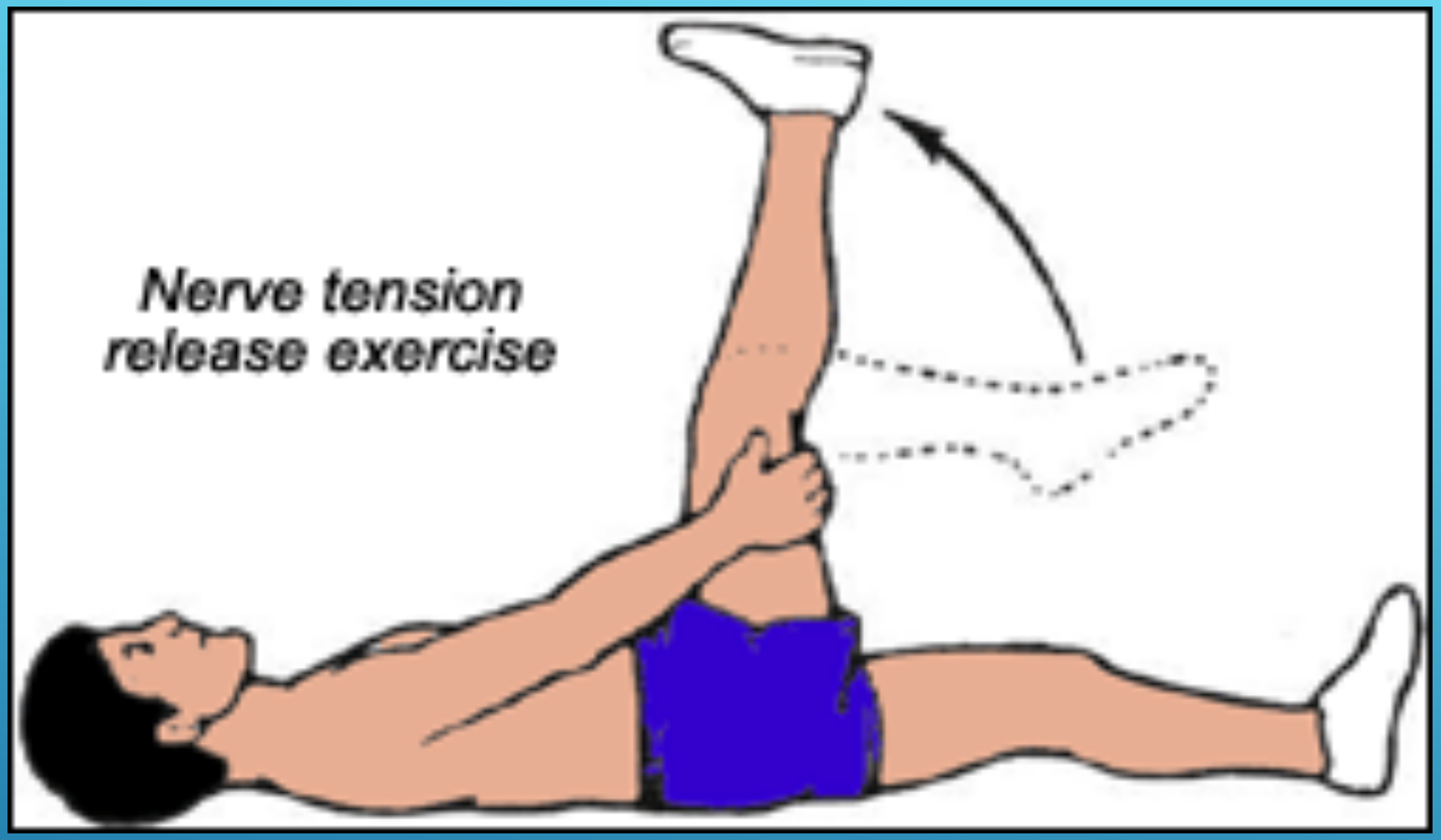
- lumbopelvic stability exercises and intra-articular steroid injections offer the MOST POTENTIAL reducing SIJ pain and it's disability.
- Sacro-iliac joint mobilization techniques may be useful
- Must include Pelvic Floor

- Patient with history of radiculopathy
- Pain for greater then 6 weeks
- RMT: End of range pain, no centralization
- + neural tension tests

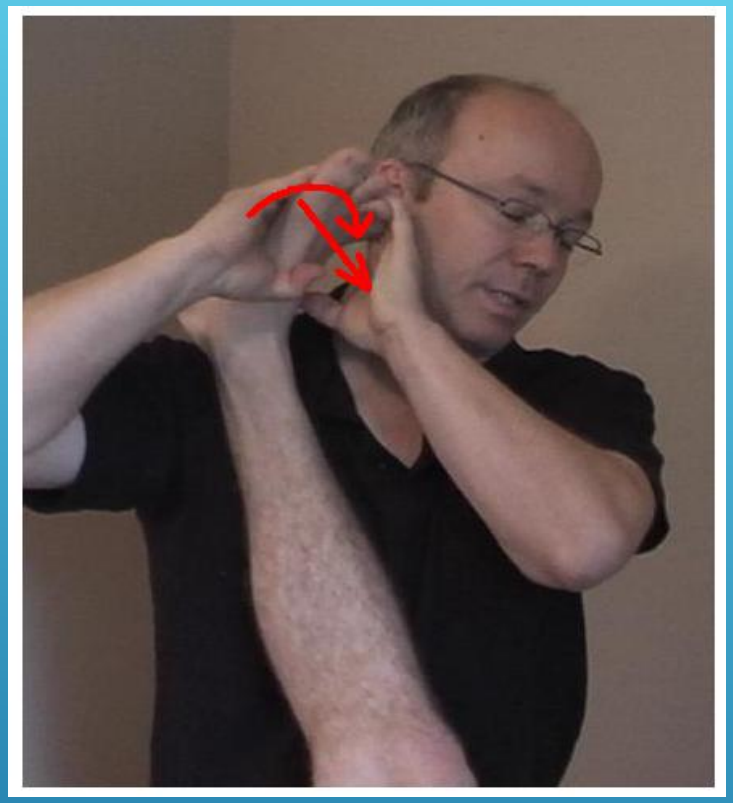
ADVERSE NEURAL TENSION EXAM RESULT AND TREATMENT

ADVERSE NEURAL TENSION

- Treatment
  - Neural irritation: No adherence
    - Desensitization exercises: only to point of pain not into it
    - Repetition is the key
    - Progressive pressure moving the nerve over increasing number of joints proximal to distal
  - Adherent Nerve Root
    - Same exercises but must move the into the pain
  - Both these are help by ESI with therapy



