CERVICAL ASSESSMENT

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Cervical Spine Anatomy Review

- Consists of several pairs of joints
- Atlanto-occipital joint
  - Articulations are between the occiput and C1
  - Principle motion at this joint is flexion and extension - nodding of head
  - Gliding synovial diarthrotic joint

Atlanto-axial joint

  - Articulation between C1 and C2. pivot synovial
  - Principle motion at this joint is rotation
  - DAMAGE TO THIS REGION CAN CAUSE SYMPTOMS OF HEADACHES, FATIGUE , VERTIGO, POOR CONCENTRATION, HYPERTONIA OF SYMPATHETIC NERVOUS SYSTEM, AND IRRITABILITY
  - THERE MAY BE COGNITIVE DYSFUNCTION, CRANIAL NERVE DYSFUNCTION, AND SYMPATHETIC SYSTEM DYSFUNCTION

https://www.youtube.com/watch?v=RNUpMNd_u1U

Nerve Roots and Vertebral Segments

- 7 cervical vertebra and 8 cervical nerve roots
  - C1 exists btw occiput and C1
  - Each nerve root is named by the vertebra below it
- Atlanto-occipital and atlanto-axial joints are the most complicated articulation of the axial skeleton
- Rotation is the primary movement of the atlanto-axial joint (odontoid process- pivot)
  - Talking and chewing produce small movement at C1-2
- The atlanto-axial joint is stabilized by the transverse ligament (holds dens from C2 onto C1)
  - This ligament can weaken and rupture in individuals with Rheumatoid arthritis

Facets

- The lower C/S (C3-7) is often called the cervicobrachial pain is often referred to the U/E
- 14 facet joints (C1-C7)
- T1-2 are often included
- Superior facets face upward, backward and medially, the inferior facets face downward, forward and laterally; this facilitates flexion and extension and prevents side flexion and rotation from occurring independent of each other (COUPLED MOVEMENT)
- The most mobility occurs between C4-5 and C6-7 (most degeneration occurs here)
- Gliding, synovial, Diarthrotic Joints

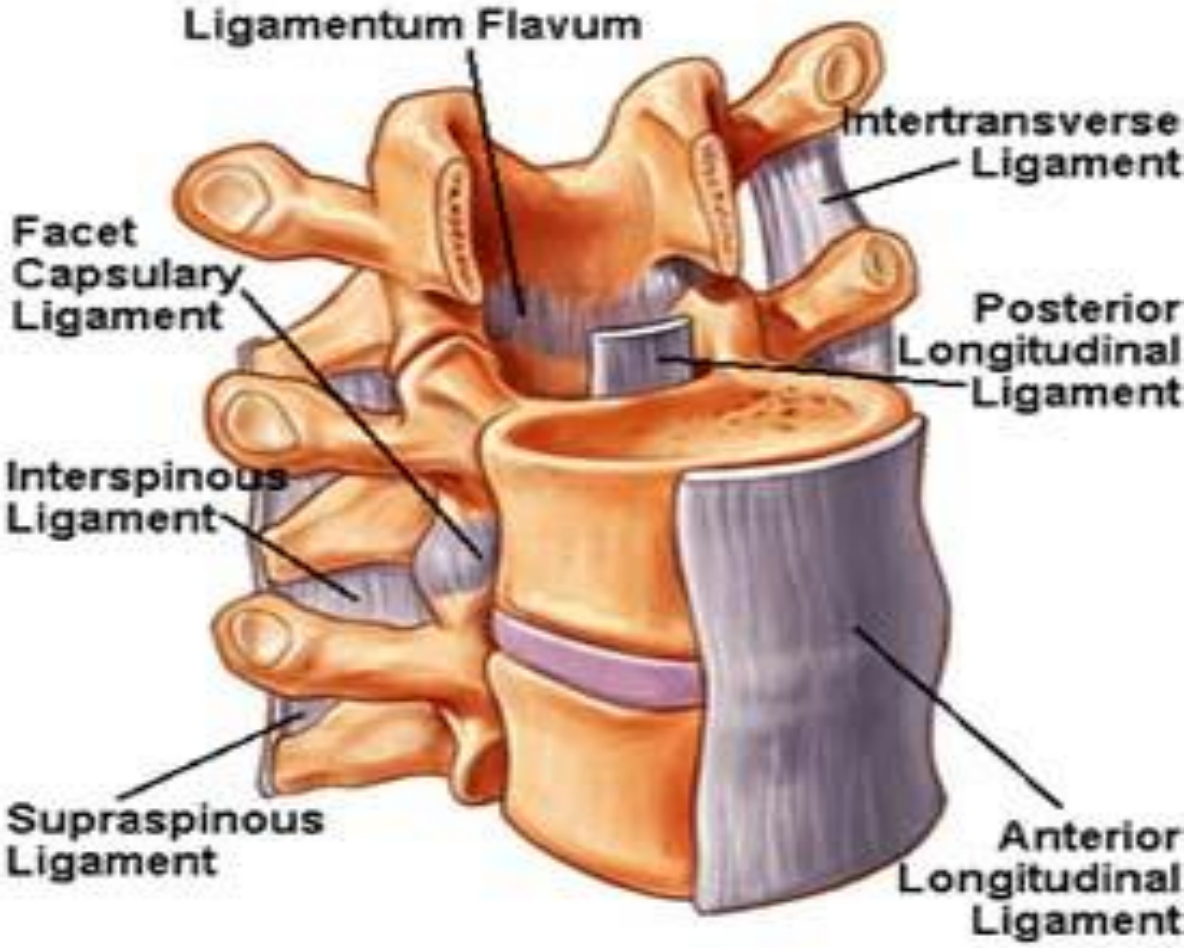
Ligaments

- Anterior and posterior longitudinal ligaments
  - The Anterior Longitudinal Ligament attaches to the front (anterior) of each vertebra. This ligament runs up and down the spine (vertical or longitudinal).
  - The Posterior Longitudinal Ligament runs up and down behind (posterior) the spine and inside the spinal canal.

Ligaments Continued

- Ligamentum flavum
  - The Ligamentum Flavum forms a cover over the dura mater: a layer of tissue that protects the spinal cord. This ligament connects under the facet joints to create a small curtain over the posterior openings between the vertebrae.
- Supraspinous and interspinous ligament
  - The supraspinous ligament, Travels along with the vertebral column ,is a strong, fibrous cord that connects together the apices of the spinous processes of the seventh cervical vertebra to the sacrum; at the point of attachment to the tips of the spinous process. From vertebra C7 to the skull, the ligament becomes structurally distinct from more caudal parts of the ligament and is called the **ligamentum nuchae**

Ligaments


Ligamentum Flavum
Intertransverse Ligament
Facet Capsulary Ligament
Posterior Longitudinal Ligament
Interspinous Ligament
Supraspinous Ligament
Anterior Longitudinal Ligament

Vertebral Artery

- Passes through C/S TP's at C6
- Supplies 20% of the brains blood (along with the internal carotid artery-80%)
- Lies close to facet joints, easily compressed with osteophyte formation or injury to the facet joint
- Vertebral and carotid arteries are stressed by rotation, extension and traction

