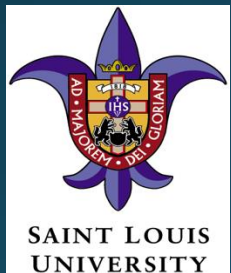


The Pain in my Neck is not from my In-laws.... Cervical Spine Evaluation and Treatment

Skin, Bones, Hearts, & Private Parts



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Disclosures

- Christopher Hemmer, DNP, ANP has no financial relationship with commercial interest to disclose



Conference Learning Objectives

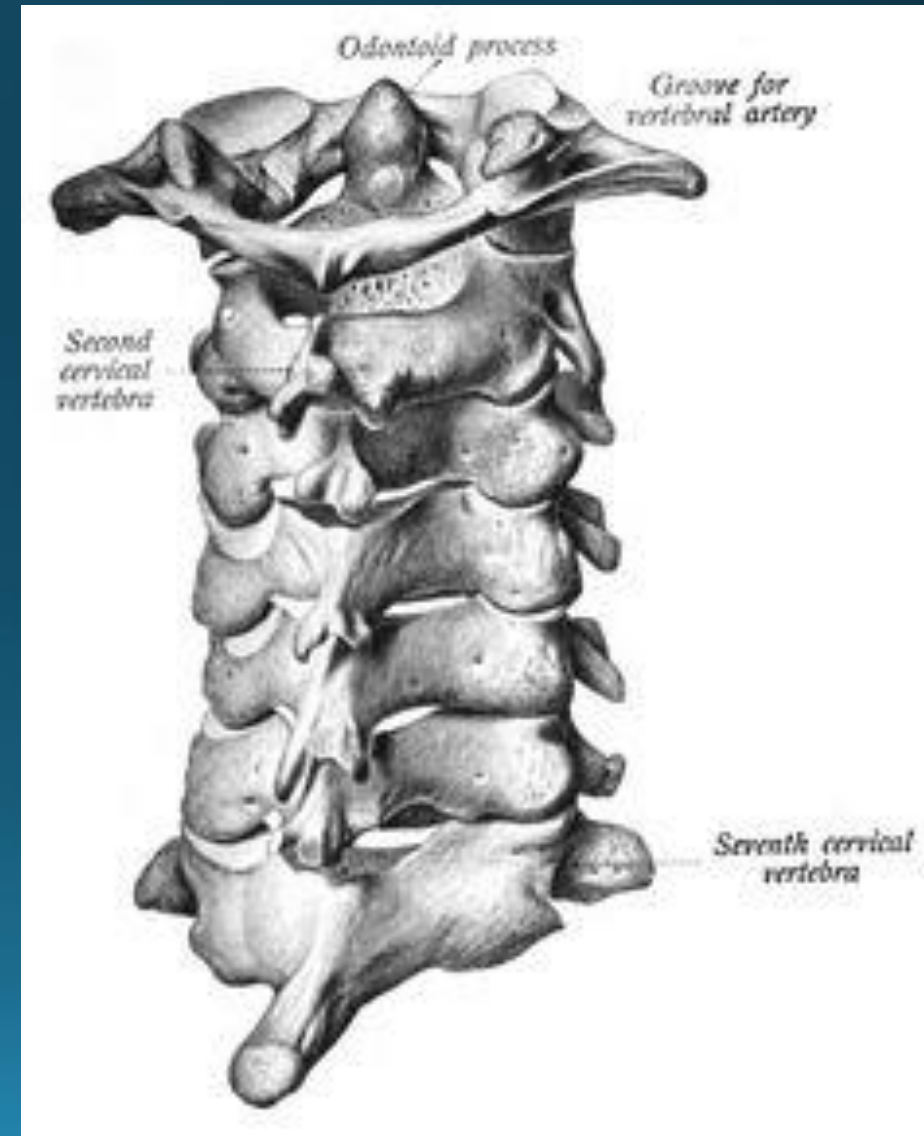
- 1. Measure self reporting knowledge gained on selected clinical topics in primary and acute care
- 2. Identify current approaches to client management which affect your patient population
- 3. Reflect upon ideas and experiences gained from other professionals involved in the delivery of patient care, healthcare policy, entrepreneurial ventures, research activities, and the future of healthcare
- 4. Evaluate possible changes to your current practice methods and barriers to achieving those changes.

Session Objectives

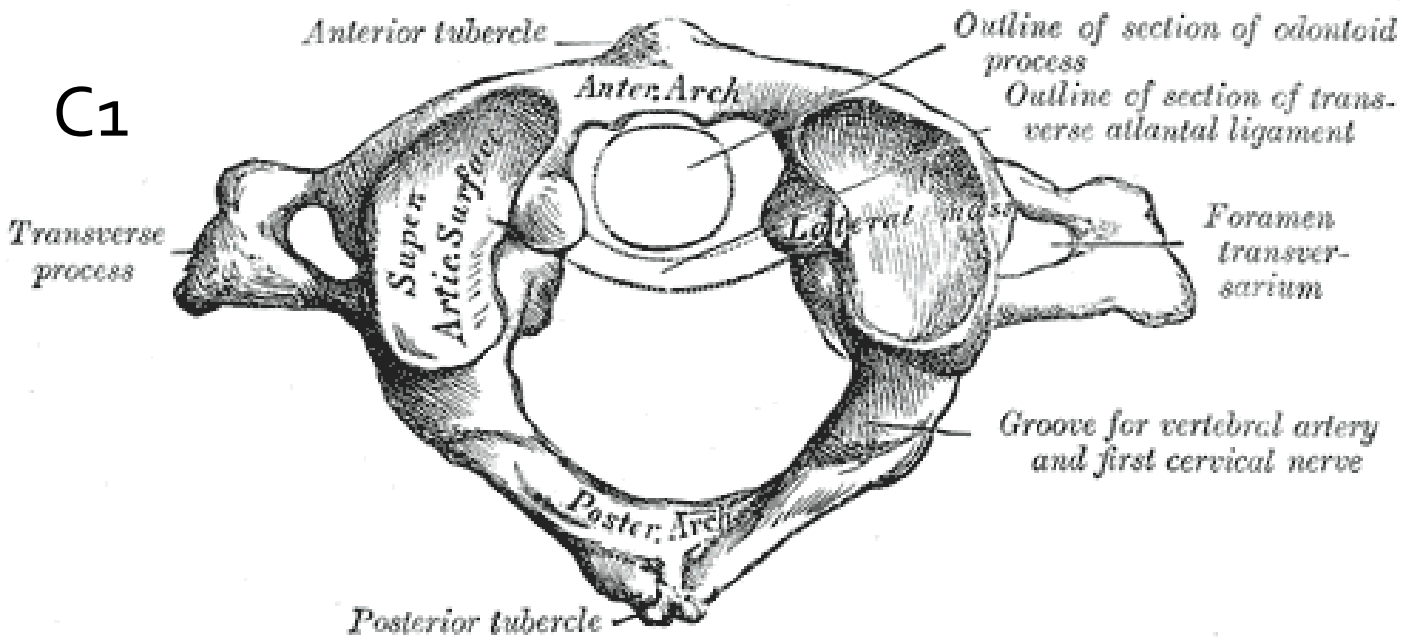
- Discuss pertinent cervical spine anatomy as well as common terms used to describe degenerative process
- Describe a thorough physical examination of a patient who presents with cervical spine complaints
- Recognize the “red flags” associated with cervical spine complaints and how best to address them