NEURAL MOBILIZATION PROGRESSION #1



NEURAL MOBILIZATION PROGRESSION #2

NEURAL MOBILIZATIONS PROGRESSION #3

FACET JOINT SYNDROME

- May look like SI Joint
- More lumbar pain then pelvic or buttock pain
- Very local pain
- Pain with EOR Extension, standing
- Relieved by sitting or leaning forward
- No Centralization, directional preference is flexion

FACET JOINT

- Treatment:
  - Flexion exercises
  - Mobilizations: gapping
  - Spinal Stability emphasizing the TRA and the Multifidus
  - Facet joint injections and Radiofrequency denervation

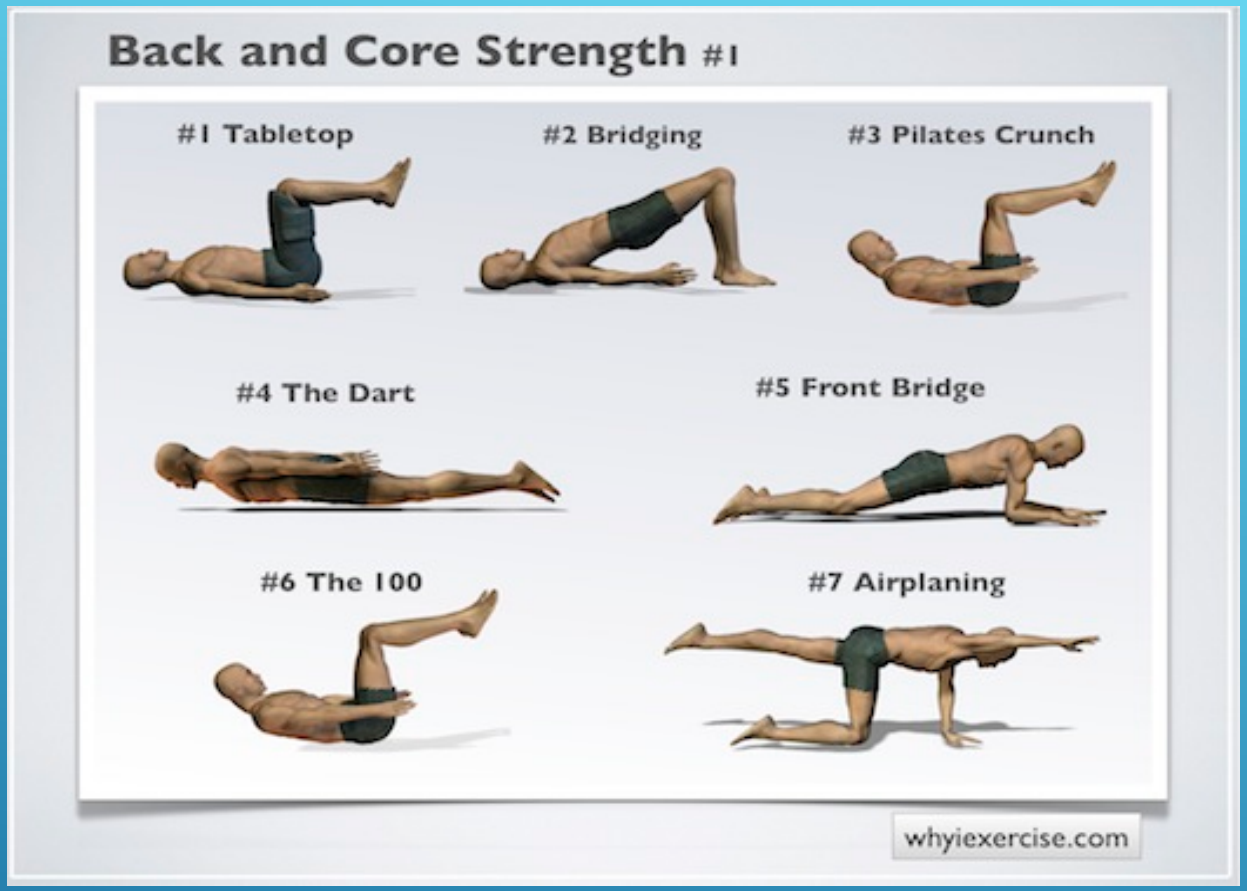
GAPPING MOBILIZATION

MYOFASCIAL PAIN

- Every condition above with have findings of myofascial pain (MFPS)
- Treating the MFPS should only occur after these other conditions have been ruled out or effectively treated
- Often times fixing the underlying problem also resolves the MFPS
- When it does not, then Trigger point therapy is useful including Trigger Point Injections, Dry Needling, Myofascial Release Techniques