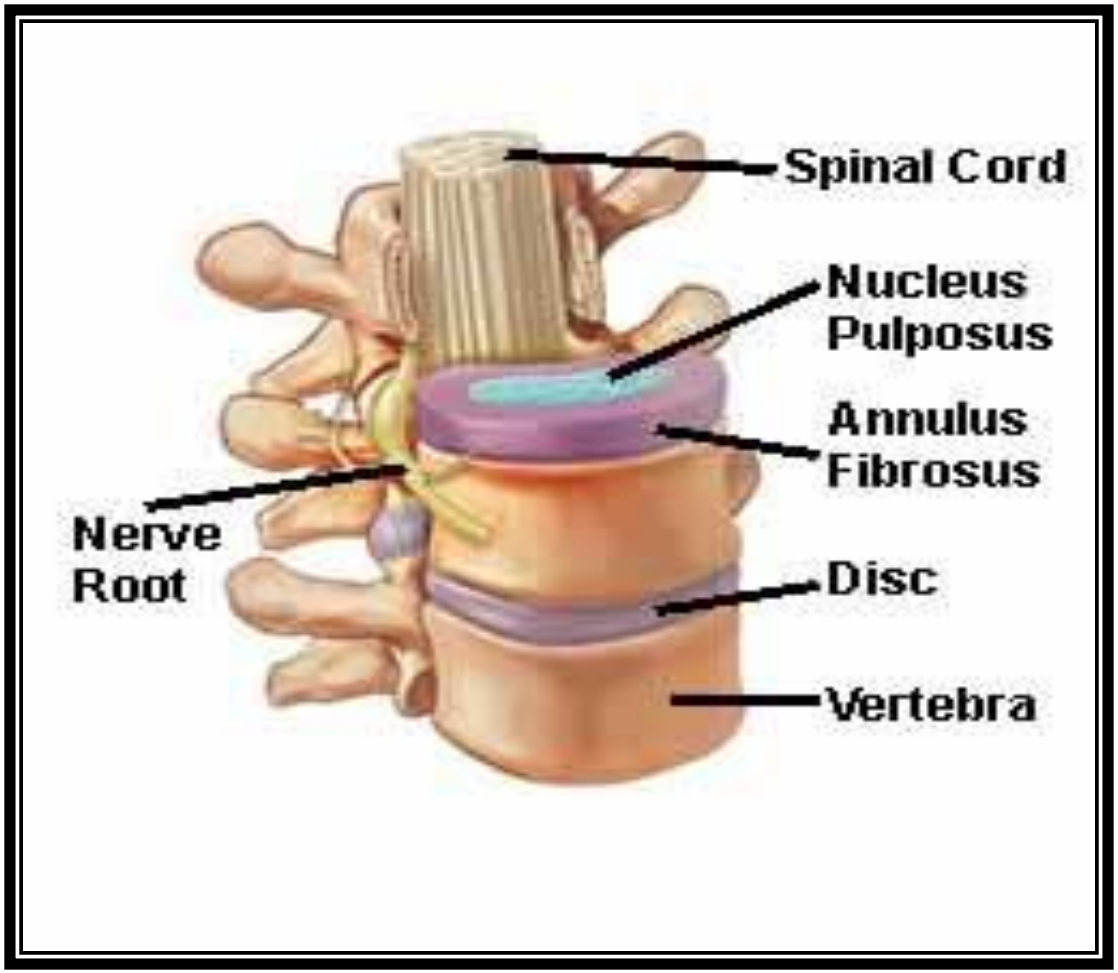
Vertebral Artery Continued

- Most stress on artery occurs at:
  - Entrance of C6 transverse process
  - Within bony canals of vertebral transverse processes
  - Between C1-2
  - Between C1 and entry to skull
- Vertebral artery insufficiency:
  - Dizziness
  - Dysphagia- difficulty swallowing
  - Dysphasia- impairment in understanding language
  - Diplopia- double vision
  - Drop attacks- falling without fainting
  - Dysarthria- difficulty speaking
  - Nausea
  - Nystagmus - a condition where the eyes move rapidly and uncontrollably. ... side to side (horizontal **nystagmus**) ... The movement can vary between slow and fast and usually happens in both eyes
  - Positive cranial nerve signs

Intervertebral Disc Anatomy

- Discs give the C/S the lordotic shape
- No disc exits between occiput and atlas (C0-1) or atlas and axis (C1-2)
- Consists of the annulus Fibrosus and nucleus pulposus
- Annulus fibrosus withstands tension in the disc

Intervertebral Disc



Capsular pattern

Capsular Patterns

- If the capsule of a joint is affected, the pattern of limitation is the feature that indicates the presence of a capsular pattern
- The pattern is a result of a total joint reaction, with muscle spasm, capsular contraction and generalized osteophyte formation being possible causes
- Each joint has a characteristic pattern of limitation
- Only joints that are controlled by muscle can have a capsular pattern

Non-Capsular Patterns

- A limitation that exists but does not correspond to the classic capsular pattern for that joint
- Although a total capsular reaction is absent there are other possibilities such as ligamentous adhesions, internal derangement, or extra articular cartilage

Positions & Capsular Pattern

- Resting Position – Midway between Flexion and Extension
- Close Pack – Full Extension
- Capsular Pattern - a limitation of pain and movement in a joint specific ratio, which is usually present with arthritis, or following prolonged immobilization
- Cervical Capsular Pattern – Side Flexion and Rotation equally limited, extension

Patient history

- Group read page 168-178

Observation

- Home read page 179-182

Degrees of motion Cervical Spine

- Atlanto-occipital joint
  - Flexion- 5
  - Extension- 10
  - Lateral Flexion- 5
  - Rotation- negligible
- Atlanto-axial joint
  - Flexion- 5
  - Extension- 10
  - Lateral flexion- negligible
  - Rotation – 40-45

Degrees of motion Cervical Spine

- Intracervical region (C2-7)
  - Flexion- 35
  - Extension- 70
  - Lateral flexion- 35
  - Rotation- 45
- Total craniocervical region
  - Flexion- 45-50
  - Extension- 85
  - Lateral flexion- 40
  - Rotation- 90
- All C/S endfeels are a tissue stretch

AROM

- flexion
- extension
- side flexion
- rotation

Approximate Range of Motion for the Three Planes of Movement for the Joints of the Craniocervical Region*

Joint or Region	Flexion and Extension (Sagittal Plane, Degrees)	Axial Rotation (Horizontal Plane, Degrees)	Lateral Flexion (Frontal Plane, Degrees)
Atlanto-occipital joint	Flexion: 5 Extension: 10 *Total: 15*	Negligible	About 5
Atlanto-axial joint complex	Flexion: 5 Extension: 10 *Total: 15*	40–45	Negligible
Intracervical region (C2–C7)	Flexion: 35 Extension: 70 *Total: 105*	45	35
Total across craniocervical region	Flexion: 45–50 Extension: 85 *Total: 130–135*	90	About 40

PROM

- Flexion (tissue stretch)
- Extension (tissue stretch)
- Side flexion (tissue stretch)
- Rotation (tissue stretch)

RIM

- Flexion
- Extension
- Side flexion
- Rotation

Peripheral Joint Scanning

- Used to rule out obvious pathologies in the extremities and to note areas that may need more detailed assessment
- Each of the following is scanned bilaterally
- Pathology originating in the C/S can refer pain/tingling to the upper extremity

TMJ

- Therapist checks the movement of the joint by placing the index finger anterior to the ear
- The client then open and closes the mouth as the therapist feels for equal movement of the condyles, and for clicking or grinding
- Note if client experiences pain and with what movements
- Therapist observes the client when opening and closing mouth looking for any deviation

Shoulder

- Client is asked to actively abduct, forward flex arm
- Then client is asked to medially and laterally rotate while arm is abducted to 90
- Lastly the client is asked to perform an apley's scratch test with both arms
- Therapist notes any restrictions, and if client experiences pain

Elbow

- The elbow joint is actively moved through flexion, extension, supination and pronation
- Any restrictions or abnormal movements should be noted

Wrist/Hand

- Client actively performs flexion, extension, radial and ulnar deviation of wrist
- Active flexion, extension, abduction, adduction and opposition are performed in the hand
- Any restrictions or abnormal movements should be noted

Neurological Scans

NERVE ROOT	DERMATOME	MYOTOME	REFLEX	PARETHESIAS
C1	Vertex of skull	None	None	**None**
C2	Temple, forehead, occiput	Longus colli, sternocleidomastoid, rectus capitis	None	**None**
C3	Entire neck, posterior cheek, temporal area, under mandible	Trapezius, splenius capitis	None	**Cheek, side of neck**
C4	Shoulder area, clavicle area, under scapular area	Trapezius, levator scapulae	None	**Horizontal band along clavicle and upper scapula**
C5	Deltoid area, anterior aspect of entire arm to base of thumb	Supraspinatus, infraspinatus, deltoid, biceps	Biceps, brachioradialis	**Thumb and index finger**
C6	Anterior arm, radial side of hand to thumb and index finger	Biceps, supinator, wrist extensors	Biceps, brachioradialis	**Thumb and index finger**
C7	Lateral arm and forearm to index, long and ring fingers	Triceps, wrist flexors (rarelt wrist extensors)	Triceps	**Index, long and ring fingers**
C8	Medial arm ad forearm to long, ring and little fingers	Ulnar deviators, thumb extensors, thumb adductors (rarely triceps)	Triceps	**Little finger alone or with 2 adjacent fingers**
T1	Medial side of forearm to base of little finger			
T2	Medial side of upper arm to medial elbow, pectoral and midscapular region			
T3 – T12	**T3-T6 – upper thorax** **T5-T7 – costal margins** **T8-T12 – abdomen and lumbar region**			

Myotomes

- Myotomes are tested with resisted isometric contraction of each action
- Contraction should be held for 5 seconds so that weakness if any can be noted
- Where applicable both sides are tested at the same time to provide comparison
- To test the motions of the neck it should be placed slightly into the movement to be tested, for example if testing neck flexion the neck should be slightly flexed before the resisted contraction is applied

Cervical Myotomes 195

C1 – C2 neck flexion

C3 neck side flexion

C4 shoulder elevation

C5 shoulder abduction

C6 elbow flexion and/or wrist extension

C7 elbow extension and/or wrist flexion

C8 thumb extension and/or ulnar deviation

T1 abduction and/or adduction of hand intrinsics

Muscle Strength Grading:

0	No muscle contraction is detected
1	A trace contraction is noted in the muscle by palpating the muscle while the patient attempts to contract it.
2	The patient is able to actively move the muscle when gravity is eliminated.
3	The patient may move the muscle against gravity but not against resistance from the examiner
4	The patient may move the muscle group against some resistance from the examiner.
5	The patient moves the muscle group and overcomes the resistance of the examiner. This is normal muscle strength.

Positioning for Cervical Myotome Testing

C1-C2 Neck Flexion

- Pt. head should be slightly flexed. Examiner applies pressure to forehead while stabilizing the trunk w hand btw scaps. Ensure the neck does not extend when applying pressure.

- Rectus lateralis, rectus capitis anterior, longus capitis, longus coli, longus cervicis and SCM

C3 Neck Side Flexion

- Examiner places one hand above the pt's ear and applies a side flexion force while stabilizing the pt's trunk w the other hand on the opposite shoulder. Both R and L side flexion should be tested.

- Longus capitis, longus cervicis, traps, middle scalene

C4 Shoulder elevation

- Have pt elevate shoulders to half elevation. Examiner applies a downward force to both shoulders while pt attempts to hold them in position. Ensure pt is not “bracing” their arms against the thighs or rib cage.