Anatomy

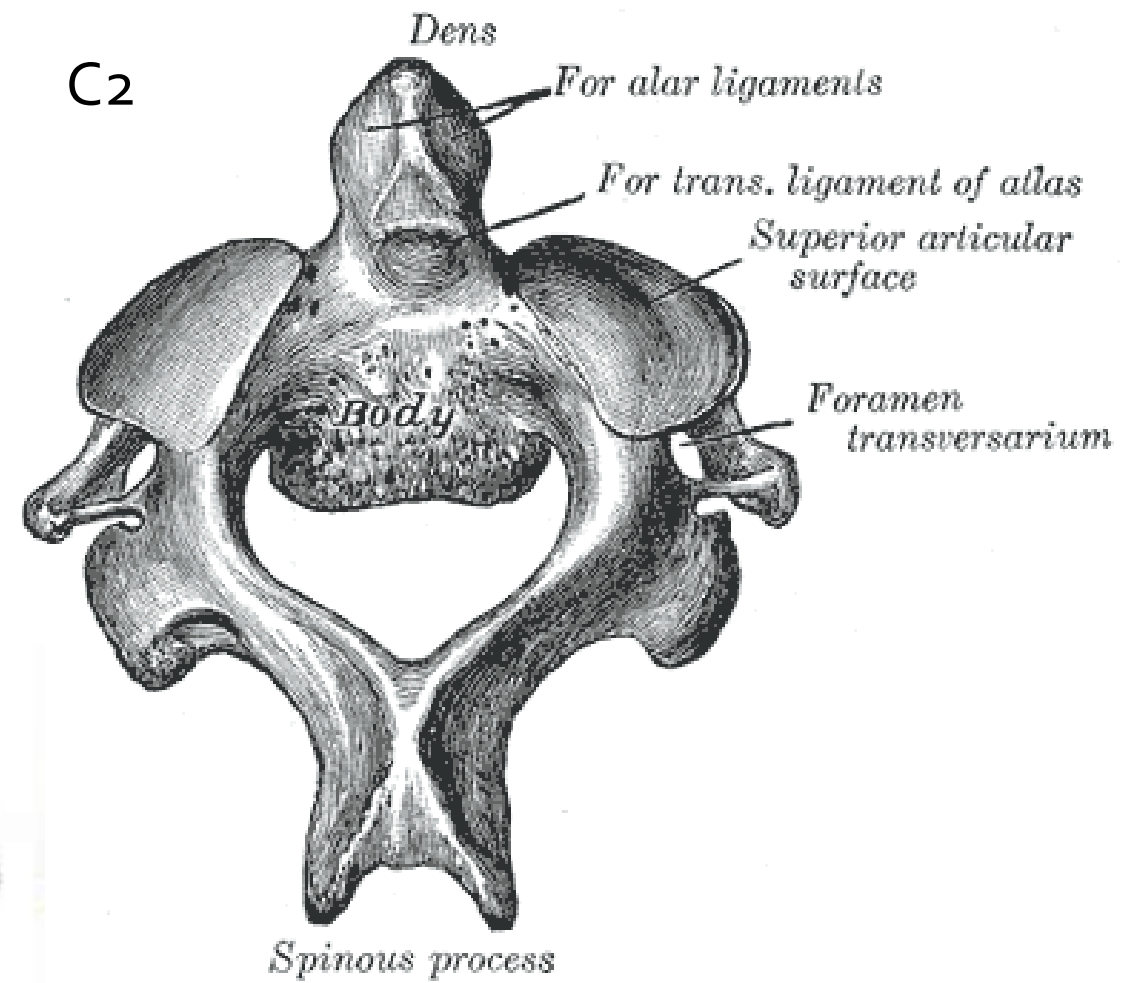
- Cervical spine is comprised 7 vertebrae
- The top 2 vertebrae have unique anatomy
- C1 - atlas is a ring shaped bone that articulates with the skull
- C2 - Axis has a large post like structure called the odontoid (dens)
- Approximately 50% of rotation and flexion/extension occurs between C1-2