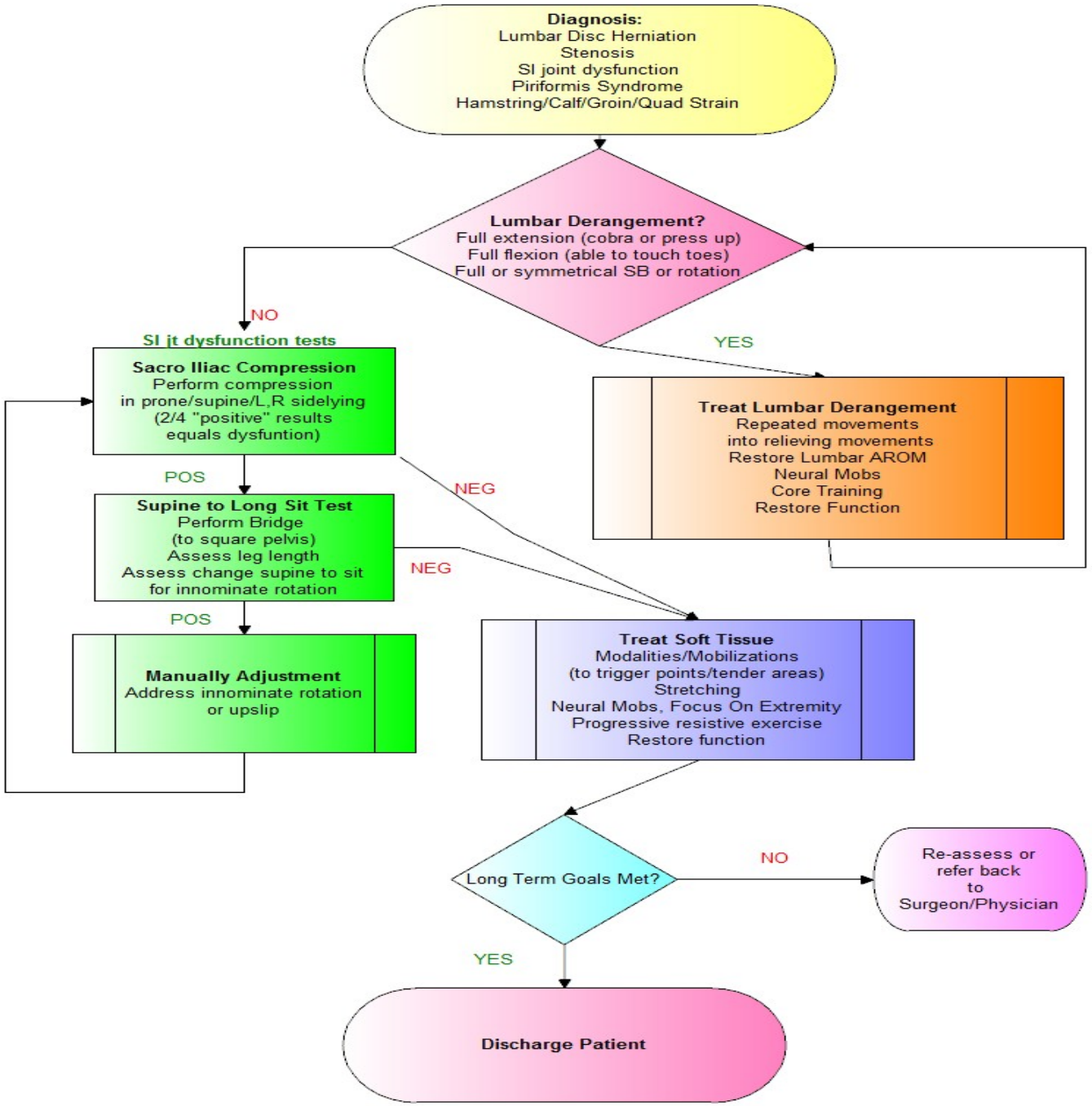
SPINAL STABILITY EXERCISES

- Literally Thousands of different exercises
- Should match the directional preference
- Should be done only after the underlying mechanical issues is addressed
- Should always address the Multifidus
- Only in the rare case is it THE treatment



SPINAL STABILITY EXERCISES

ALGORITHM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Perform compression
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Stretching
Neural Mobs, Focus On Extremity
Progressive resistive exercise
Restore function
Long Term Goals Met?
NO
Re-assess or
refer back
to
Surgeon/Physician
YES
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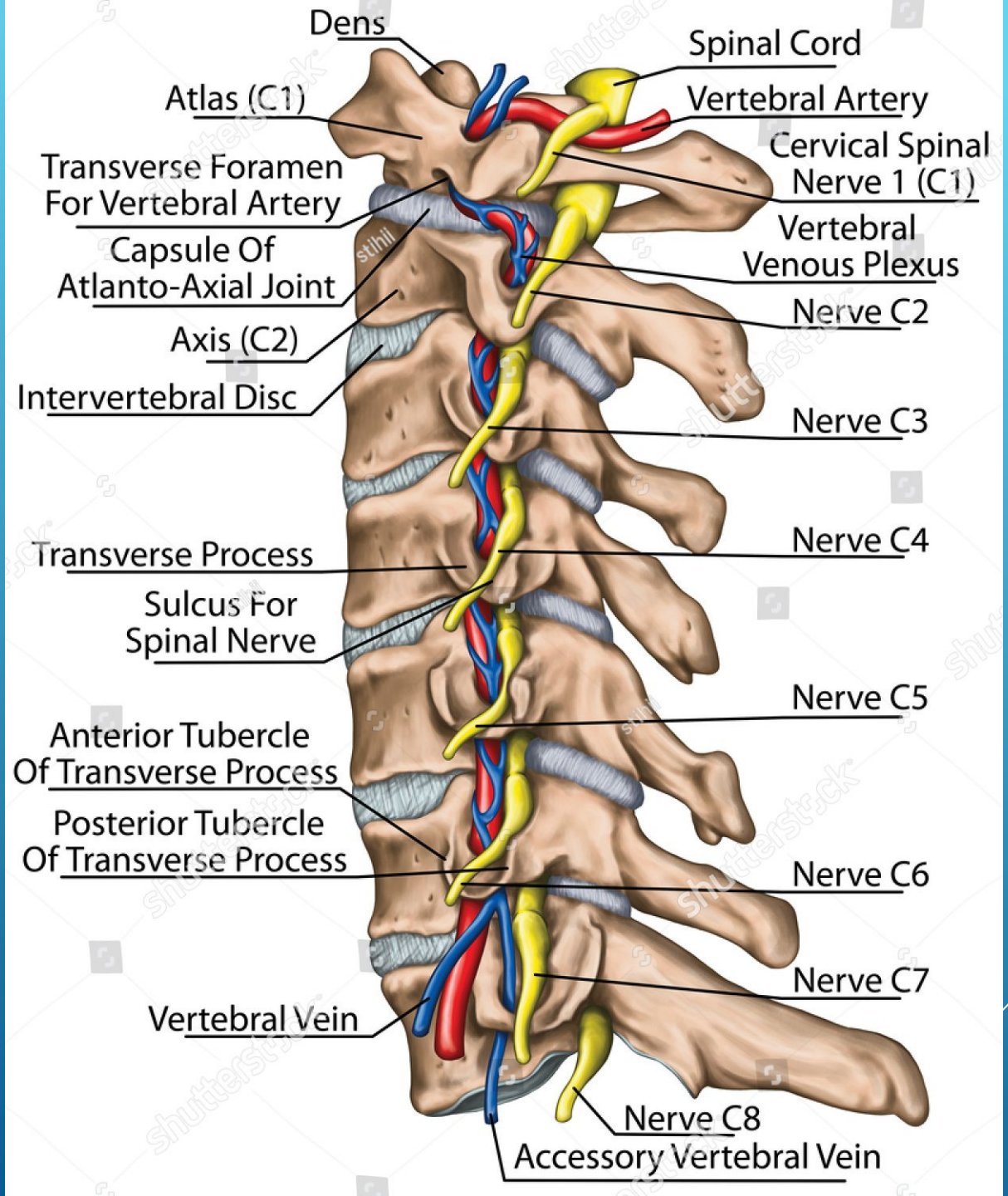
CERVICAL SPINE