- Diaphragm, traps, levator scap, ant scalenes, middle scalene

C5- Shoulder abduction

Ask the patient to abduct both their arms to 75°- 80° w elbows flexed to 90°. Examiner applies a downward force to the humerus while pt attempts to hold the position. To prevent rotation examiner places forearms on top of pt's forearms.

Deltoid muscle is innervated by the C5 nerve root via the axillary nerve.

Rhomboid maj and min, delt, supra, infra, teres minor, biceps, ant and mid scalenes

C6- Elbow flexion and wrist extension

Have pt put arms at sides w elbows flexed to 90 and forearms in neutral. Apply a downward isometric force to the forearm to test elbow flexors.
Pt. arms by the sides; elbows at 90; forearms pronated; wrist, hands and fingers in netral. Examiner applies a downward force to the hands to test wrist extension.
The biceps muscle is innervated by the C5 and C6 nerve roots via the musculocutaneous nerve.

Serratus ant, lats, subscap, teres major, pec major, biceps, coracobrachialis, brachialis, supinator, ECRL, all scalenes

C7- Elbow extension/ wrist flexion

Have pt put arms at sides w elbows flexed to 90 and forearms in neutral. Apply a upward isometric force to the forearm to test elbow extensors.
Pt. arms by the sides; elbows at 90; forearms supinated; wrist, hands and fingers in netral. Examiner applies a upward force to the hands to test wrist flexion.

The triceps muscle is innervated by the C6 and C7 nerve roots via the radial nerve.

Serratus ant, lats, pec major/minor, pronator teres, FCR, FDS, ECRL, ECRB, extensor digitorum, extensor digiti minimi, mid and post scalenes.

C8 thumb extension and ulnar deviation

- Pt. arms by the sides; elbows at 90; forearms pronated; wrist, hands and fingers in netral. Examiner applies a lateral force to the hands to test ulnar deviation.
- Pt. extends the thumb just short of full ROM. Examiner applies isometric force to bring the thumb into flexion.

- Pec major and minor, triceps, FDS, FDP, FPL, pronator quad, FCU, abductor pollicis longus, EPL, EPB, extensor indicis, abductor pollicis brevis, FPB, opponens pollicis, mid and post scalenes

T1 Hand Intrinsics

- The patient squeezes a piece of paper between the fingers while the examiner tries to pull it away; the pt may squeeze the examiner's fingers, or the pt may abduct the fingers slightly with the examiner isometrically adducting them.

- FDP, intrinsic muscles of hand (except extensor pollicis brevis), FPB, opponens pollicis

- Remember as with most videos there will be some variations on how we perform some motions.
- Make sure that you are referring to the slides or your textbook as these videos are just for reference

- https://www.youtube.com/watch?v=kogxzmQj1-Y

FUNCTIONAL ASSESSMENT

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Why??

- If in the history pt complains of functional difficulties or examiner suspects some functional impairment, a series of functional tests or movements may be performed to determine the functional abilities.
- breathing, swallowing, looking up at ceiling, looking down at belt buckle or shoe laces, shoulder check, tuck chin in, poke chin out and neck strength

SPECIAL TESTING

VBI Health History

- Vertigo, dizziness, unsteadiness and giddiness (drunk feeling)
- Patient may have headache or neck that is worse or different than any other pain they have previously experienced
- Visual disturbances (foggy vision, double vision
- Facial numbness
- Dysphagia, dysarthria, hoarseness
- Syncope (drop attacks)
- Hearing changes
- Ataxia (hemiparesis) (lack of voluntary muscular control)
- Nystagmus

Possible Risk Factors

- Most Common – Atherosclerosis
- History of Transient Ischemic Attacks
- Head and neck trauma (MVA)
- Hypertension
- Diabetes
- Smoking
- Oral Contraceptive use
- Ligamentous hypomobility
- C1-C2 instability (congenital defect, Marfans Syndrome, prior trauma, Spondylolisthesis

Vertebrobasilar Ischemia (VBI)/ Vertebral Artery Insufficiency

What is it?

- Insufficient blood supply to the brain due to disruption in blood flow supplied by carotid or vertebral Artery

Possible Causes?

- Emboli or Thrombosis, Aneurysm, arterial dissection or vascular compression secondary to cervical stenosis, instability, bony anomaly or soft tissue mass

Special Tests
VBI/Dekleyn-Nieuwenhuyse 211

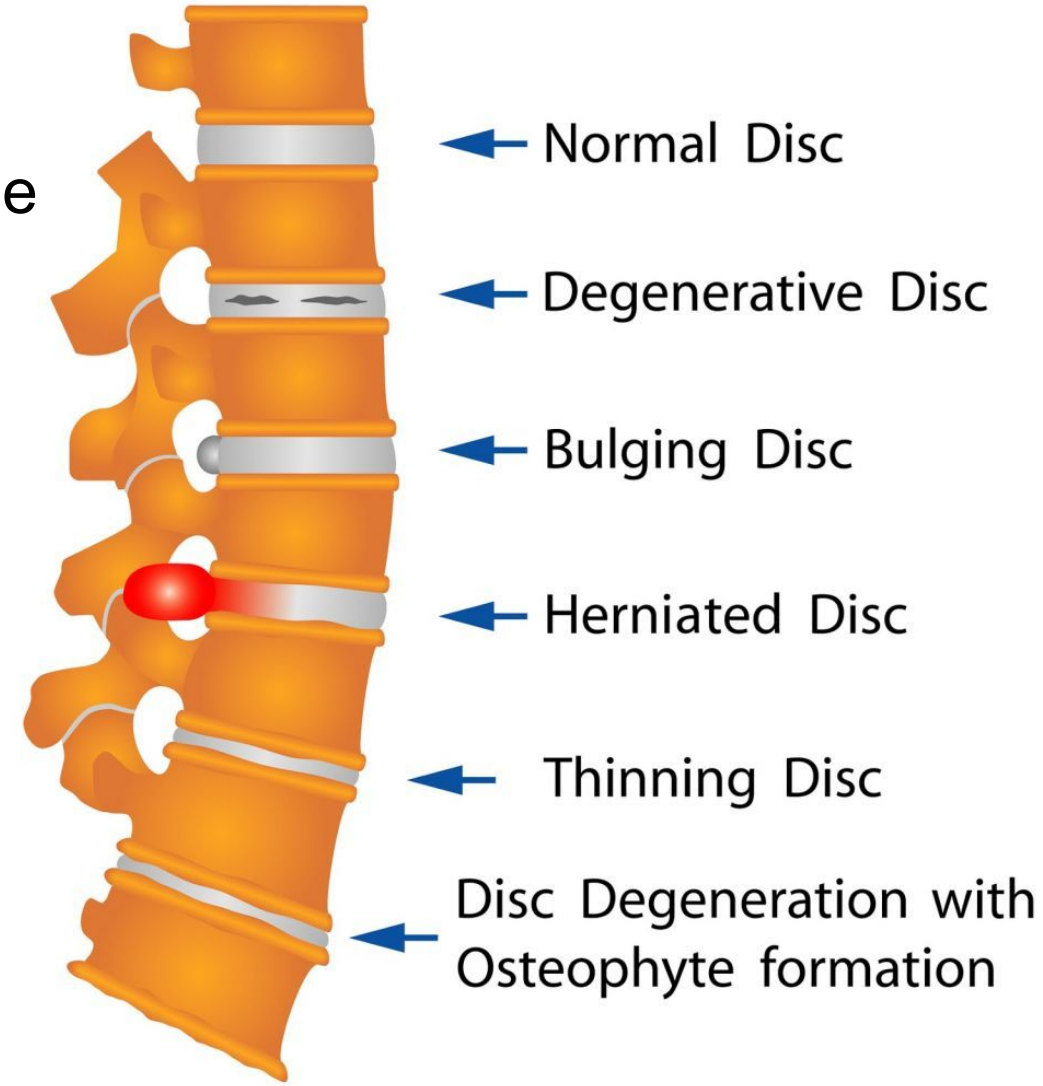
- How is it done?
  - Client seated or supine
  - Examiner support clients head then places the clients head into
    - Extension and rotation
  - Hold position for 30 seconds
- Results – Positive sign – pre syncope, nystagmus, vertigo (dizziness), slurred speech, visual changes, nausea *Indicates – VBI, cervicogenic vertigo, cervical instability with brainstem compression* Tingling or electric arm pain *nerve root compression*

Barre's Test 208

- **Barre's**
- Method: pt.. standing with arms flexed to 90 degrees, elbows straight, supinated palms up. Pt. closes eyes and holds position for 10-20 seconds
- Positive: one arm falls slowly while pronating

Disc Pathologies

- Herniated/ ruptured disc
- Degenerative disc disease
- Thinning disc
- Bulging disc



Upper Motor Neuron Lesion

- https://youtu.be/euZ2KQySbs8

Special Tests

***Clonus**

- Method: client supine, passively, rapidly and flex or extend client's wrist forcefully
- Positive: rapid alternating contractions of the wrist (tremor)- UMNL (MS, ALS)

Romberg 206

- Method: client standing with eyes closed for 20-30 seconds
- Positive: pt. sways excessively or loses balance from ankles – (Posterior Column disease (UMNL))
  - Swaying with the eyes open and worse with closed – (Impaired cerebellar function (UMNL)
  - Swaying from the hips and catching themselves in the nick of time – Simulated balance problems Malingering should be suspected

https://youtu.be/w132NCEHpI8

Barres 208

- Method: pt.. standing with arms flexed to 90 degrees, elbows straight, supinated. Pt. closes eyes and holds position for 10-20 seconds
- Positive: one arm falls slowly while pronating

*Babinski

- Method: client supine, stroke sole of foot laterally from heel upwards
- Positive: extension of big toe and fanning of 4 small toes Pyramidal Tract lesion (UMNL)

https://youtu.be/iV_a2WSbdM8

*Hoffman's Sign

- If an upper motor neuron lesion is suspected, the pathological reflexes should be checked and the deep tendon reflexes may show hyperreflexia. The upper limb equivalent of Babinski's test.
- How to
  - Examiner holds the patients middle finger and briskly flicks the distal phalanx
- Positive sign
  - Interphalangeal joint of the thumb of the same hand flexes/adducts. The fingers may also flex.
  - Check dermatomes to isolate the nerve.