C1



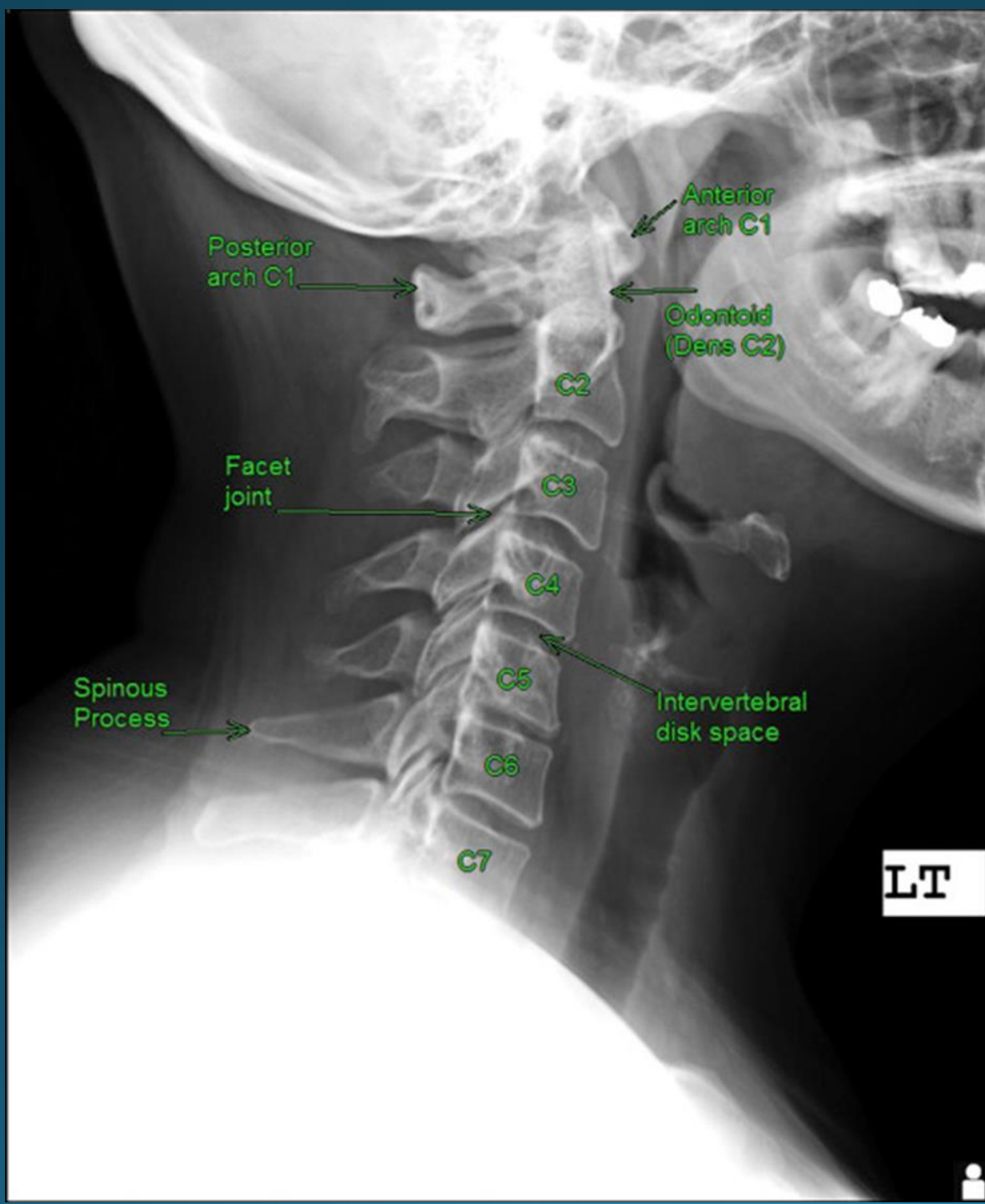
C2

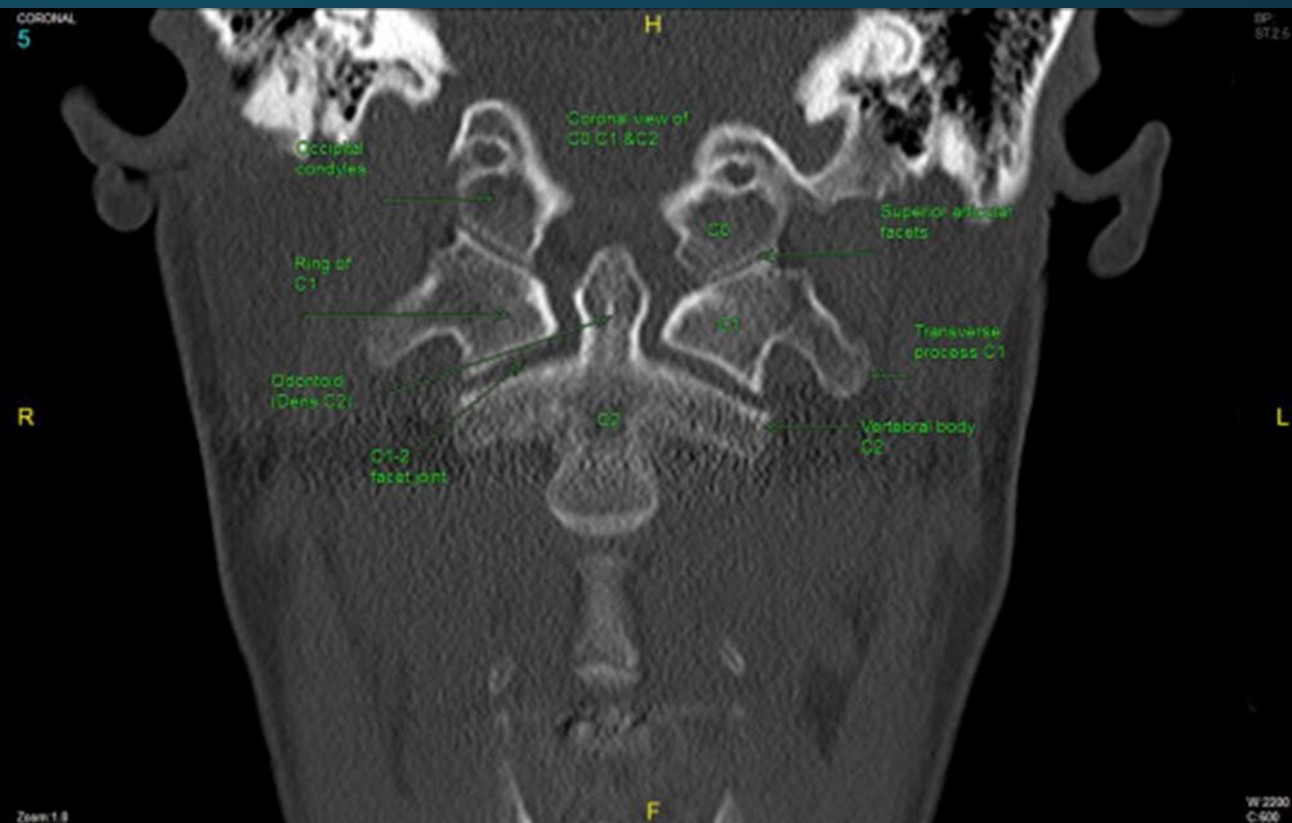
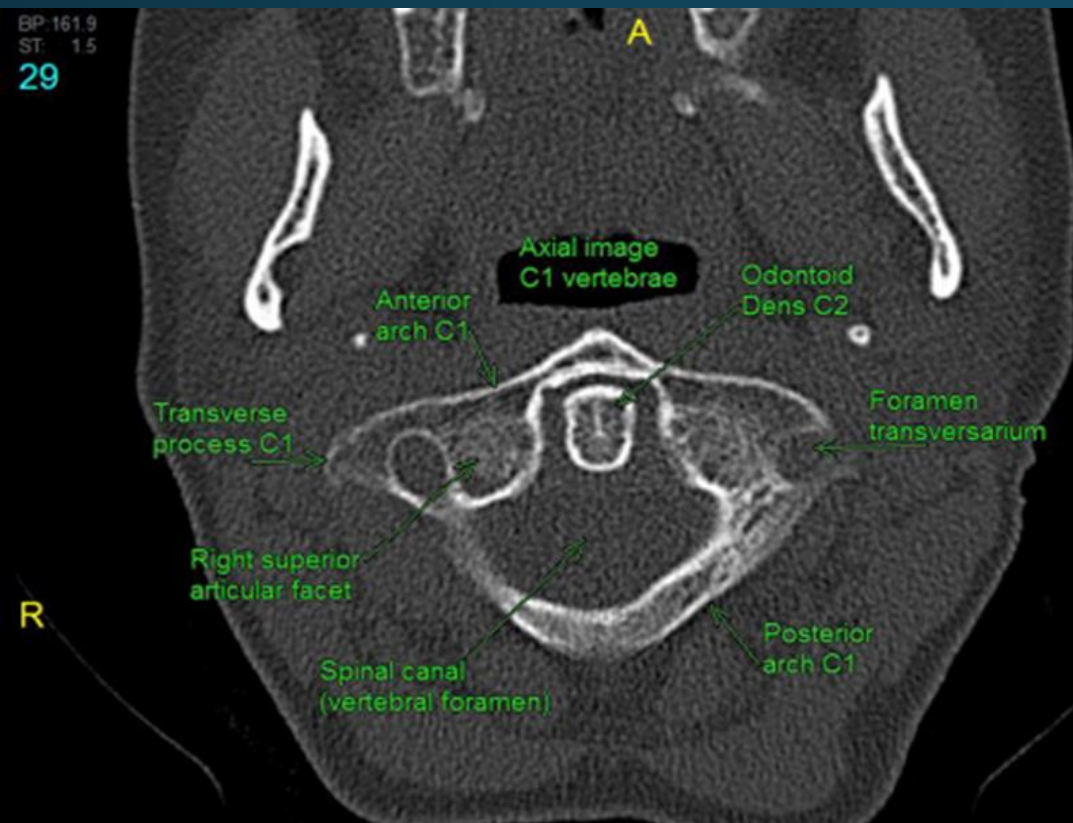


- C₃-6 vertebrae are very similar in anatomy.
- Some of the spinous process will be bifid, small transverse process, foramen transversarium, vertebral foramen, uncinated process, superior and inferior articular process (facet joint complex)
- C₇ which is the last of the cervical vertebrae is characterized by a long spinous process and is commonly used as an anatomic landmark