ANATOMY REVIEW


Dens
Spinal Cord
Atlas (C1)
Vertebral Artery
Cervical Spinal Nerve 1 (C1)
Transverse Foramen For Vertebral Artery
Vertebral Venous Plexus
Capsule Of Atlanto-Axial Joint
Nerve C2
Axis (C2)
Intervertebral Disc
Nerve C3
Nerve C4
Transverse Process
Sulcus For Spinal Nerve
Nerve C5
Anterior Tubercle Of Transverse Process
Posterior Tubercle Of Transverse Process
Nerve C6
Nerve C7
Vertebral Vein
Nerve C8
Accessory Vertebral Vein

SPECIFIC TESTS

1. MOBILITY
2. REPETITIVE MOVEMENT TESTS
3. NEURAL TENSION TESTS
4. QUADRANT TESTING
5. UPPER CERVICAL LIGAMENT TESTS
   - SHARP PURSER TEST
   - ALAR-ODOINTOID INTEGRITY TEST
   - SEGMENTAL INSTABILITY TEST
6. MYOFASCIAL EXAMINATION

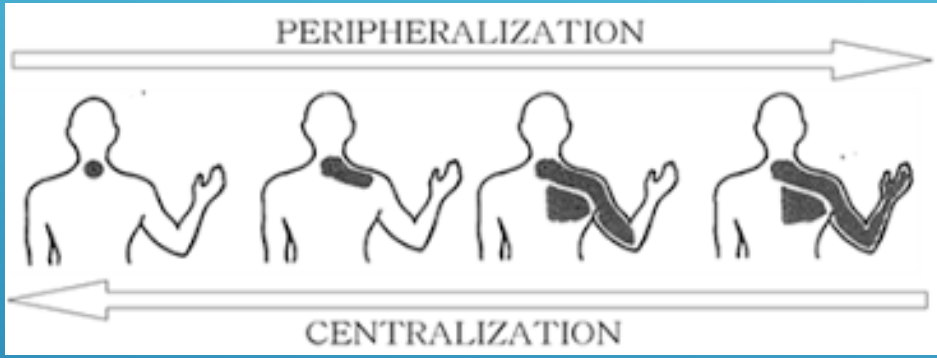
1 MOBILITY

1) AROM (OA -> C7/T1)
   - Flexion: 50 degr.
   - Extension: 80 degr.
   - SB: 45 degr.
   - ROT: 85 degr.

2) PROM

3) SEGMENTAL MOBILITY
   - OA: "Nodding"
   - AA: 40 – 45 degr Rotation
   - C2 – C7: ~ 10 degr. per segment
     SB and Rot to the same side