Nerve compression Tests

- These tests are used when radiating pain is leading you to suspect a nerve root compression
  - Spurling's (described later)
  - **Shoulder Abduction Test- C4-5 nerve roots 202**
    - Method: client sitting, passively or actively place clients forearm on their head
    - Positive: pain is alleviated

Foraminal Encroachment

- A condition where the foramen is decreased in size placed the nerve root at risk of impingement
- Can be caused from degeneration of disc. Osteophytes and arthritis
- Considered a contraindication - caution local – Muscle Energy Techniques and direct manipulation are contraindicated

Shoulder depression Test 203

- This test may be used for brachial plexus lesions, or
- foraminal encroachment- if on same side of compression of adhesion of the dural sleeve of the nerve or
- hypomobile joint or adhesion of joint- adjacent joint capsule on the side being stretched

How its done?

- Client is seated
- Examiner side flexes 1D (one direction) and depresses the opposite shoulder
- Positive signs listed on previous slide, if nerve related dermatome or myotome testing may be beneficial to further identify cause
  - This test may be used for brachial plexus lesions, or
  - foraminal encroachment- if on same side of compression of adhesion of the dural sleeve of the nerve or
  - hypomobile joint or adhesion of joint- adjacent joint capsule on the side being stretched

Cervical Sprain/Strain

- What is it?
  - AKA Whiplash
  - Soft tissue damage (Stretch, tearing or rupture) to the ligaments, muscles and intervertebral discs and other tissues surrounding the cervical spine that can lead to a variety of clinical symptoms

How does it happen?

- Lower speed impacts often result in more significant and potentially chronic injuries
- Hyperextension of the neck causes damage to the anterior neck tissues – Anterior Longitudinal Ligament, longus Colli, SCM, Scalenes, TMJ due to stretching and tearing
- Hyperflexion – Damages posterior neck tissues – nuchal and interspinous ligaments, trapezius, levator scapulae, Suboccipitals and TMJ

Grades of injury

- Grade 1 – Mild Sprain/ Strain
  - Mild swelling, tenderness over ligament, no bruising
  - Mild stretch no instability
  - Negative stress tests
  - Mild pain at extreme end ROM
  - Functional recovery 2 – 14 days
  - Structural recovery 6 - 30 days

Grade 2 Moderate Sprain/Strain

- Mild to moderate swelling not in deep tissues
- Large injury which can result in tearing of many tissues
- Mild to moderate instability on Stress tests
- Functional recover 14 days to 2 months
- Structural recovery 1 – 3 months

Grade 3 Severe Sprain/Strain

- Severe deep bruising and swelling – FRACTURE, INSTABILITY AND DISCLOCATION MUST BE RULED OUT
- Complete tearing of many structures may be involved
- Positive instability Stress tests
- Almost Complete loss of ROM
- Functional recovery time 1-3 months
- Structural recovery time 6 plus months

Causes and Risk Factors

- Direct Trauma - Motor Vehicle Accidents (MVA) Cervical Acceleration – Deceleration , falls, sports injuries
- Repetitive strain or overuse
- Posture or Postural Problem
- Sudden unguarded movement

Health History

- VERY IMPORTANT – examiner must get accurate information regarding
  - Specific mechanism of injury and forces involved
  - Patient position at time of impact
  - Height of head rest
  - Speed and size of other vehicle
  - History or prior injury

Continued

- Pain
  - May be right after injury or delayed
  - Minor injury may have DOMS (Delayed onset muscle soreness 24-48 hours after)
  - Pain may radiate into occiput or down to shoulder/arm
- Headache
- Possible sleep difficulties

Watch for the following

- Be aware of symptoms that can show a more serious condition
  - Dysphagia, blurred vision, dizziness, tinnitus, vertigo, sleep issues, forgetfulness, neck clicking or instability feeling, fatigue, mood fluctuations, jaw pain

Observation

- Postural changes
- Stiff guarded movements
- Swelling
- Redness or bruising

Palpation

- Palpate all segments of C spine
- AROM restricted in most motions
- Pain in a single direction indicates muscle or tendon damage
- Pain in many directions indicates joint capsule

Special Tests

- **Spurling's or foraminal compression test 201**
- Method: client sitting, therapist applies downward compression on top of head in neutral, repeat in extension and then rotation + extension. Only proceed to the next stage if the previous stage is pain-free
- Positive: pain refers into extremity indicates nerve compression
- Local pain on contralateral side indicates sprain or strain

Special Tests

- **Distraction 200**
- Method: pt.. sitting, grasp below occiput with heel of hands and pull clients head towards ceiling slowly
- Positive: pain in neck

Benign Positional Vertigo

- What is it?
  - Abnormal sensation of movement caused by certain positions of the head resulting in nystagmus
- How it happens?
  - Two theories include
    - Canalithesis theory – free moving canaliths in the semicircular canal
    - Cupolithesis theory – Densities adhere to posterior semi circular cana
  - Causes sensitivity to gravity

Cont…

- Vertigo – Vertigo is commonly caused by a problem with the way balance works in the inner ear, although it can also be caused by problems in certain parts of the brain.
- Causes of vertigo may include:
  - benign paroxysmal positional vertigo (BPPV) where certain head movements trigger vertigo
  - migraines – severe headaches
  - labyrinthitis – an inner ear infection
  - vestibular neuronitis – inflammation of the vestibular nerve, which runs into the inner ear and sends messages to the brain that help to control balance

Health History

- Prior history of head trauma, ear disease or CNS disease
- Caused when head is in a certain position
- May last seconds or several minutes
- Severity varies – some patients can function during it while others experience nausea and vomiting
- May wake up with it or notice it while trying to set up

Hautant's Test 208

- Used to differentiate the cause of vertigo between vascular and articular (Inner ear or TMJ disorder)
- How its done?
  - 2 part test
  - Client seated arms forward flexed to 90, closes eyes
  - Examiner watches for any change in arm position
  - Following that move into rotation and extension and the position is held with eyes still closed, each position held for 10-30 seconds
- Results – if arms waver in first part of test cause is nonvascular if arms waver in the second portion of the test dysfunction is caused by vascular impairment

Cervical Ligament Stress Tests

- These tests are used when Cervical instability is suspected
- Signs and symptoms include
  - Severe muscle spasm
  - Patient does not want to move head especially into flexion
  - Lump in throat
  - Lip or facial paresthia
  - Severe headache
  - Dizziness
  - Vomiting
  - Soft end Feel
  - Nystagmus or pupil change

Anterior Shear 212

- Tests integrity of the supporting ligaments and capsular tissues of the cervical spine
- How its done?
  - Client supine, neck in neutral resting on the table
  - Examiner applies an anterior pressure or either the posterior arch of C1 or the spinous processes of C2 to T1 or bilaterally through the lamina of each vertebral body. In all cases Tissue stretch with an abrupt end
- Positives Signs include – nystagmus, pupil changes, dizziness, soft end feel, nausea, facial or lip paresthesia or lump sensation in the throat

Rotational ALAR ligament stress test 213

- How? Client seated, therapist stabilizes the lamina of C2, with the other hand the therapist passively rotates the clients head left and right (unaffected side first).

- Positive sign- If greater than 20° to 30° of motion is present without C2 moving it indicates injury to the contralateral Alar ligament .. Especially if the lateral flexion Alar Ligament Stress test is positive in the same direction.

Lateral Flexion Alar Ligament Stress Test 212

- Tests Alar Ligament
- How its done?
  - Patient Supine, head in neutral
  - Examiner stabilizes the axis with a wide pinch grip of the spinous process and lamina, then attempts side flex the head and axis
    - If ligament is intact minimal side flexion occurs with strong capsular end feel

Transverse (Lateral) Shear Test 212

- Determine instability o the atlantoaxial articulation cause by odontoid dysplasia (abnormality)
- Client is supine with head supported
- Examiner places radial side of 2nd metacarpophalangeal joint of one hand against the transverse process of the axis and the mcp joint of the other hand against the opposite tp of the atlas
- The examiner then pushes the hands towards each other
- Normally minimal motion and no symptoms occur, the test is normally painful and clients should be informed. Pain is caused by compression of soft tissues against the bone

Tests for Cervical Muscle Strength

Deep Neck Flexor Endurance Test 199

How its done?

Patient supine in crook lying position, neck maximally retracted and lifted approx.. 2 -5 cm's above the table. Examiner places a hand on the table under the occiput.

Monitor the folds of skin that occur due to the retraction of the chin and flexion. As the folds separate or the clients head touches your hand the test is terminated.