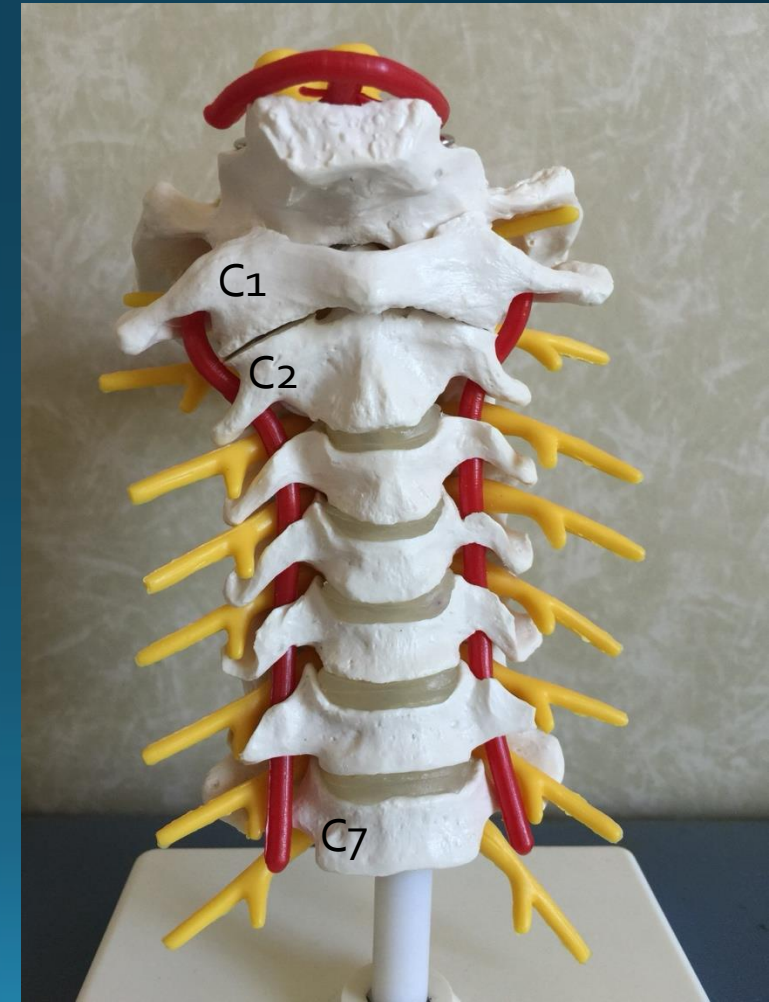
C₇

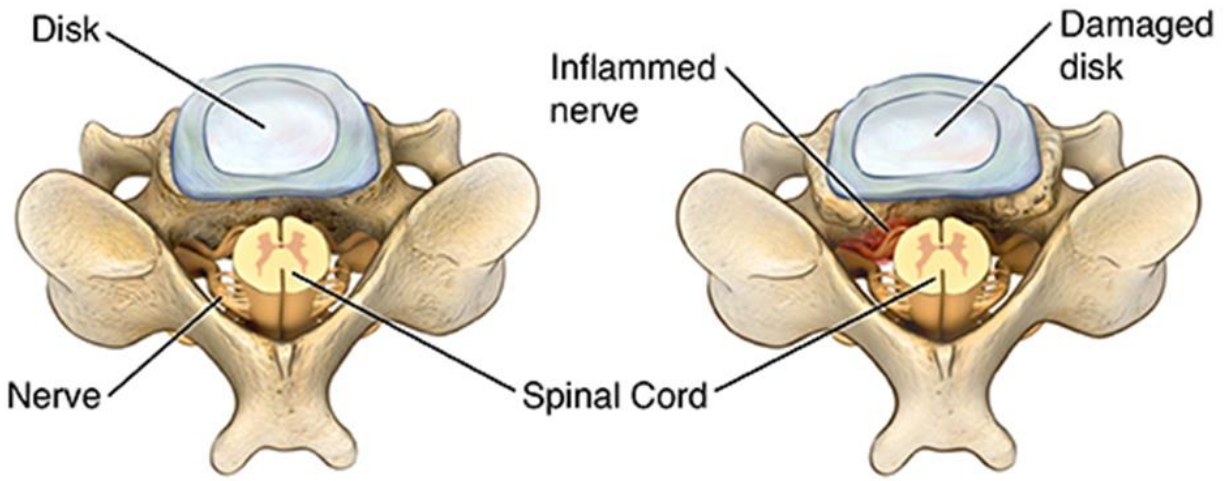






- C1-2 space does not have an intervertebral disk
- The remainder of the cervical spaces have an intervertebral disk
- Disk act as a “shock absorber” for the vertebral bodies.
- It is a normal process for these disk to become worn down over time from activity, trauma, age, genetics, etc..

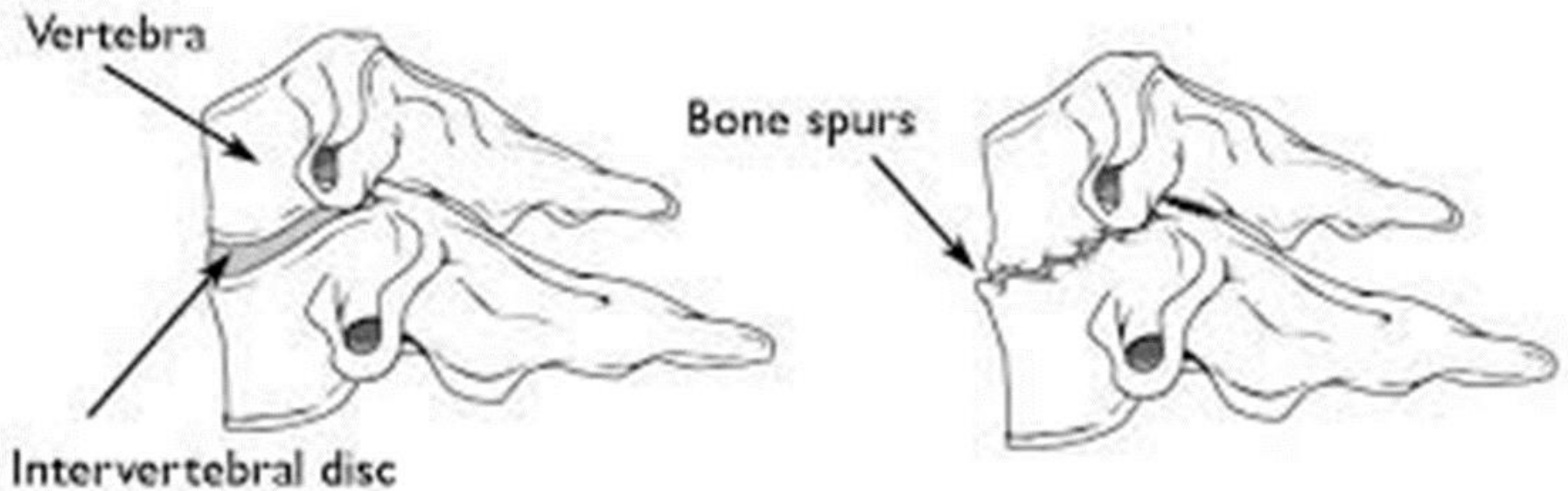




Top view

Normal vertebra and disk

Damaged vertebra and disk



Physical Exam

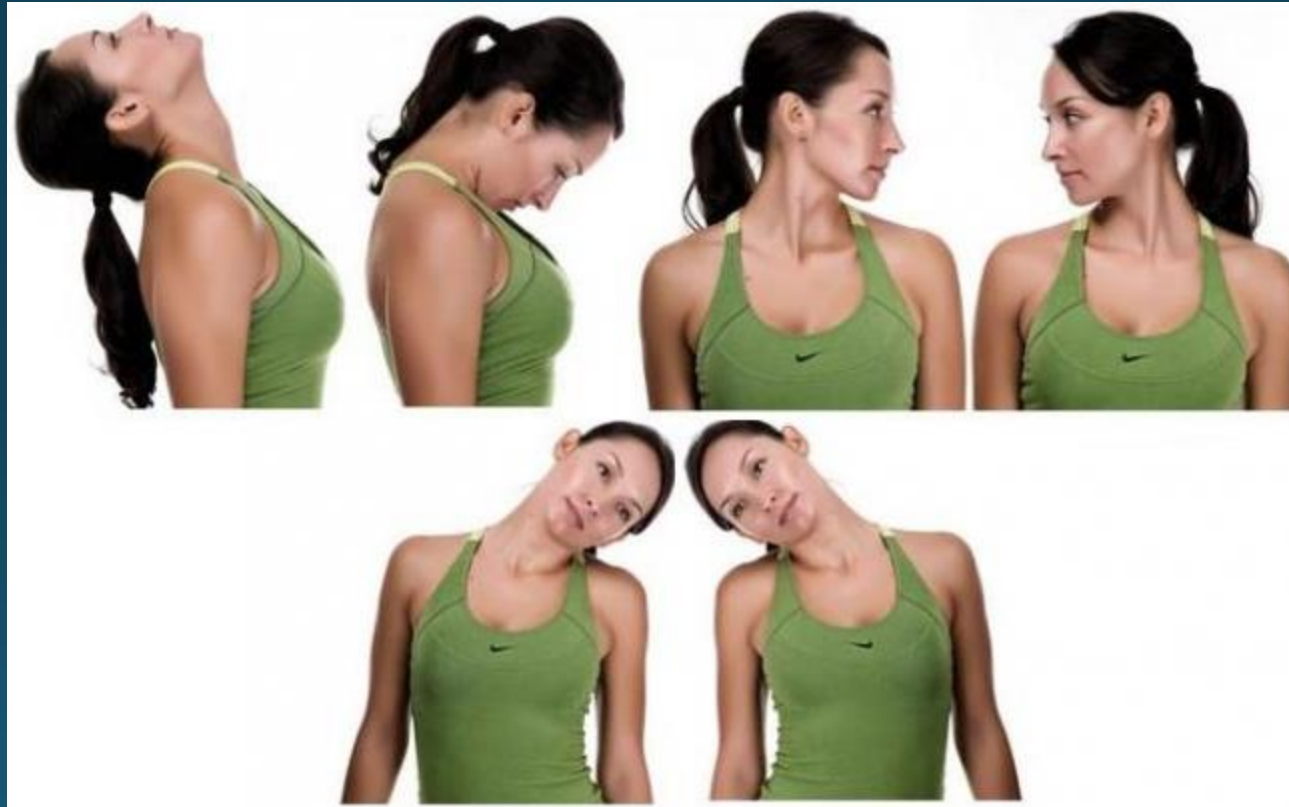
- Observation:
- What does this patient look like from the time they walk into the exam area (gait, stride, widened stance, assistive devices, braces).
- How is the patient positioned in the room (pacing, rubbing neck, rubbing arm, shaking the hands).
- What is the over all posture (kyphosis/spasm)? Is there any obvious involuntary movements such as muscle fasciculation or obvious atrophy.
- Examine the skin area for complaints that may suggest a different cause of pathology or for signs of heating pad use.