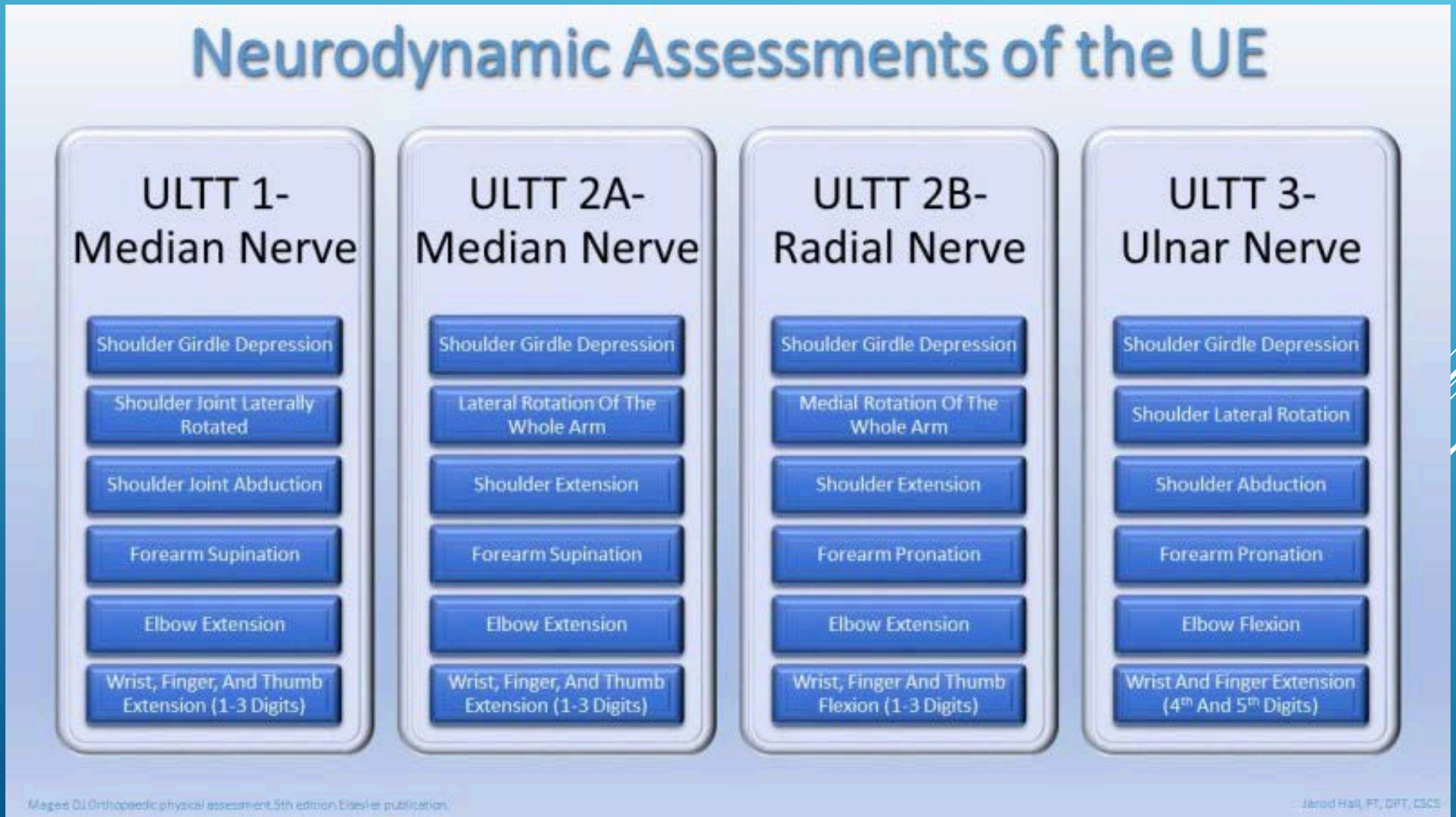
2 REPETITIVE MOVEMENT TESTS



EXAMINE FOR DIRECTIONAL PREFERENCE

- FLEXION
- EXTENSION
- PROTRACTION
- RETRACTION

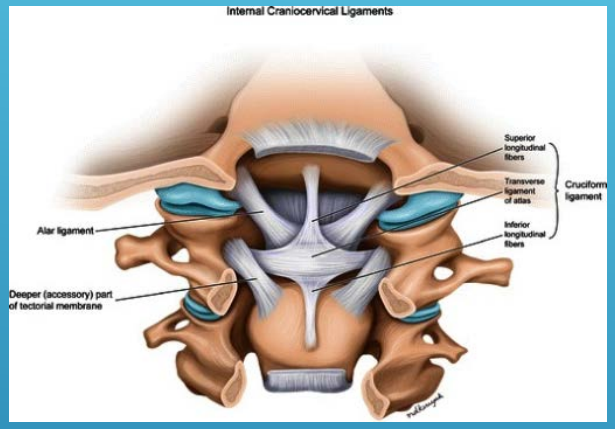
3 NEURAL TENSION TESTS

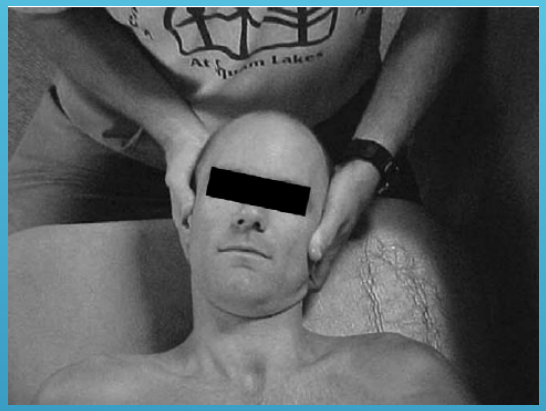


4 QUADRANT TESTING

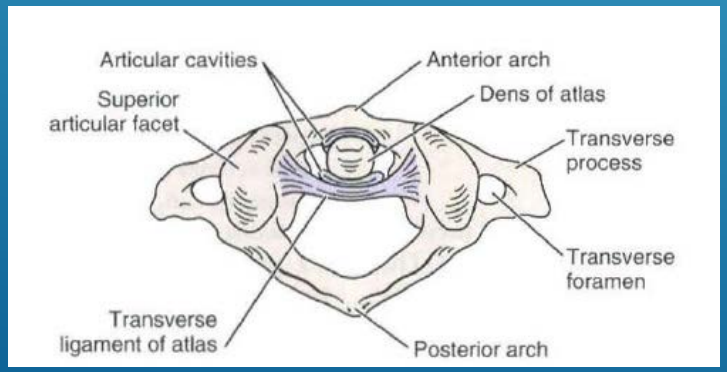
5 UPPER CERVICAL LIGAMENT TESTS

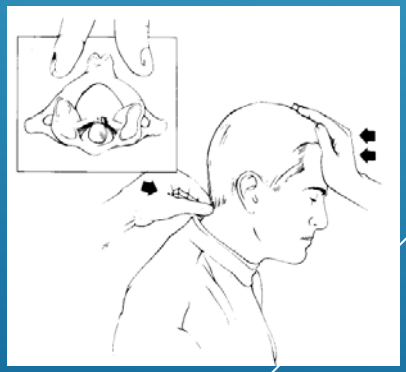
* ALAR-ODOINTOID INTEGRITY TEST





* SHARP-PURSER TEST



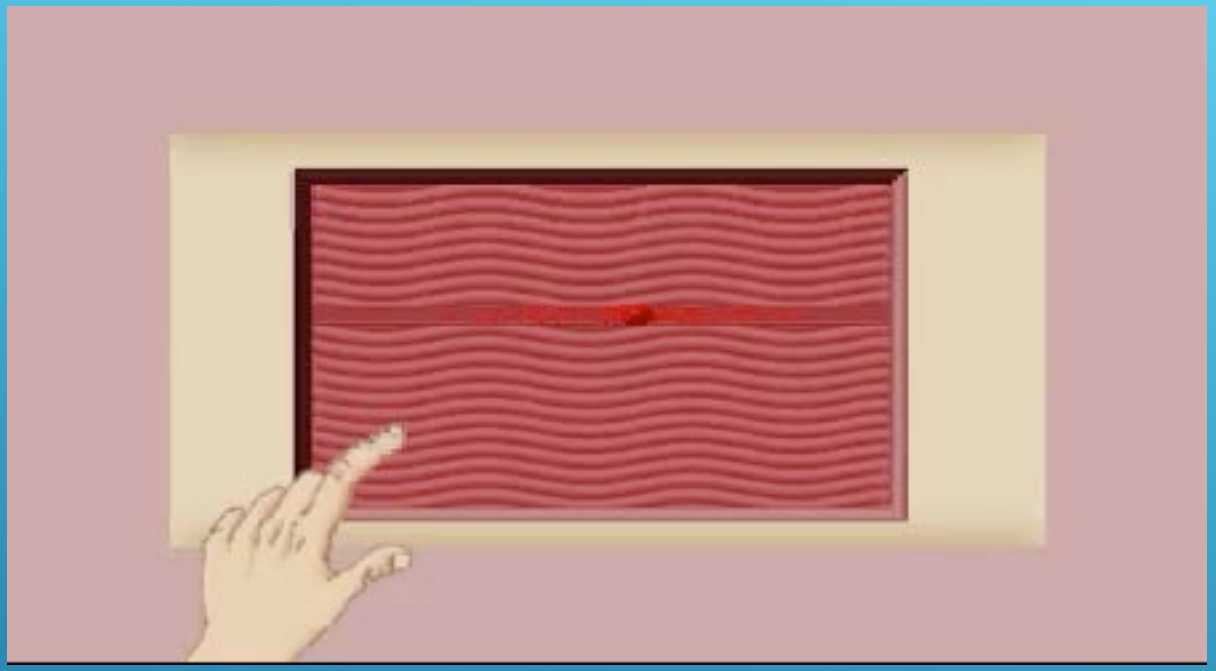


SEGMENTAL INSTABILITY TEST

