Cervical Spine Exercise and Manual Therapy for the Autonomous Practitioner

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Agenda

- Cervical spine screening for sinister pathology
- Osteopathic examination concepts for the physical therapist
- Manual therapy techniques of the cervical spine
- Exercise strategies for the cervical spine

SPIN and SNOUT

- SnOUT = Sensitivity
  - With a (-) result rule it OUT
  - tests that have high Sensitivity, when a (-) result occurs, rule OUT the condition
  - **S**ensitivity **N**egative finding rules **OUT**
- SpIN = Specificity
  - With a (+) result rule it IN
  - test that have high Specificity, when a (+) result occurs, rule IN the condition
  - **S**pecificity **P**ositive finding rules **IN**

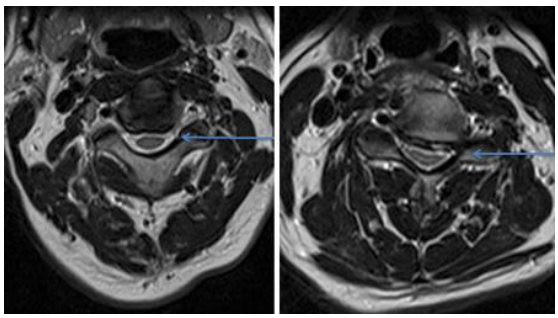
Likelihood Ratios

- Negative LR
  - *Meaningful Negative likelihood ratio = less than .2*
  - *lower number increases shift in accurate probability*
- Positive LR
  - *Meaningful Positive likelihood ratio = over 2*
  - *higher the number increases shift in accurate probability*

Neuro Exam

- Motor and Sensory Exam
- Cranial Nerve
- Reflexes
- Gait

Cervical Myelopathy



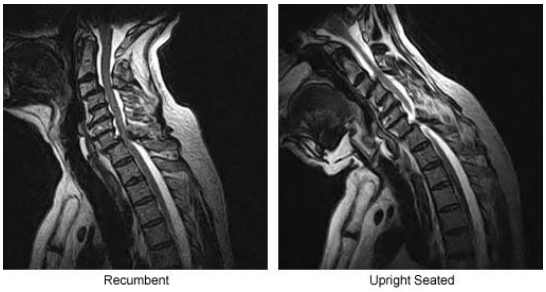
Cook's Clinical Prediction Rule For Myelopathy

- Gait deviation
- Hoffmann's test
- Inverted supinator sign
- Babinski test
- Patient age > 45 years old

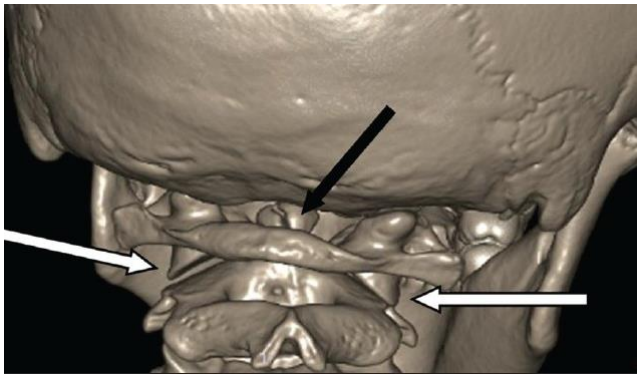
Number of positive tests	Sensitivity	Specificity	LR+	LR-
1	94	31	1.4	.18
2	39	88	3.3	.63
3	19	99	30.9	.81
4	9	100	Inf	.91