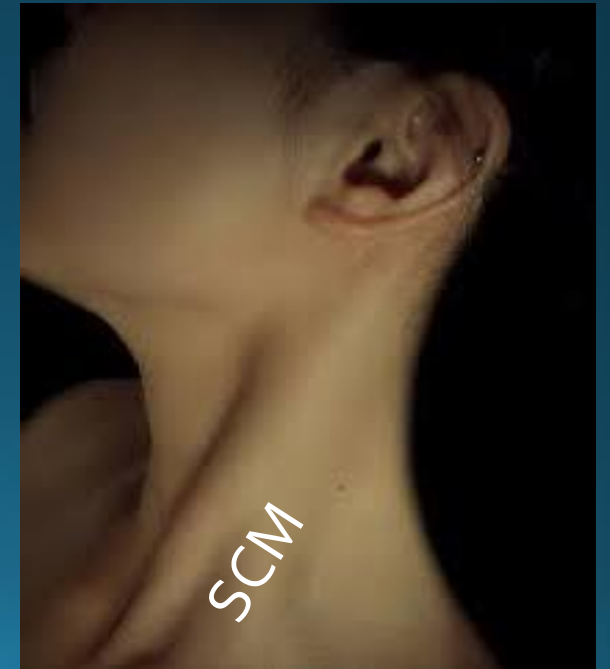
Atrophy from Cervical spine



- The cervical spine has 6 planes of motion
- Flexion of the neck 50 degrees (chin to chest)
- Extension of the neck 60 degrees (face parallel to ceiling)
- Rotation in each direction nearing 80 degrees
- Lateral flexion 40 degrees (ability to place ear on the shoulder)

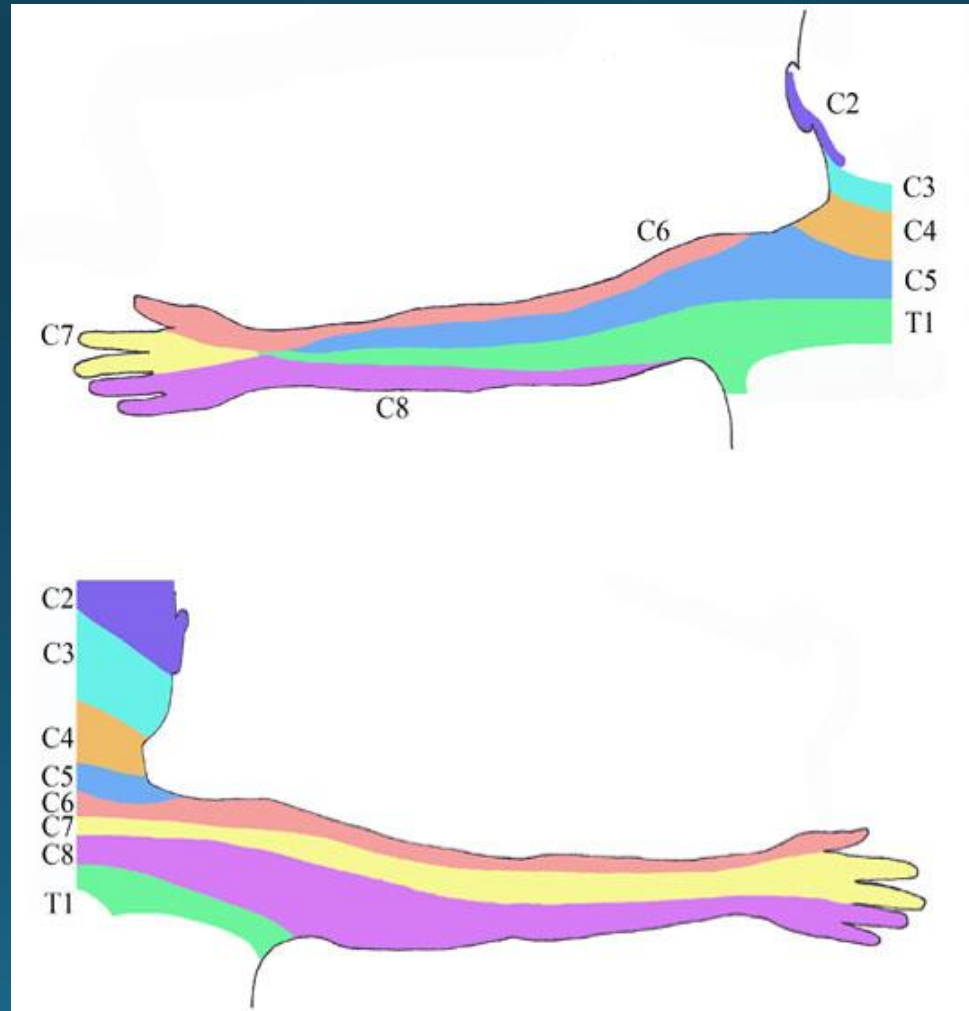


- Palpation:
- Start with an anterior to posterior approach. Evaluate for any goiter or lymphadenopathy
- The sternocleidomastoid muscle will be palpable from the most lateral position superiorly will then dive medially as it courses inferiorly (this is easier to examine with the patients head rotated)
- The posterior neck has several deep muscles but the most superficial will be the trapezius. This is a common area for spasm.



Examination of sensation will be more helpful with some simple tools. Pin wheel, cotton tip applicator, or a small piece of ice will be beneficial to determine if a sensory deficit is present. Generally start with the face and work distally toward the upper extremities.

Remember dermatomes are not exact and there can be some “cross over”





- To accurately document strength and motor function it is suggested that the ASIA criteria be used. This criteria is widely accepted and helps keep consistency with a rather subjective exam
- Should also keep in mind that some muscle groups will be innervated by more than one nerve root so strength may be better than expected in some cases
- Most common cervical nerve roots to be examined C5, C6, C7, & C8

American Spinal Injury Association (ASIA)

Strength Grading

- Grade Strength Measured
- 0 Total paralysis
- 1 Palpable or visible contraction
- 2 Active movement
- 3 Active movement against gravity
- 4 Active movement against gravity with some degree of resistance
- 5 Active movement with full resistance (normal)

C₅ nerve root

- The C₅ nerve root can be examined by way of the deltoid muscle. The ability to abduct the arm to 90 degrees and provide good resistance is adequate for this nerve root.
- Keep in mind that C₅ and a rotator cuff injury can mimic each other

C₆ nerve root

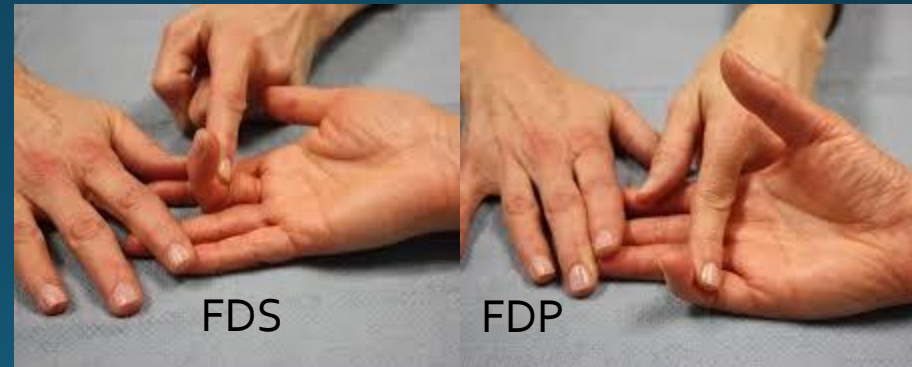
- The C₆ nerve root can be examined through a few maneuvers. Wrist extension and biceps are both easily checked but do have some cross over. Supination is the purest measures of isolated C₆ nerve root function

C7 nerve root

- The C 7 nerve root is generally examined via the triceps and wrist flexors.
- When checking the triceps have the patient avoid a sudden jerky type of push. Instead have them start out slowly and you (the examiner) increase the resistance

C8 nerve root

- The C 8 nerve root is simply examined by having the patient grip your fingers. Specifically, you are evaluating FDS & FDP



T₁ nerve root

- The T₁ nerve root is important when evaluating the cervical spine. The patient's ability to perform abduction and adduction of the digits provides the clinician the ability to examine the interossei.