PATIENT IS PERFORMING A STRONG ISOMETRIC CONTRACTION TOWARDS EXTENSION AND HOLDS.
THE EXAMINER GIVES PA PRESSURE ON EACH SEGEMENT VIA THE SPINOUS PROCESS.
EVALUATE THE (IN)ABILITY TO MOVE EACH SEGMENT

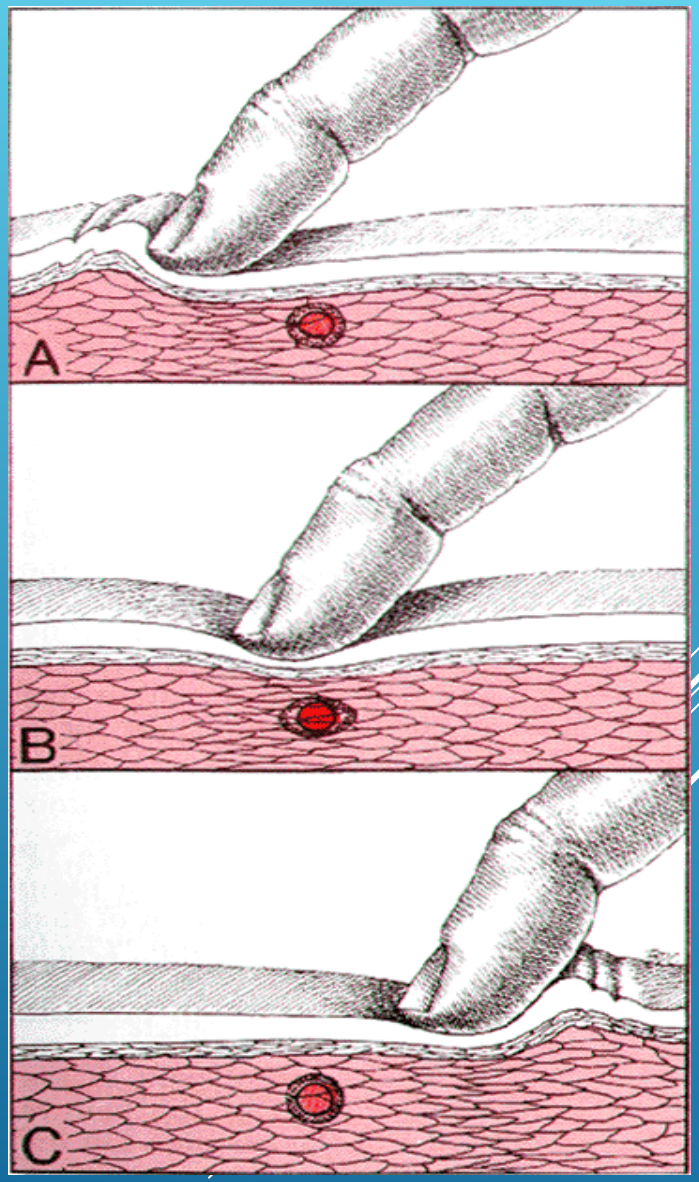
6 MYOFASCIAL EXAMINATION

Identification of a MTrP

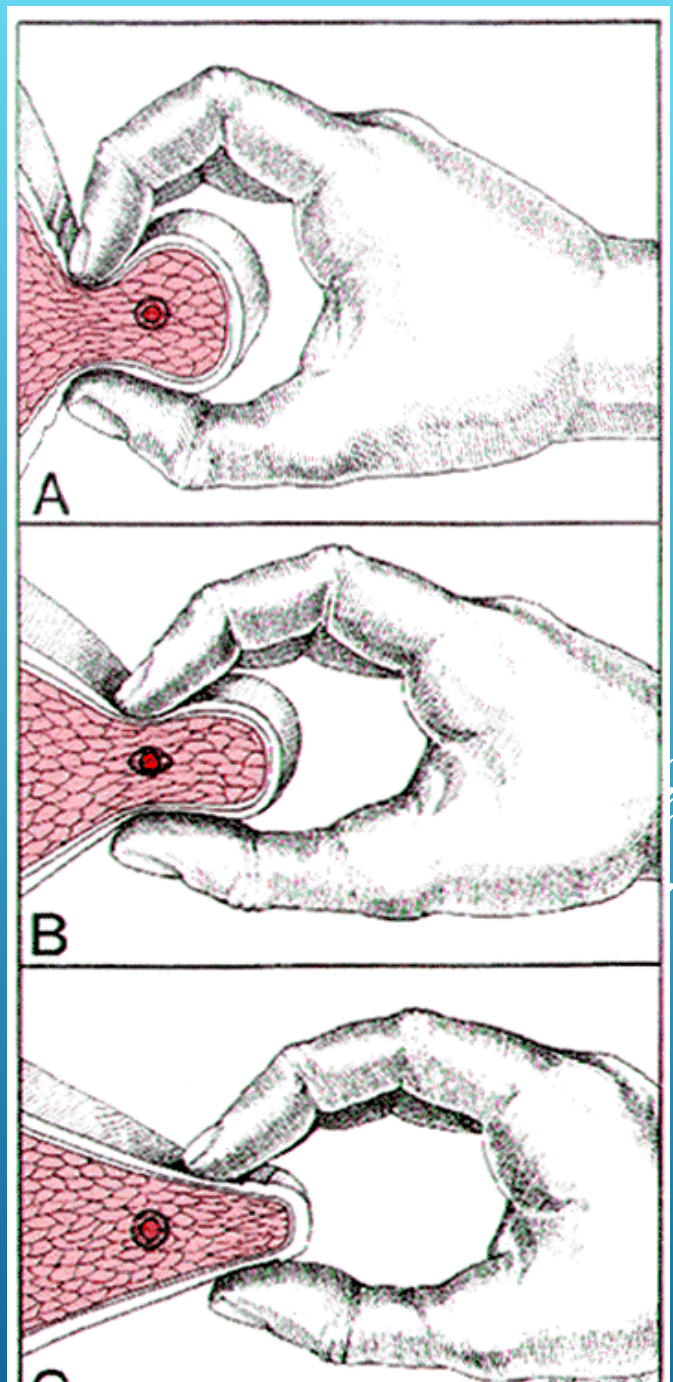


- MTrPs can only be identified by palpation
- Perpendicular to the fiber direction
- First, the clinician identifies a taut band
- Next, by palpating along the band, the local contraction knot can be identified