Cook CE. J Man Manip Ther 2010

Cervical Spine Instability



Recumbent Upright Seated

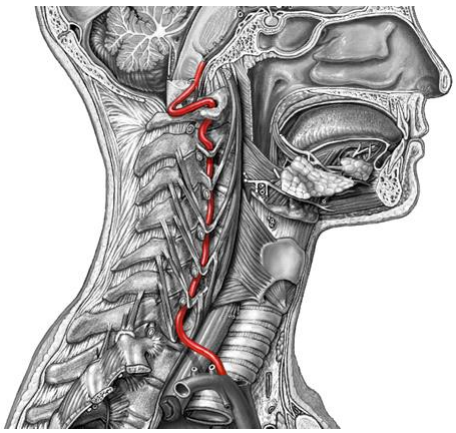


Sub-Cranial Instability

- Anterior shear
- Tectorial membrane distraction
- Alar ligament tests

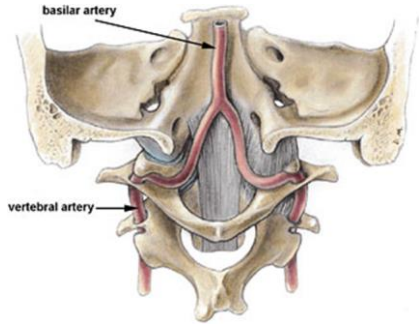
Vertebral Artery Syndrome – Acute Onset

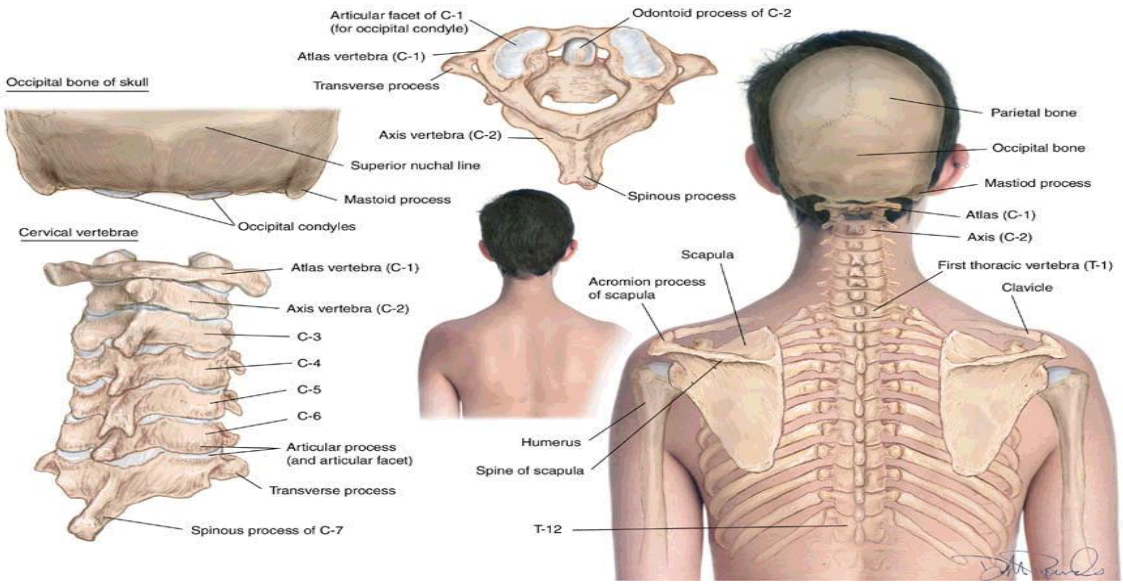
- Mid/upper cervical pain
- Occipital headache
- Acute pain “unlike any other”
- Increased blood pressure



Vertebral Artery Syndrome – Late Onset

- Hindbrain transient ischemic attack
  - Dizziness
  - Diplopia
  - Dysarthria
  - Dysphagia and hoarseness
  - Drop attacks
  - Nausea/Vomiting
  - Nystagmus
  - Facial numbness
  - Ataxia and limb weakness
  - Loss of short term memory





VERTEBRAL MOTION

- All spinal and vertebral movements are described in relation to motions of their ANTERIOR and SUPERIOR surfaces

COUPLED MOTIONS

- **Vertebral units demonstrate coupled motions**
- Sidebending and rotation always occur together rather than separately **they are coupled & change in response to the AP curves of the vertebral axis**
- **Neutral (type I) mechanics**
- **Nonneutral (type II) mechanics**

CERVICAL MECHANICS

- The cervical spine DOES NOT follow Fryette's Principles 1 & 2

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NEUTRAL (TYPE I) MECHANICS

Modified Fryette's 1st principle
AA AND OA LEVEL C/S

- In the OA and AA coupled motions of sidebending and rotation occur in OPPOSITE directions (with rotation occurring towards the convexity).
  - All three: Flexion/Extension/Neutral (Only OA)
- HINT/Mnemonic O in OA= Opposite