Motor Innervation Upper Extremity

Nerve Root Innervation	Muscles Tested
C ₅	Deltoid/shoulder abduction
C ₆	Supination/wrist extensor
C ₇	Triceps/wrist flexors
C ₈	Finger flexion/ FDS/FDP
T ₁	Interossei/finger ab & adduction

FDP = flexor digitorum profundus

FDS = flexor digitorum superficialis.

Deep Tendon Reflexes (upper extremity)

- **Upper Extremity Reflexes by Nerve Roots**

• <i>Reflex</i>	<i>Nerve Root</i>
• Biceps	C5 or C6 nerve
Triceps	C7 nerve root
Brachioradialis	C5 or C6 nerve

- **Reflex Grading Upper Extremity**

• <i>Grade</i>	<i>Response</i>
• 0	No response
• 1	Slight but definite
• 2	Brisk response
• 3	Very brisk response
• 4	Repeating response/clonus

Reflexes



Pathological reflexes

- Babinski: stroking the lateral plantar region of the foot. A normal (non-pathological) response in patients over 2 years of age is flexion of the toes or down going. A pathological response would be up going great toe and fanning of the toes.
- Hoffman sign: flicking the distal phalanx. A pathological response is flexion of thumb/ index finger at the IP joint. Negative response is no movement (normal).



Hoffmans Reflex



Babinski reflex



Other signs & tests

- Cervical abduction sign is when a patient has their arm across the top of their head. This places slack in the nerve and decrease pain into the extremity.
- Spurling sign: placing the neck into gentle extension while applying an axial load will reproduce cervical radicular complaints if positive.



Other signs & test

- Lhermitte sign: will produce an electrical shock down the spine and extremities if positive. This is performed by having the patient demonstrate maximal flexion of the neck
- Grip and release test: ask the patient to make a fist and open all digits into extension. Patient should be able to complete 20 cycles in 10 seconds (less than this amount can suggest cervical myelopathy)



Pathology

- Most cervical spine pathology will be classified into one of three groups: mechanical, neuropathic, and referred.
- The most common forms of neck problems are certainly the first two; mechanical and neuropathic.

Mechanical neck pain

- Mechanical neck pain or also known as axial column pain is derived from degenerative changes that occur in the disk as well as the facet joint complex (zygoapophysial joints).
- Axial neck pain is defined as pain occurring in the cervical spine, occipital region, and posterior scapula but little to no arm pain.
- Pain lasting less than 4 weeks is considered acute
- Pain lasting 4-12 weeks subacute
- Pain lasting greater than 12 weeks is considered chronic
- Typically the neurologic exam will be normal but the patient will have significant complaints as above.
- Degenerative changes are commonly seen on imaging especially in the 6th decade of life and on.
- Most common places to find degenerative changes C5-6>C6-7>C4-5

Note the advanced degenerative changes
@C5-7.