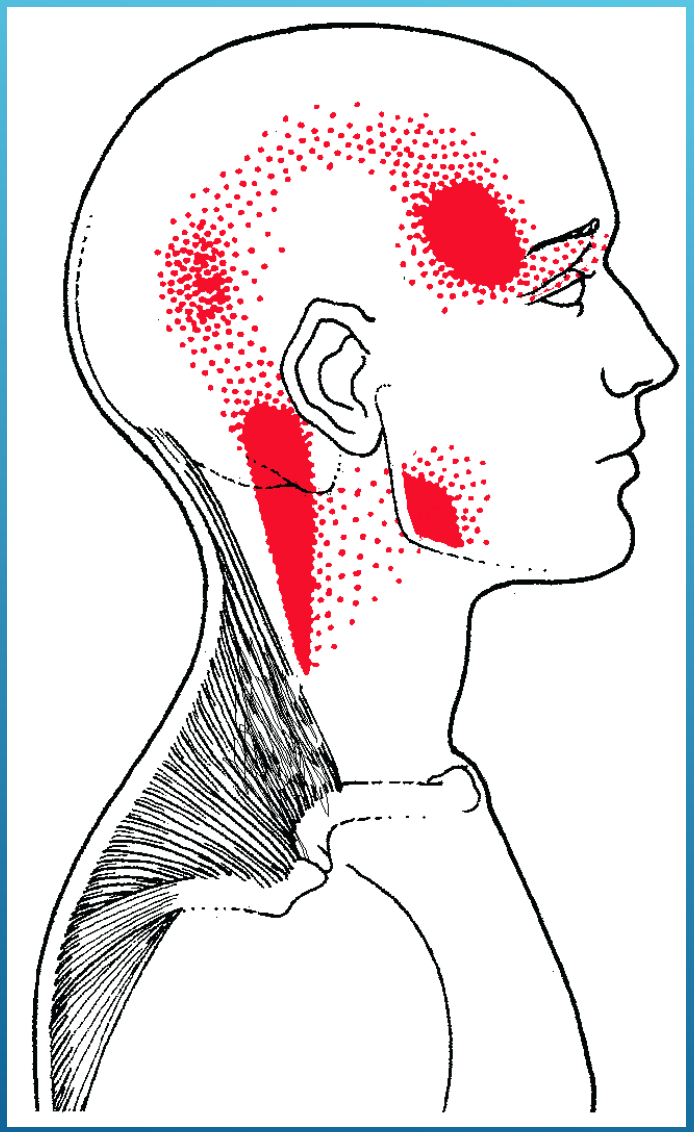
Flat Palpation



Pincer Paplation

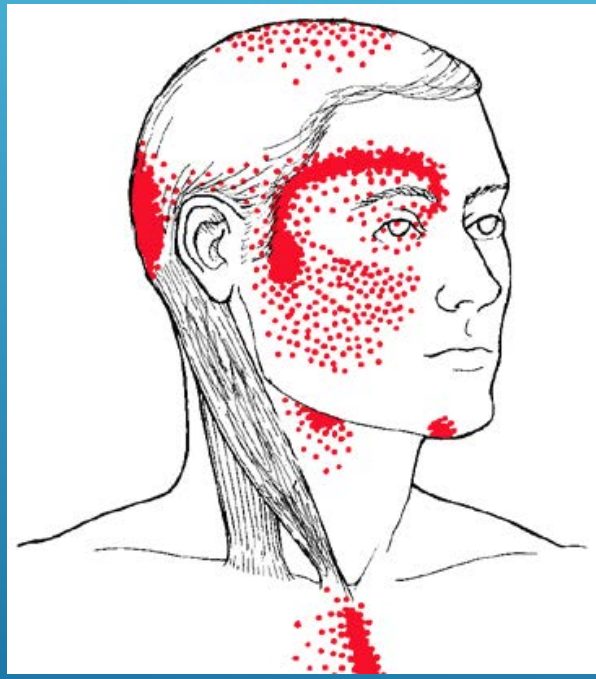


REFERRAL PATTERNS

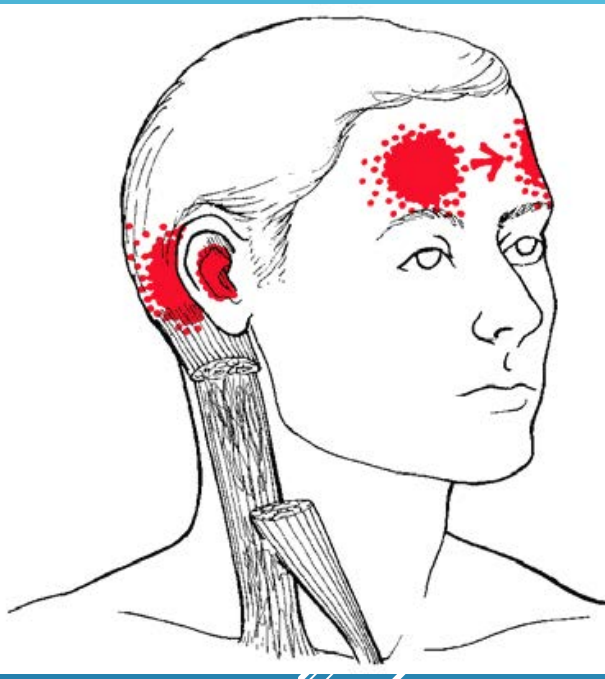


UPPER TRAPEZIUS

SCM

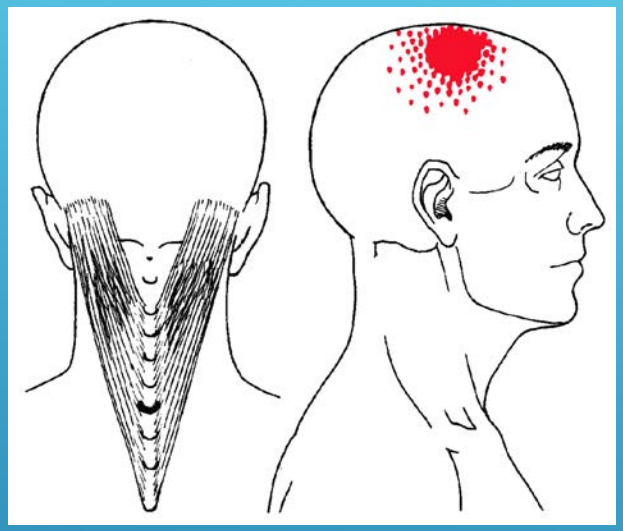


STERNAL HEAD

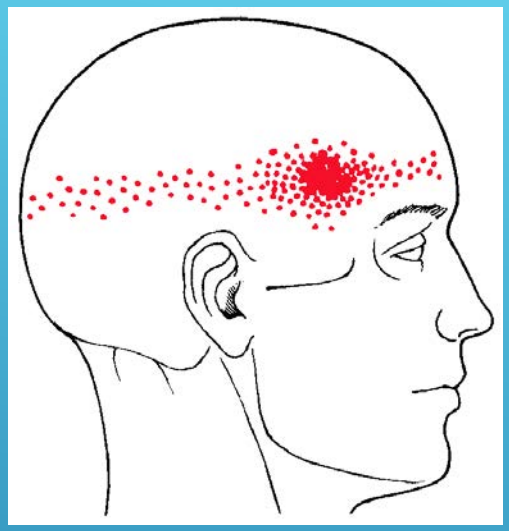