Normal findings are able to hold for 26 – 39 seconds, below 24 seconds is a positive sign for weakness or neck pain

Tests For Neurological Symptoms

- Primarily designed to provoke neurological symptoms (Distraction is the exception)
- It involves elements to either apply pressure or stretching to nervous tissue
- They may not necessarily tell you where the pathology is originating or what the cause may have been

Distraction Test 200

- This test is used for patients who have complained or radicular symptoms in the history and show radicular signs during the examination.
- How its done;
  - Examiner places one hand under the pt.. chin and the other around occiput, then slowly lift the pt...'s head applying a traction to the c/spine.
- Positive;
  - The pain is relieved or decreased when head is lifted or distracted, indicating pressure on the nerve roots that has been relieved.

Spurling's Test/ foraminal compression test 201

- This test is performed if the pt.. has complained of nerve root symptoms, which are diminished or absent at the time of assessment. This test is designed to provoke symptoms.
- How its done;
  - Stage 1- head is in neutral, examiner then carefully presses straight down on head
  - Stage 2- head is placed in extension, examiner the carefully presses straight down on head
  - Stage 3- head is placed in extension and then rotation to the unaffected side first, examiner then carefully presses straight down on head
- Positive;
  - Pain radiates into arm toward which the head is side flexed during compression; this indicates pressure on the nerve root (cervical radiculitis)
  - Neck pain with no radiation into shoulder or arm is not a positive
  - Follow with myotome or dermatome testing to narrow down the nerve root

Jackson's Compression 202

- This test is a modification of Spurling's
- How its done;
  - The patient rotates the head to one side. Examiner then carefully presses straight down on head. Repeated on other side.
- Positive test;
  - Pain radiates into arm, indicating pressure on a nerve root. Dermatome testing can give indication to nerve root

Shoulder Abduction Relief Test 202

- Used for radicular symptoms of primarily C4-C5 nerve roots
- How its done
  - Patient is sitting or lying down, examiner passively or the patient actively elevates the arms through abduction so that the hand or forearm rests on the top of the head.
- Positive
  - A decrease and in or relief of symptoms indicates a cervical extradural compression problem, such a herniated disc, epidural vein compression, or nerve root compression.
  - Use dermatome testing to differentiate between the nerve root.

Shoulder Depression Test 203

- This test may be used to evaluate to brachial plexus lesions, since the test position is the mechanism of injury for these lesions, plexopathies and radiculopathies. With brachial plexus lesions, more than one nerve root is usually affected.
- How its done
  - Examiner side flexes the patients head to one side while applying a downward pressure on the opposite shoulder
- Positive
  - If pain increases, it indicates irritation or compression of the nerve roots or foraminal encroachments, such as osteophytes in the area

ULTT 1 203

- How it's Done?
  - Client Supine side to be tested at the edge of the table
  - Examiner applies a depressive force to clients shoulder
  - With other hand grasp client wrist and abduct to 110, Flex the elbow to 90
  - Extend arm 10 degrees and externally rotate 60 degrees
  - Slowly extend their wrist and hand
  - Fully supinate their forearm and slowly extend their elbow
  - If symptoms occur slightly flex elbow and have them laterally flex head away from tested limb to confirm nerve root compression
- Result – Positive sign – Recreation of their shoulder or arm pain Indicates – C5,C6,C7 nerve roots and median nerve are the source of clients shoulder/arm pain

ULTT 2

- How is it done?
  - Client is supine, affected side on the edge of the table
  - Examiner applies depressive force to affected shoulder (hand or hip)
  - Grasp clients wrist and abduct the arm 10 degrees, flex the elbow to 90
  - Slowly extend wrist and fingers
  - Fully supinate and extend their forearm
  - If pain recreates flex the elbow a little and have them laterally flex the head away from the tested arm

- Results – Positive Test - Recreation of shoulder and arm pain **Indicates-** Median nerve, musculocutaneous nerve, axillary nerve as the source of clients arm/shoulder pain

ULTT 3

- How it is done?
  - Client Supine with affected shoulder on the edge of the table
  - Examiner applies a depressive force into the shoulder
  - Abduct clients arm to 110 degrees, flex elbow to 90
  - Slowly flex the wrist and fingers and ulnar deviate
  - Fully pronate and slowly extend their elbow
- Results – Positive Sign – Recreation of shoulder/arm pain **Indicates –** The Radial nerve as the source of clients pain

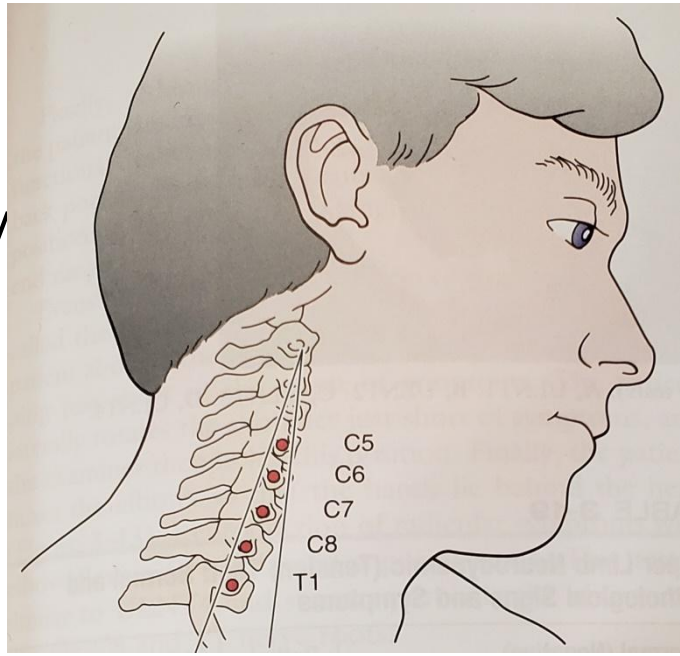
ULTT 4

- How its done?
  - Client Supine with affected shoulder on the edge of the table
  - Examiner applies a depressive force into the shoulder
  - Hold clients wrist and abduct to 90, laterally rotate to 60
  - Slowly extend wrist and fingers then deviate to the radial side
  - Slowly flex and pronate forearm
  - Bring palm of hand to ear
- Results – Positive sign – Recreation of client shoulder/arm pain **Indicates – Ulnar nerve,** C8 and T1 nerve roots as the source of the clients pain

  - Video https://youtu.be/rir6x6liqc4

Tinel Sign for Brachial Plexus Lesion

- How its done
  - The patient sits with the neck slightly side flexed. The examiner taps the area of the brachial plexus with a finger along the nerve trunks in such a way that the different nerve roots are tested
- Positive sign
  - Tingling sensation in the distribution of the nerve, this mean that the lesion is anatomically intact and some recovery is occurring.
  - If pain is elicited in the distribution of a peripheral nerve, the sign is positive for a neuroma and indicates a disruption of the continuity of the nerve.
  - Pure local pain implies that there is an underlying cervical plexus lesion



Valsalva Test

- What is it?
- Performed to assess for the possibility of disc Pathology
- How do we do it?
- Ask client if the experience the pain reoccur or become more severe while bearing down to have a bowel movement
- What is a positive Result?
- A positive response to the questioning

SPECIAL TEST REVIEW

TESTS FOR VBI

Special Tests VBI/Dekleyn-Nieuwenhuyse

- How is it done?
  - Client seated or supine
  - Examiner support clients head then places the clients head into
    - Extension and rotation
  - Hold position for 30 seconds
- Results – Positive sign – pre syncope, nystagmus, vertigo (dizziness), slurred speech, visual changes, nausea *Indicates – VBI, cervicogenic vertigo, cervical instability with brainstem compression* Tingling or electric arm pain *nerve root compression*

Barre's Test

- **Barre's**
- Method: pt. standing with arms flexed to 90 degrees, elbows straight, supinated palms up. Pt. closes eyes and holds position for 10-20 seconds
- Positive: one arm falls slowly while pronating

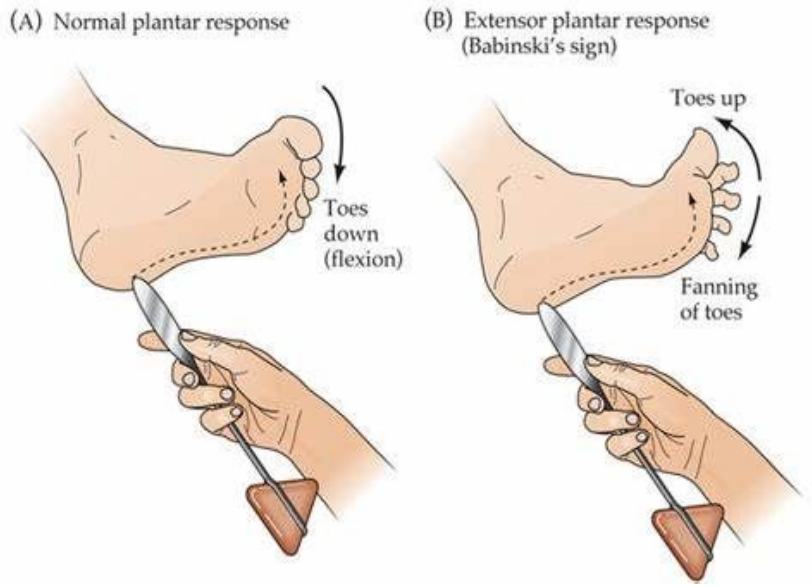
TESTS FOR UPPER MOTOR NEURON LESIONS

Hoffman's Sign

- If an upper motor neuron lesion is suspected, the pathological reflexes should be checked and the deep tendon reflexes may show hyperreflexia. The upper limb equivalent of Babinski's test.
- How to
  - Examiner holds the patients middle finger and briskly flicks the distal phalanx
- Positive sign
  - Interphalangeal joint of the thumb of the same hand flexes/adducts. The fingers may also flex.
  - Check dermatomes to isolate the nerve.