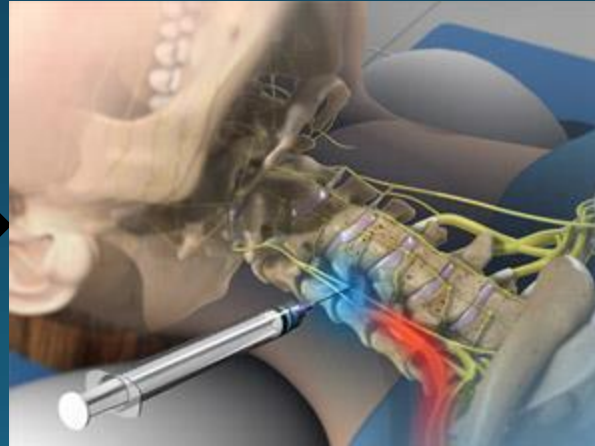
Reversal of cervical lordosis

Irregularity and sclerosis around the facet
joints



Treatment

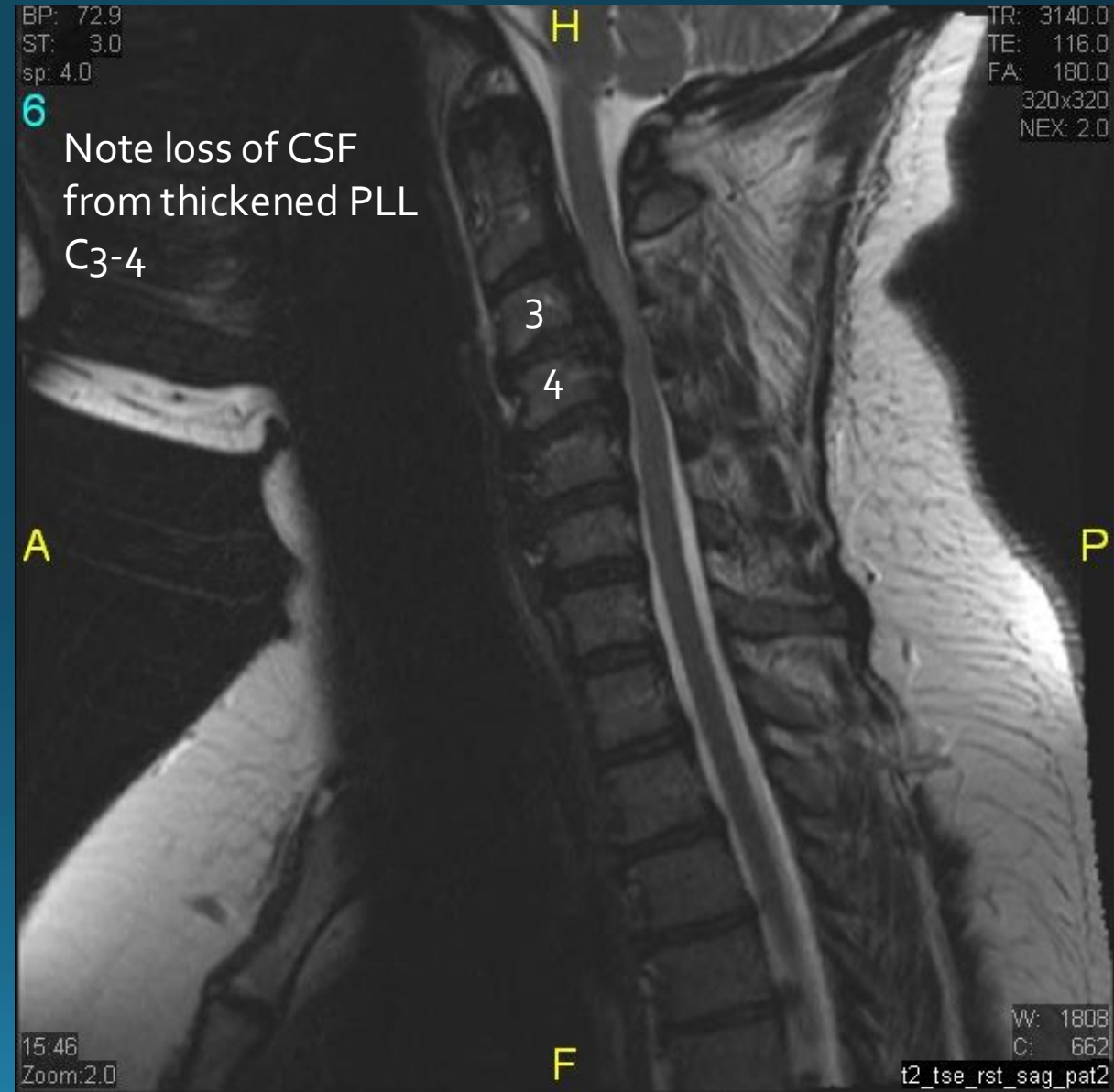
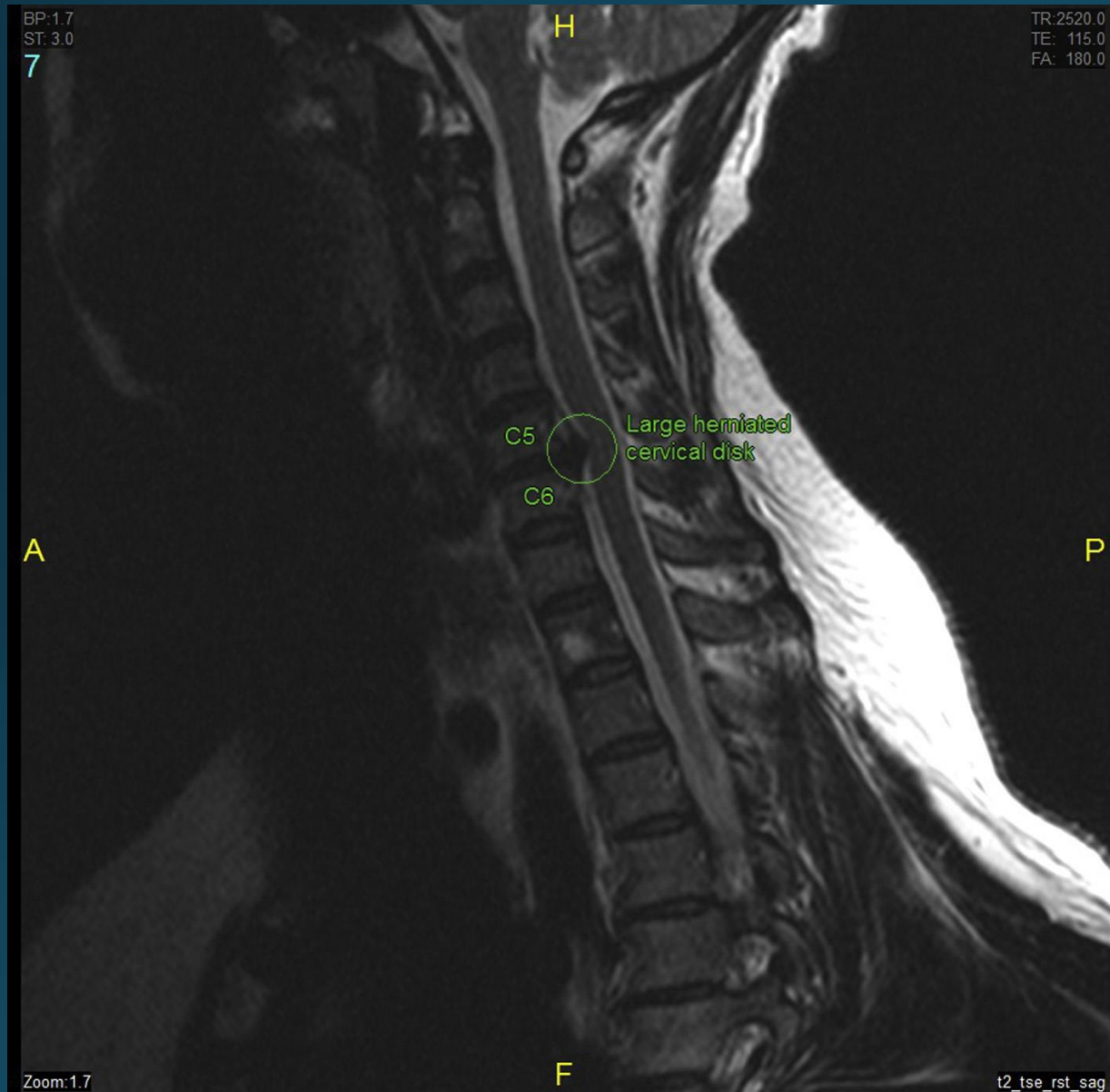
- Degenerative disk disease, regardless of the level, is one of the most common diagnosis as it relates to the cervical spine.
- Conservative treatment options include: Acetaminophen, NSAIDs, physical therapy, home traction, transcutaneous electrical nerve stimulation (TENS), chiropractic manipulation, epidural steroid injections, nerve blocks, Botox injections, radiofrequency ablation, and surgical fusion.



Neuropathic cervical pain

- Neuropathic pain suggests the patient has complaints of numbness, tingling, pain, or weakness generally caused by nerve root compression from disk herniation or degenerative changes.
- Patients less than 40 y/o the cause of neuropathic pain is more likely disk herniation
- Patients over 40 y/o the cause of neuropathic pain is increasingly more likely to be degenerative but can certainly still be discogenic in nature
- Patients with subjective numbness/ tingling WITHOUT motor changes or reflex asymmetry can have a trial of conservative treatment before more advanced imaging. However, in the presence of motor weakness and or reflex changes a more urgent tone should be considered.
- Treatment options are very similar to those previously discussed

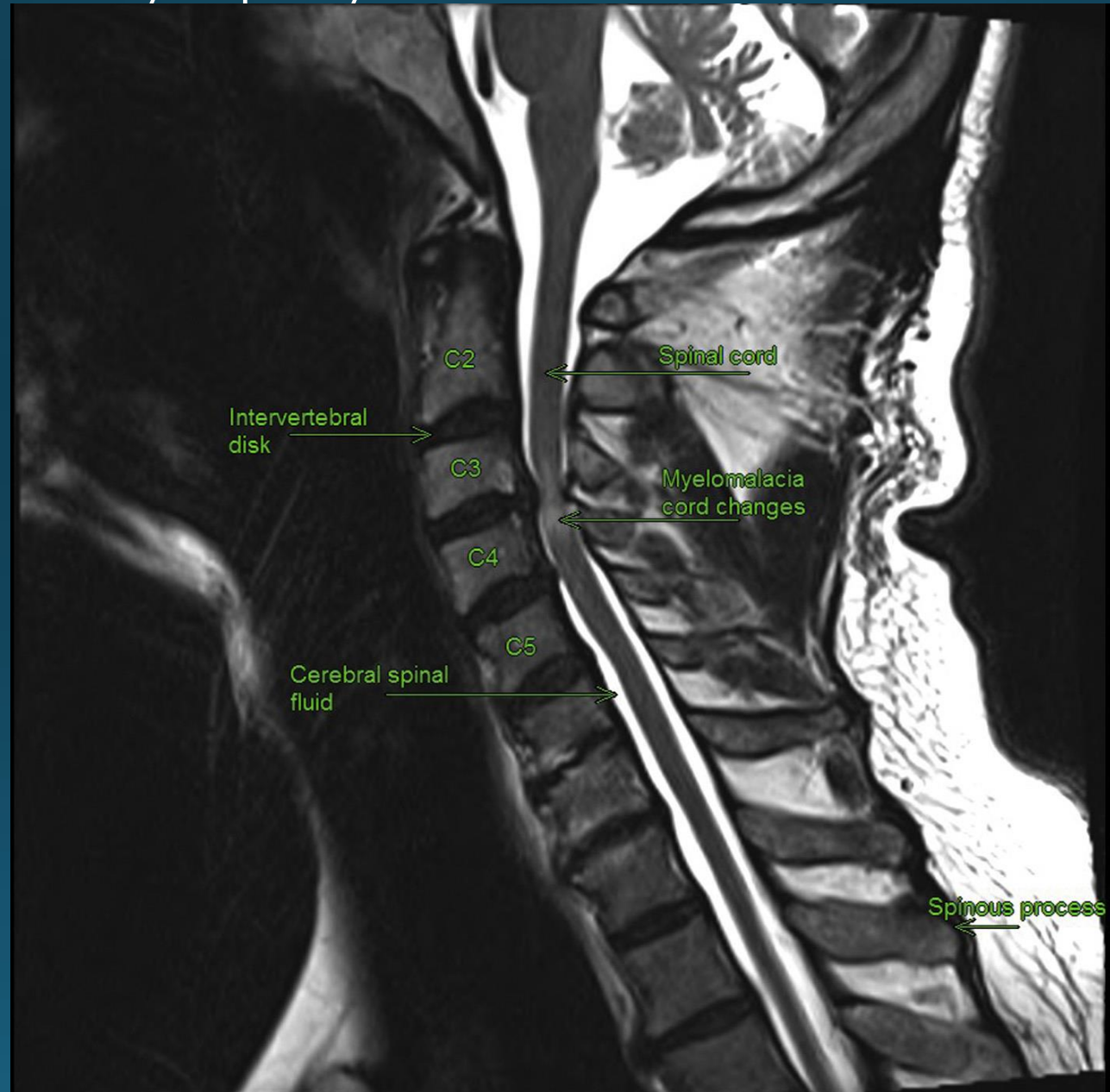
Common MRI Findings with Neuropathic Pain