CLAVICULAR HEAD

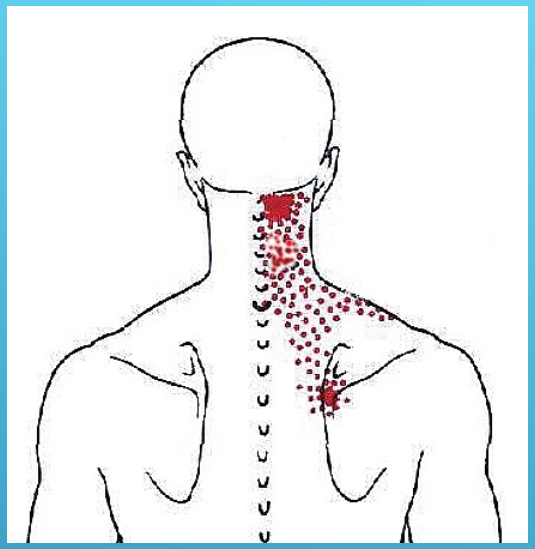
SPLENIUS CAPITIS

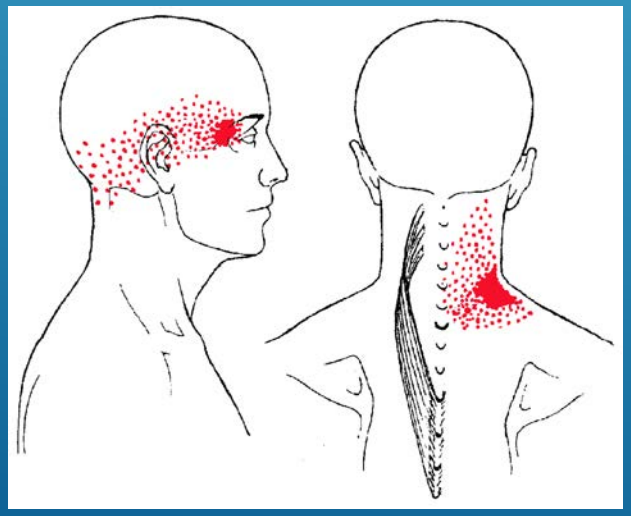


SEMISPINALIS

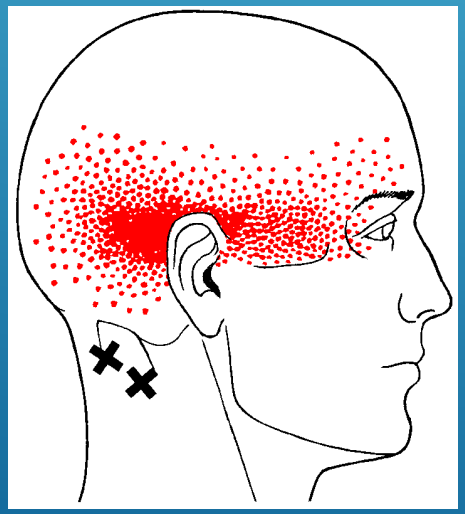


MULTIFIDI

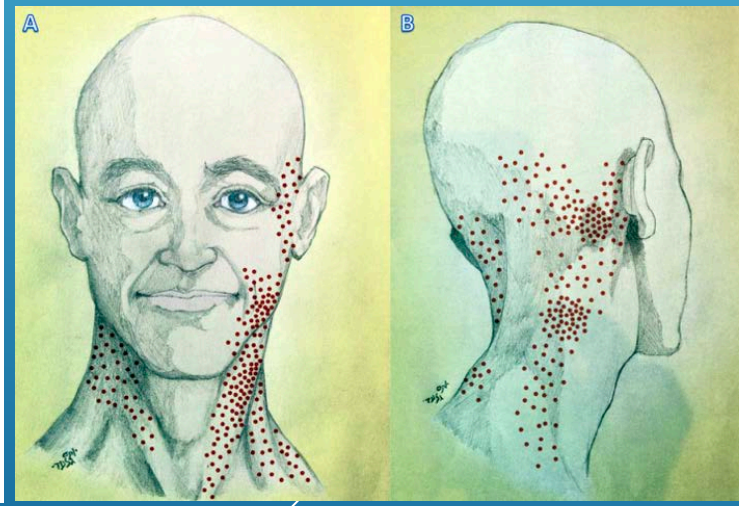




SPLENIUS CERVICIS



OCI



LONGUS COLLI

COMMENTS AND QUESTIONS