NONNEUTRAL (TYPE II) MECHANICS

Modified Fryette's 2nd principle

- In the Lower C/S C2-7 the coupled motions of sidebending and rotation in a single vertebral unit occur in the SAME direction (with rotation towards the concavity).
- All three: Flexion/Extension/Neutral

FRYETTE'S 3rd PRINCIPLE

- Initiating motion of a vertebral segment in any plane of motion will modify and reduce the movement of that segment in all other planes of motion

OA MECHANICS

- Occipital motion on the atlas (C1)
- Primary motion is FLEXION & EXTENSION
  - **occipital condyles articulate with C1**
  - **nodding motion**
- Sidebending and rotation occur to OPPOSITE sides regardless of AP curves

AA MECHANICS

- Atlas (C1) motion on the Axis (C2)
- Primary motion is ROTATION
  - **50% of cervical spine rotation occurs here**
  - **sidebending is extremely limited**
- Sidebending and rotation occur to OPPOSITE sides regardless of AP curves

C2 - C7 MECHANICS

- **Primary motion for the upper portion of the lower cervical unit is** ROTATION (~C2-C4)
- **Primary motion for the lower portion of the lower cervical unit is** SIDEBENDING (~C5-C7)
- Sidebending and rotation occur to the SAME side regardless of AP curves

MOTION TESTING

- Translation: left-to-right or right-to-left movement
- Right translation: left-to-right movement that induces left sidebending
- Left translation: right-to-left movement that induces right sidebending

- If limited translation to the right than the patient lives in right sidebending
- If limited translation to the left than the patient lives in left sidebending

MOTION TESTING

- OA: translation
- AA: rotation
- C2-C7: translation directed at the articular pillars

NOMENCLATURE

- 3 parts to the written diagnosis:
  - type
  - SR **(sidebending and rotation)**
  - direction
- Type is always N, F or E - neutral, flexed, or extended
  - Except in the AA-only rotation is recorded

NOMENCLATURE

- C3 - NS_RR_R FS_LR_L ES_RR_R
- OA - NS_LR_R FS_LR_R ES_RR_L

- A patient is found to have a limited translation to the right at the C3 level. It improves in both Flexion and Extension
- What would the diagnosis be?

- $C3NS_RR_R$

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- A patient is found to have a limited translation to the right at the OA level. It improves in Extension, but not in Flexion.
- What would the diagnosis be?

- $OAES_RR_L$

Mobilization techniques Cervical Spine

- Mobilization techniques
- **Extension:** Vertebral body needs to glide anterior. P-A glides approximation of the spinous processes. The facets close. Manual Techniques in supine, prone, sitting. Self-technique using a towel.

Mobilization techniques Cervical Spine

- Mobilization techniques
- **Flexion:** Vertebral body needs to glide posterior. The facets open. Manual and self-technique in sitting. Stabilize the vertebrae below and the patient actively flexes the neck.