Babinski

- How its done
  - Patient is supine, stroke the sole of the foot laterally from heel to toe
- Positive sign
  - Extension of big toe and fanning of 4 small toes



Romberg Test

Method: client standing with eyes closed for 20-30 seconds, ankles together

Positive: pt.. sways excessively or loses balance from ankles – (Posterior Column disease (UMNL))

- Swaying with the eyes open and worse with closed – (Impaired cerebellar function (UMNL)
- Swaying from the hips and catching themselves in the nick of time – Simulated balance problems Malingering should be suspected
- 190

TESTS FOR VASCULAR SIGNS

Vertebral and Internal carotid artery testing is an important step in cervical assessment

Most important in cases where end range mobilization/manipulation is being used; rotation over 45 degrees

Vertebral artery most susceptible to injury where is exits transverse foramen and loops behind C1 before entering the cranial vault

Vertebrobasilar insuffiency provokes symptoms of ischemia of the medulla, pons, and cerebellum.

Continued

- Vertebrobasilar insuffiency provokes symptoms of ischemia of the medulla, pons, and cerebellum.
- Signs include
  - Get from previous slide or page 191

VBI

- What is it?
- Insufficient blood supply to the brain due to disruption in blood flow supplied by carotid or vertebral Artery
- How do we do it?
- Client seated or supine
- Examiner support clients head then places the clients head into
- Extension and rotation
- Hold position for 30 seconds
- What is a positive Result?
- Pre syncope, nystagmus, vertigo (dizziness), slurred speech, visual changes, nausea Indicates – VBI, cervicogenic vertigo, cervical instability with brainstem compression Tingling or electric arm pain nerve root compression

Barre's

- How its done
  - Patient is standing with shoulders forward flexed to 90°, elbows straight and forearms supinated, palms up and eyes, holding the position for 10-20 seconds
- Positive
  - One arm slowly falls with simultaneous forearm pronation.
- Cause
  - Thought to be diminished blood flow to the brainstem.

- Identical to the first part of Hautant's test

TESTS FOR VERTIGO AND DIZZINESS

Vertigo – Vertigo is commonly caused by a problem with the way balance works in the inner ear, although it can also be caused by problems in certain parts of the brain.

Causes of vertigo may include:

benign paroxysmal positional vertigo (BPPV) where certain head movements trigger vertigo

migraines – severe headaches

labyrinthitis – an inner ear infection

vestibular neuronitis – inflammation of the vestibular nerve, which runs into the inner ear and sends messages to the brain that help to control balance

Dizziness

- Dizziness - Dizziness is a term used to describe a range of sensations, such as feeling faint, woozy, weak or unsteady. Dizziness that creates the false sense that you or your surroundings are spinning or moving is called vertigo.

Hautant's

- Used to differentiate the cause of vertigo between vascular and articular (Inner ear or TMJ disorder)
- How its done?
- 2 part test
- Client seated arms forward flexed to 90, closes eyes
- Examiner watches for any change in arm position
- Following that move into rotation and extension and the position is held with eyes still closed, each position held for 10-30 seconds
- Results – if arms waver in first part of test cause is nonvascular if arms waver in the second portion of the test dysfunction is caused by vascular impairment

TESTS FOR CERVICAL INSTABILITY (INSTABILITY CLEARING TESTS)

Instability most commonly a result ligament damage, bone or joint damage

May be a result chronic arthritic conditions, trauma, long term corticosteroid use, congenital malformations, down syndrome, or osteoporosis

Signs and Symptoms of Cervical Instability

- Severe muscle spasm
- Patient does not want to move head (especially in flexion)
- Lump in throat
- Lip of facial paresthesia
- Severe headache
- Dizziness
- Nausea
- Vomiting
- Soft end feel
- Nystagmus
- Pupil changes

Anterior Shear Test

- Tests the integrity of the supporting ligaments and capsular tissues of the cervical spine
- Client supine head resting on table in neutral, Examiner applies and anteriorly directed force through the posterior arch of C1 or the sp's of C2 – T1. Normal end feel is tissue stretch with an abrupt stop.
- Positive signs (especially in the upper cervical region) include nystagmus, pupil changes, dizziness, soft end feel, nausea, facial or lip paresthesia and a lump sensation

Lateral Flexion Alar Ligament Test

- Tests Alar Ligament
- How its done?
- Patient Supine, head in neutral
- Examiner stabilizes the axis with a wide pinch grip of the spinous process and lamina, then attempts side flex the head and axis
- If ligament is intact minimal side flexion occurs with strong capsular end feel

Lateral Shear Test

- Determine instability o the atlantoaxial articulation cause by odontoid dysplasia (abnormality)
- Client is supine with head supported
- Examiner places radial side of 2nd metacarpophalangeal joint of one hand against the transverse process of the axis and the mcp joint of the other hand against the opposite tp of the atlas
- The examiner then pushes the hands towards each other
- Normally minimal motion and no symptoms occur, the test is normally painful and clients should be informed. Pain is caused by compression of soft tissues against the bone

Rotational Alar Ligament Stress Test

- Client seated, therapist stabilizes the lamina of C2, with the other hand the therapist passively rotates the clients head left and right (to the no symptom side first).
- Positive sign- If greater than 20 to 30 degrees of motion is present without C2 moving it indicates injury to the contralateral Alar ligament .. Especially if the lateral flexion Alar Ligament Stress test is positive in the same direction.

Tests for Cervical Muscle Strength

Deep Neck Flexor Endurance Test

How its done?

Patient supine in crook lying position, neck maximally retracted and lifted approx. 2 -5 cm's above the table. Examiner places a hand on the table under the occiput.

Monitor the folds of skin that occur due to the retraction of the chin and flexion. As the folds separate or the clients head touches your hand the test is terminated.

Normal findings are able to hold for 26 – 39 seconds, below 24 seconds is a positive sign for weakness or neck pain

Tests For Neurological Symptoms

- Primarily designed to provoke neurological symptoms (Distraction is the exception)
- It involves elements to either apply pressure or stretching to nervous tissue
- They may not necessarily tell you where the pathology is originating or what the cause may have been

Distraction Test

- This test is used for patients who have complained or radicular symptoms in the history and show radicular signs during the examination.
- How its done;
  - Examiner places one hand under the pt.. chin and the other around occiput, then slowly lift the pt.'s head applying a traction to the c/spine.
- Positive;
  - The pain is relieved or decreased when head is lifted or distracted, indicating pressure on the nerve roots that has been relieved.

Spurling's Test/ foraminal compression test

- This test is performed if the pt. has complained of nerve root symptoms, which are diminished or absent at the time of assessment. This test is designed to provoke symptoms.
- How its done;
  - Stage 1- head is in neutral, examiner then carefully presses straight down on head
  - Stage 2- head is placed in extension, examiner the carefully presses straight down on head
  - Stage 3- head is placed in extension and then rotation to the unaffected side first, examiner then carefully presses straight down on head
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Jackson's Compression

- This test is a modification of Spurling's
- How its done;
  - The patient rotates the head to one side. Examiner then carefully presses straight down on head. Repeated on other side.
- Positive test;
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Shoulder Abduction Relief Test

- Used for radicular symptoms of primarily C4-C5 nerve roots
- How its done
  - Patient is sitting or lying down, examiner passively or the patient actively elevates the arms through abduction so that the hand or forearm rests on the top of the head.
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- This test may be used to evaluate to brachial plexus lesions, since the test position is the mechanism of injury for these lesions, plexopathies and radiculopathies. With brachial plexus lesions, more than one nerve root is usually affected.
- How its done
  - Examiner side flexes the patients head to one side while applying a downward pressure on the opposite shoulder
- Positive
  - If pain increases, it indicates irritation or compression of the nerve roots or foraminal encroachments, such as osteophytes in the area

ULTT 1

- How it's Done?
  - Client Supine side to be tested at the edge of the table
  - Examiner applies a depressive force to clients shoulder
  - With other hand grasp client wrist and abduct to 110, Flex the elbow to 90
  - Extend arm 10 degrees and externally rotate 60 degrees
  - Slowly extend their wrist and hand
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ULTT 3

- How it is done?
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  - Slowly flex the wrist and fingers and ulnar deviate
  - Fully pronate and slowly extend their elbow
- Results – Positive Sign – Recreation of shoulder/arm pain **Indicates –** The Radial nerve as the source of clients pain

ULTT 4

- How its done?
  - Client Supine with affected shoulder on the edge of the table
  - Examiner applies a depressive force into the shoulder
  - Hold clients wrist and abduct to 90, laterally rotate to 60
  - Slowly extend wrist and fingers then deviate to the radial side
  - Slowly flex and pronate forearm
  - Bring palm of hand to ear
- Results – Positive sign – Recreation of client shoulder/arm pain **Indicates – Ulnar nerve,** C8 and T1 nerve roots as the source of the clients pain