Mobilization techniques Cervical Spine

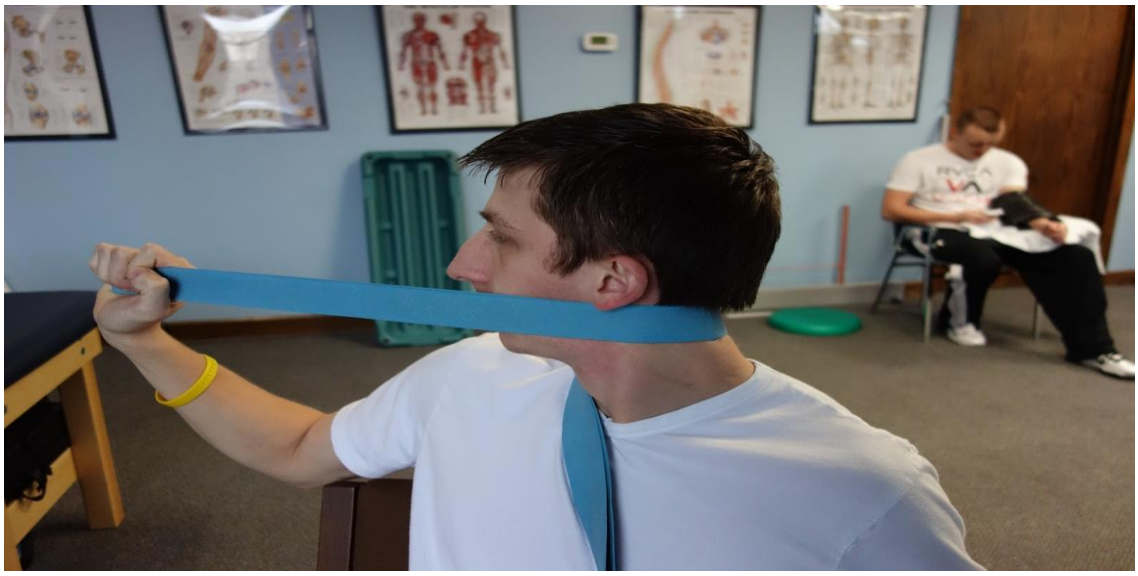
- Mobilization techniques
- **Lateral flexion:** Vertebral body needs to glide away from the direction of lateral flexion. The facet toward the lateral flexion closes and the opposite facet opens. Manual technique in supine and sitting.

Mobilization techniques Cervical Spine

- Mobilization techniques
- **Rotation:** Vertebral bodies of the lower cervical need to turn in the direction of rotation. The facet toward the rotation closes and the side away from the rotation opens. Manual techniques in supine, prone, sitting using unilateral P-A's, blocking techniques, and active movement techniques. Self-technique using a towel.

Seated Mobilization

- Glides grade 3 and grade 4
- Muscle energy
- Counterstrain
- Movement Mobilization
- Myofascial Release
- Self Mobilization



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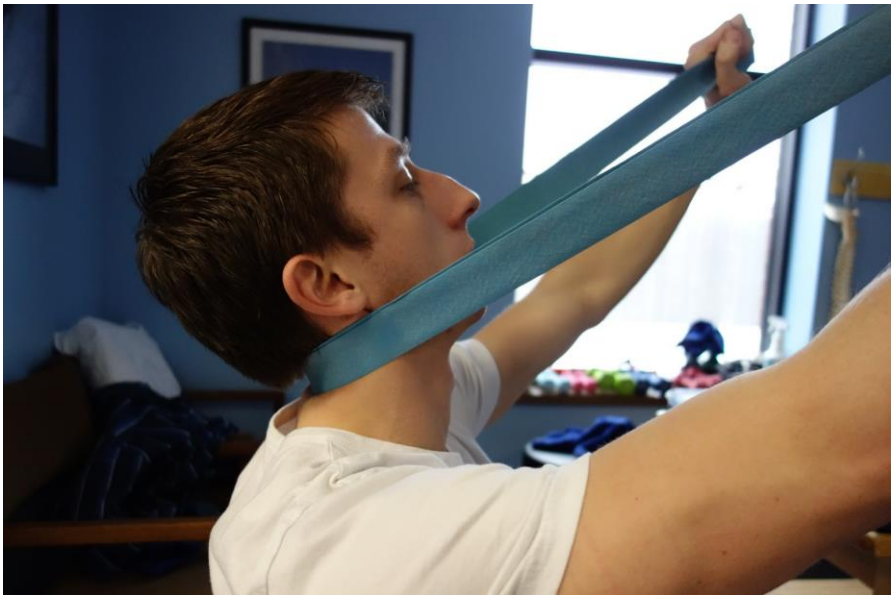
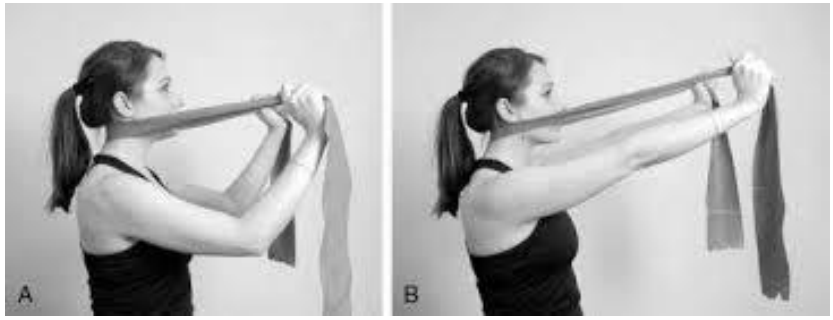
- 1st rib mobilization




A
B


A
B

Mobility Training: Thoracic Spine Rotation

Start position: Side lying with hips and knees flexed above 90

Technique: Rotate so that top arm rests flat on the floor opposite of starting position

Dose: Used for mobility, include sustained holds (10-20seconds) repetitions as needed (5-15 each side)

Mobility Training: Thoracic Spine Rotation and Extension

Start position: Quadruped position, one elbow flexed and tucked toward opposite knee

Technique: From starting position rotate trunk so that elbow reaches towards ceiling

Dose: 5 second holds at end-range, repetitive movement (5-20 repetitions)

Cranio-Cervical Flexion

Start position: Supine without pillow

Technique: Forward nodding (roll) of cranium until contraction of strenocleidomastoid and scalenes is palpated

Dose: 10 second holds x10, progressing amount of flexion without global muscle contraction

Supine Neck Flexion Test

In supine ask patient to lift head off table.

0= Unable to lift head

1= Chin thrust

Apply one finger resistance to forehead if normal

2= Chin thrust with manual resistance

3= Normal, no chin thrust

0-2 indicates SCM compensation or weak deep neck flexors

Supine Break Test

Supine with chin tuck ask patient to push head into table.

Clinician uses two fingers on each lamina to provide anterior force.

Any segment that shears forward is positive.

Cranio-Cervical Flexion With Elevation - Advanced

Start position: Supine with head resting on table

Technique: Forward roll of cranium and then lift head off table. Should maintain flexion position throughout, (look to maintain wrinkles in neck)

Dose: 10 x 10 second holds. This is an advanced movement only to be used for those with physically demanding work/recreation

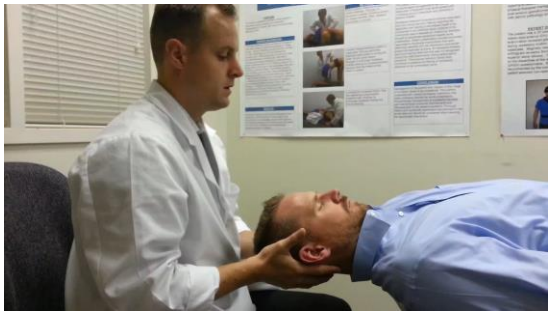
Supine Isometrics

Start Position: Supine with clinician supporting patients head

Technique: Clinician raises head slightly asking patient to move into resistance. Extension, flexion, side-bending and rotation can be resisted depending on the impairment

Dose: 5-10 second holds for 10-15 repetitions to decrease movement sensitivity and initiate muscle contractions

Craniocervical Flexion Against Gravity



Start Position: Supine with clinician supporting patients head elevated without table support

Technique: Patient assumes craniocervical flexion with clinician slowly decreasing head support. This exercise can be done in varying angles of cervical flexion and extension

Dose: Increasing duration based on tolerance to increase cervical muscular endurance

Isotonic Cervical Extensor Training

Start Position: Sitting or standing with resistance band against desired level

Technique: Patient assumes craniocervical flexion and concurrently resists into cervical extension

Dose: 10-20 repetitions increasing to over 30 repetitions as tolerance allows

Side Bending and Rotation Isotonics Against Gravity

Start Position: Side lying with towel roll and pillow supporting head

Technique: Patient raises head slightly into side bending and rotation

Dose: 5-10 second holds for 5-10 repetitions to increase side bending and rotation strength against gravity

Peri-scapular Motor Control

Start position: Standing in door frame with arms placed along sides

Technique: Slides arms up and down frame. Progressed by increasing amount of horizontal abduction arm position

Dose: High volume repeated movements (20-50), used as a periscapular retraction training movement