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Tinel Sign for Brachial Plexus Lesion

- How its done
  - The patient sits with the neck slightly side flexed. The examiner taps the area of the brachial plexus with a finger along the nerve trunks in such a way that the different nerve roots are tested
- Positive sign
  - Tingling sensation in the distribution of the nerve, this mean that the lesion is anatomically intact and some recovery is occurring.
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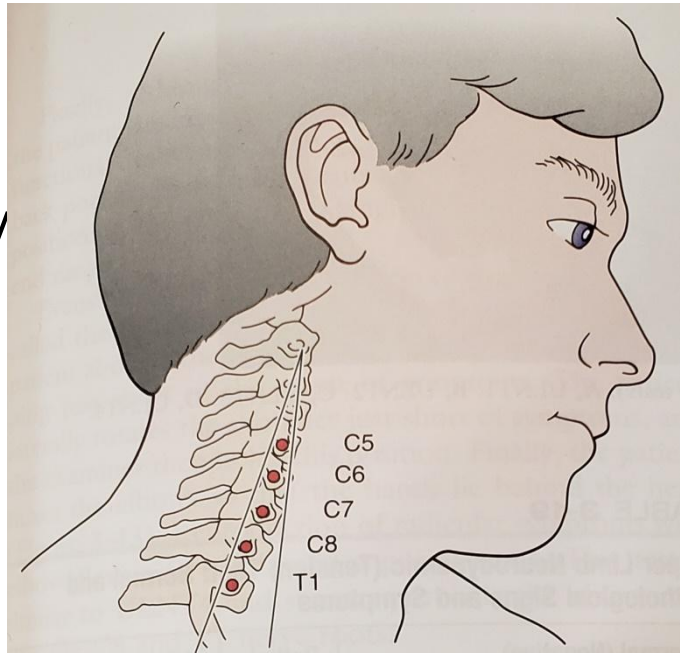

Valsalva Test

- What is it?
- Performed to assess for the possibility of disc Pathology
- How do we do it?
- Ask client if they experience the pain reoccur or become more severe while bearing down to have a bowel movement
- What is a positive Result?
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Myotomes

- C1 & C2- Neck Flexion
- C3- Lateral Flexion
- C4- Shoulder Elevation
- C5- Shoulder Abduction
- C6- Elbow Flexion and/or Wrist extension
- C7- Elbow Extension and/or Wrist Flexion
- C8- Thumb extension and/or Ulnar deviation
- T1- Abduction or Adduction of the intrinsic hand muscles

- https://www.youtube.com/watch?v=8HLdT9N757Y

Reflex Tests

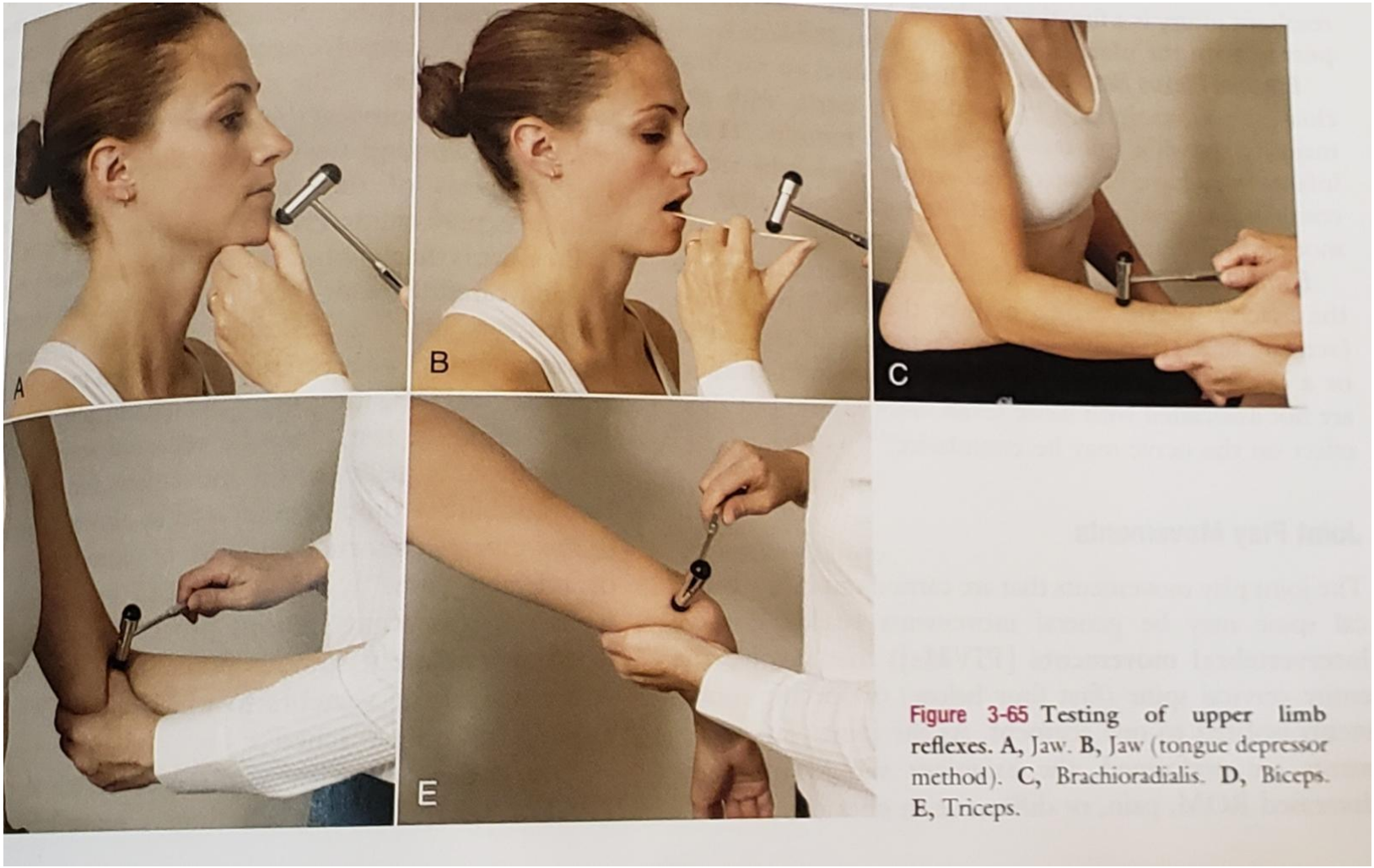


Figure 3-65 Testing of upper limb reflexes. **A,** Jaw. **B,** Jaw (tongue depressor method). **C,** Brachioradialis. **D,** Biceps. **E,** Triceps.

JOINT PLAYS

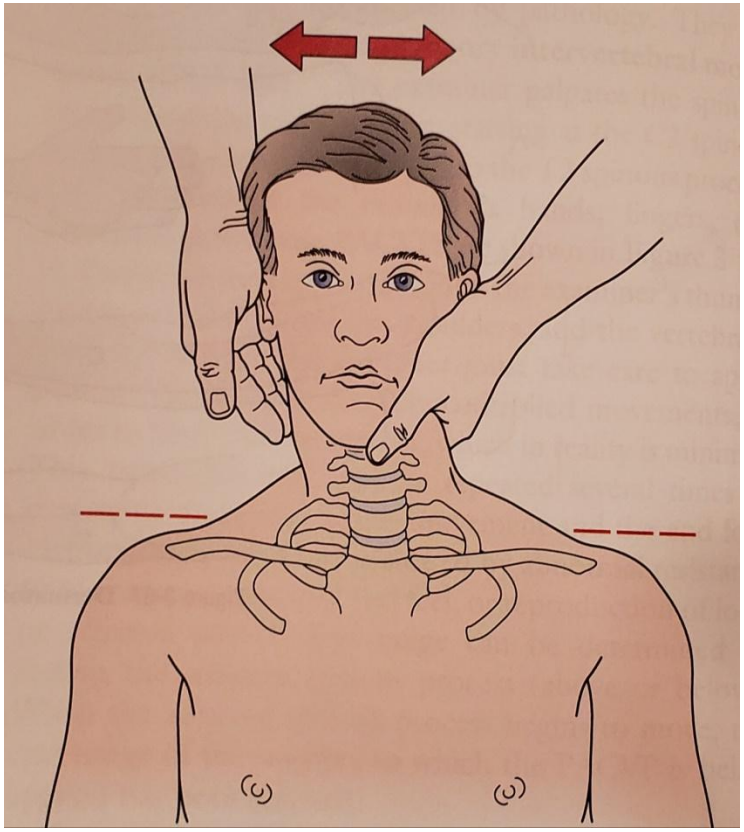
Used to assess the quality and quantity of movement of a specific joint

C-Spine joint plays

- Side glide of the cervical spine
- Anterior glide of the cervical spine
- Posterior glide of the cervical spine
- Traction glide of the cervical spine
- Rotation of the occiput on C1
- Posteroanterior central vertebral pressure (PACVP)
- Posteroanterior unilateral vertebral pressure (PAUVP)
- Transverse vertebral pressure