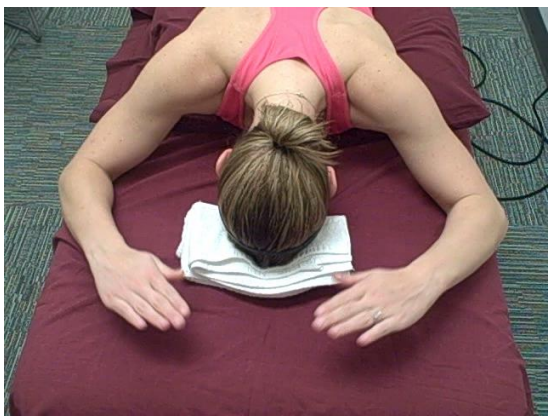
Peri-scapular Motor Control

Start position: Standing with back against wall, arms positioned 90/90

Technique: Slide arms up and down wall for retraction training movement

Dose: High repetition number for motor control re-training

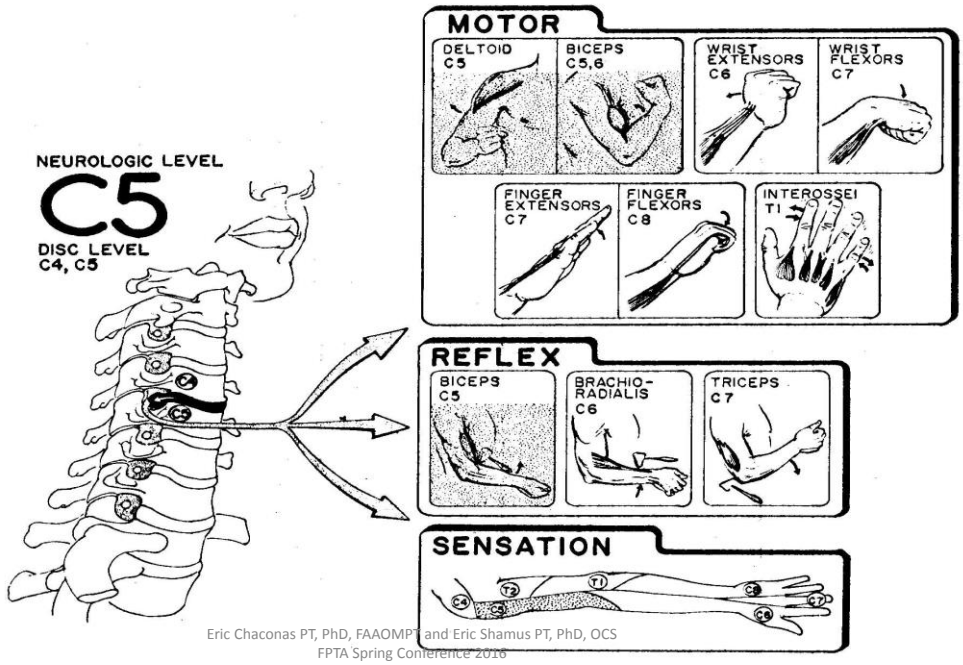
Lower Trapezius – Low Level

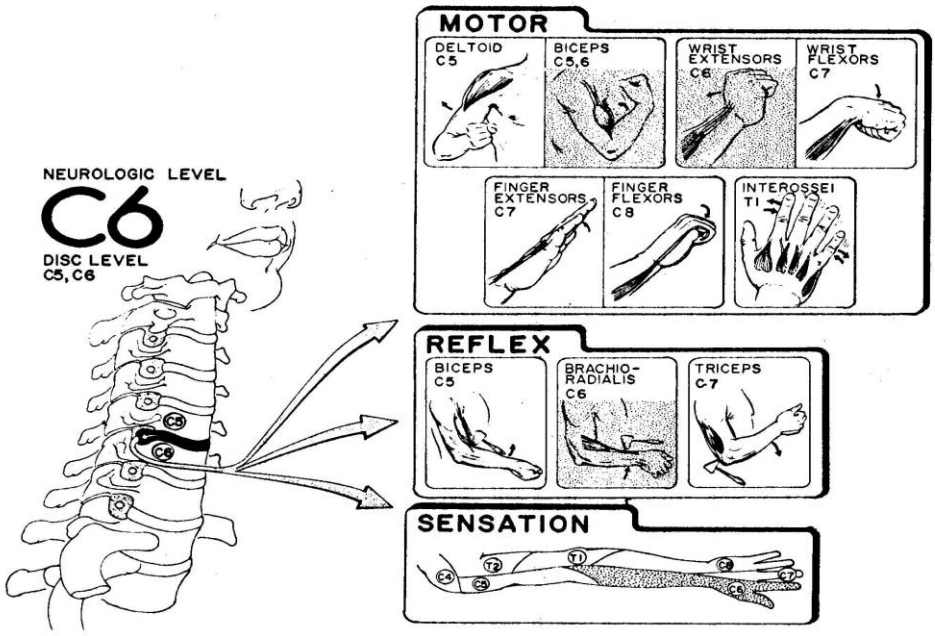


Start position: Prone with elbows resting on table, forehead resting on towel roll

Technique: Bilateral shoulder external rotation (hand lift) in this position will initiate lower trapezius contraction

Dose: High repetition range for motor control and endurance lower trapezius training





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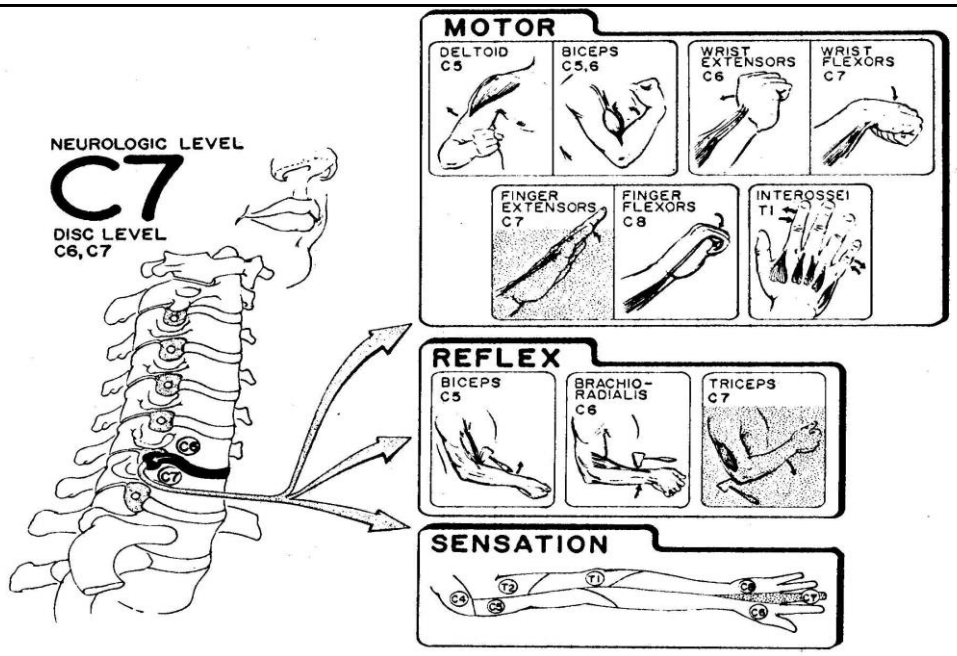
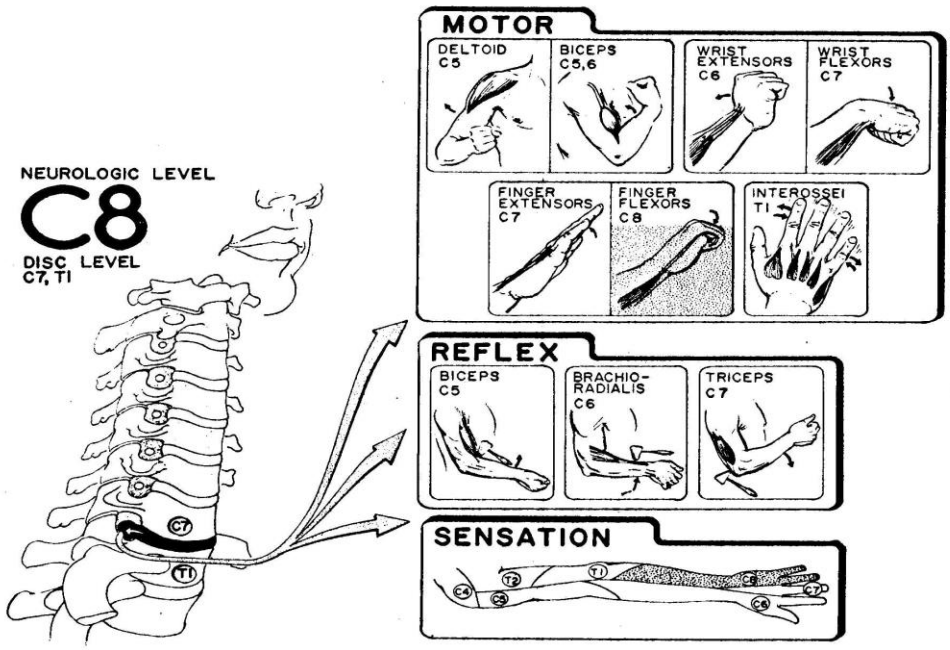
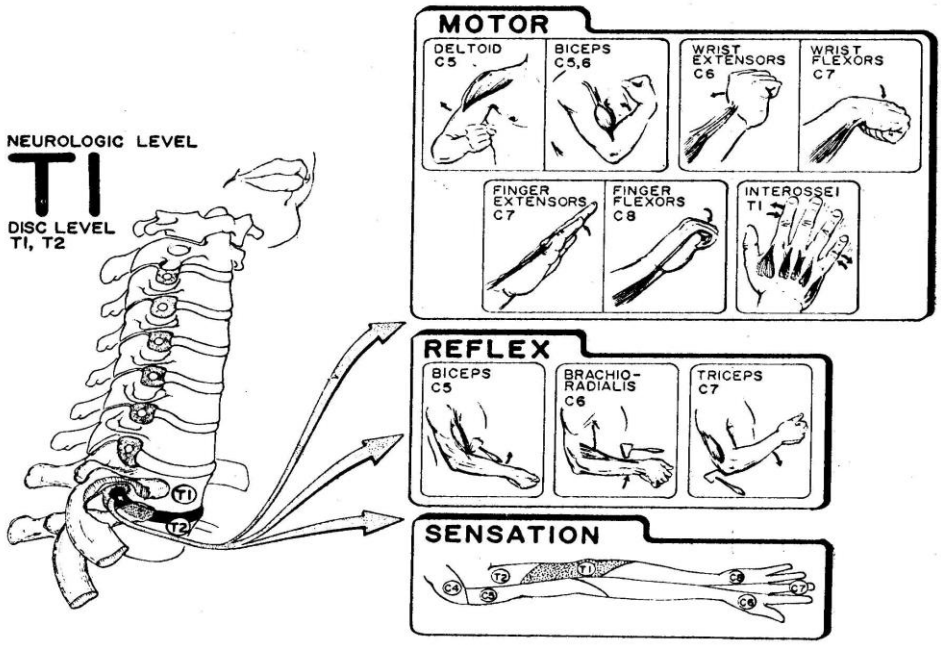

NEUROLOGIC LEVEL
C7
DISC LEVEL
C6, C7
MOTOR
DELTOID C5
BICEPS C5,6
WRIST EXTENSORS C6
WRIST FLEXORS C7
FINGER EXTENSORS C7
FINGER FLEXORS C8
INTEROSSEI T1
REFLEX
BICEPS C5
BRACHIO-RADIALIS C6
TRICEPS C7
SENSATION


NEUROLOGIC LEVEL
C8
DISC LEVEL
C7, T1
MOTOR
DELTOID C5
BICEPS C5,6
WRIST EXTENSORS C6
WRIST FLEXORS C7
FINGER EXTENSORS C7
FINGER FLEXORS C8
INTEROSSEI T1
REFLEX
BICEPS C5
BRACHIO-RADIALIS C6
TRICEPS C7
SENSATION



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