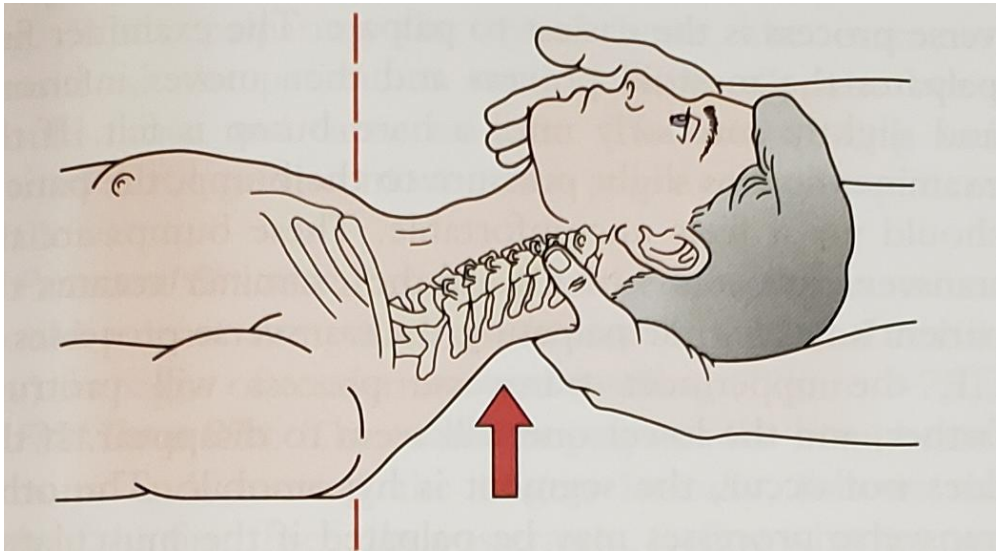
Side glide of the cervical spine (general)

- Examiner holds the patients head and moves it from side to side, keeping the head parallel to the shoulders.



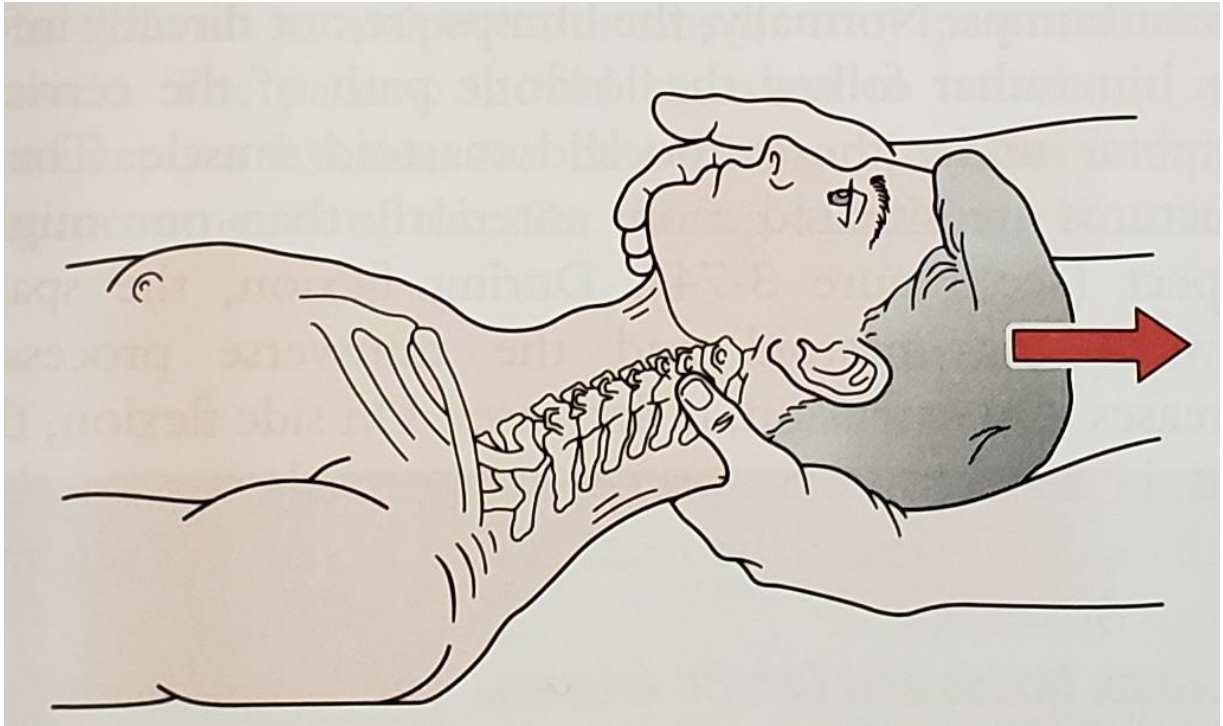
Anterior and posterior glide of the cervical spine (general)

- Examiner holds the patients head with one hand around the occiput and the other one around the chin, make sure you don't choke them.
- Examiner then draws the head forward in the same plane as the shoulders for anterior glide and posteriorly for posterior glide.
- While doing these movements, the examiner must prevent flexion and extension of the head.



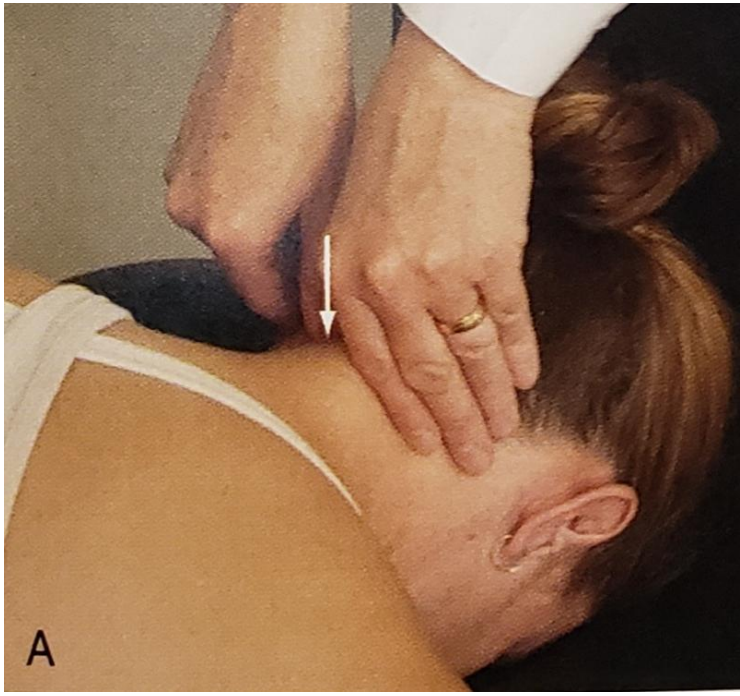
Traction glide

- Examiner places one hand around the chin and the other hand on the occiput.
- Traction is then applied in a straight longitudinal direction with the majority of the pull being through the occiput.



Posteroanterior central vertebral pressure

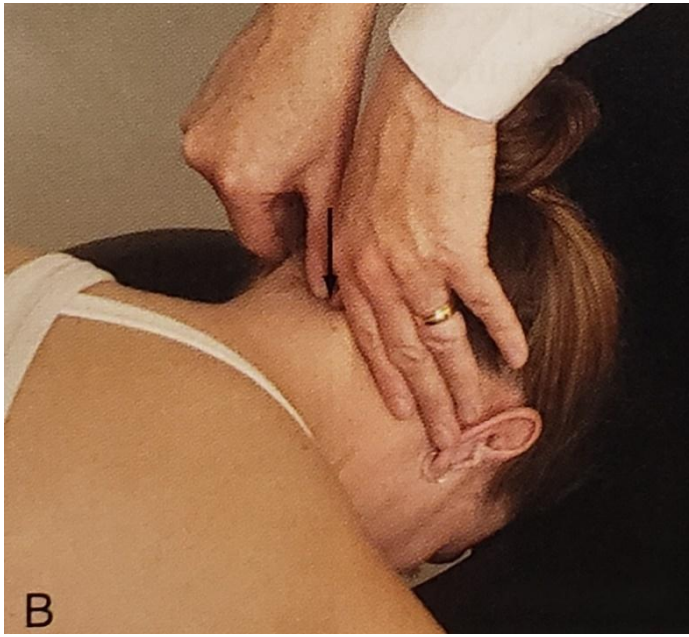
- Patient lies prone with the forehead resting on the back of their hands.
- Examiner palpates the SP's of the C-spine, starting at C2 and working towards T2.
- Pressure is then applied through the examiners thumbs pushing carefully from shoulders and the vertebrae is pushed anteriorly.
- The examiner must take care to apply pressure slowly, with careful controlled movements



- Hypomobility would be indicated by abnormal resistance to movement abnormal end feel or reproduction of local or referred pain.

Posteroanterior unilateral vertebral pressure

- Patient lies prone with the forehead resting on the back of their hands.
- Examiner palpates the TP's of the C-spine, starting at C2 and working towards T2.
- Pressure is then applied through the examiners thumbs pushing carefully from shoulders and the vertebrae is pushed anteriorly. This causes a minimal rotation of the vertebrae
- The examiner must take care to apply pressure slowly, with careful controlled movements. Both sides should be compared.



- Hypomobility would be indicated by abnormal resistance to movement abnormal end feel or reproduction of local or referred pain.

Transverse Vertebral Pressure

- Patient lies prone with the forehead resting on the back of their hands.
- Examiners thumbs are placed along the side of the SP's of the C-spine.
- Examiner then applies a transverse pressure to the side of the SP, feeling for quality of movement.
- Pressure causes a rotation of the vertebrae

- Hypomobility would be indicated by abnormal resistance to movement abnormal end feel or reproduction of local or referred pain.