Cervical Myelopathy

- Cervical degenerative myelopathy is an insidious pathology which can lead to significant physical decline.
- Generally seen in patients over 50 years of age
- The myelopathy is caused by severe constriction of the spinal cord
- Common presentation includes weakness in the upper and lower extremities, numbness/ tingling, gait imbalance (feeling of walking while intoxicated), and in severe cases incontinence.
- Common objective findings also include hyperreflexia, proximal muscle weakness, clonus and pathologic reflexes (Hoffmann & Babinski).
- When the above is suspected urgent MRI imaging (if not contraindicated) should be obtained as well as a spine consult ASAP.

MRI Cervical Spine Myelopathy



Clonus



Hyperreflexia Patella reflex



Referred Cervical Pain

- Referred or atypical presentations should be considered when the findings involve multiple dermatomes and myotomes
- Although rare, pathologies in this group include demyelinating diseases, infection, tumor, and vertebral artery dissection
- Red flags include nocturnal pain, night sweats, weight loss, fever, and chills
- A more urgent tone should be taken in these situations including advanced imaging and appropriate referral.

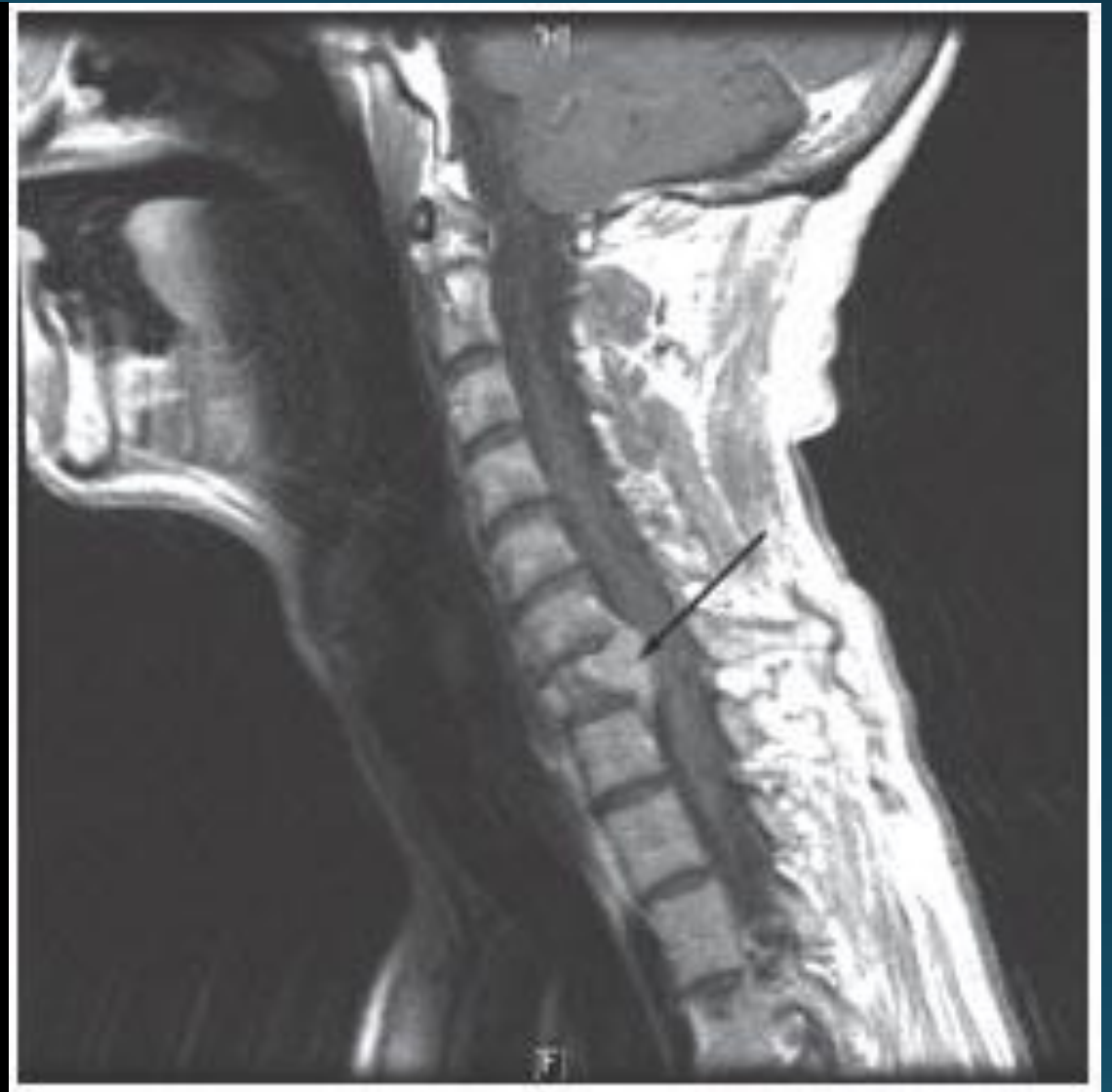


C5-6 Diskitis and epidural abscess

8



Metastatic Melanoma



http://www.nature.com/nrclinonc/journal/v3/n8/fig_tab/ncponco561_F2.html

Imaging

- Plain radiographs of the cervical spine are reasonable to obtain in the clinical setting with failure of conservative modalities and the absence of red flags.
- Typical views will include AP & Lateral (2 view) or 5 view which include AP, Lateral, left & Right oblique, and open mouth
- Open mouth is important to obtain in the patient with PMH of RA due to erosion of the odontoid which can be seen in this disease process.
- Low to no sensitivity for detecting tumor, early infection, or disc herniation



- MRI is test of choice for evaluation of neurologic structure.
- Imaging should be used to validate or refute differential diagnosis. Avoid treatment based on imaging alone
- MRI contraindications include: most pacemakers, spinal cord stimulators, cochlear implants, and aneurysm clips
- MRI is OK with previously fused segments, knee replacement, hip replacement, cardiac stents, etc..
- IV contrast is only helpful if you are concerned about infection, metastatic disease, or intramedullary abnormalities such as syrinx





- CT alone is helpful for evaluation of bony structures of the cervical spine (especially the facet joints).
- Very poor for neurological assessment of disc, nerve, cord, and soft tissue mass
- Can be helpful when used with myelography for patients not MRI compatible.
- CT does expose patients to radiation (NO radiation exposure with MRI)
- Less expensive and no claustrophobia issues

EMG/ NCV

- Nerve conduction studies can be helpful in some cases to distinguish between true cervical radiculopathy and peripheral nerve entrapment.
- Occasionally a “double crush” will occur which when a nerve root and a peripheral nerve are both compressed (herniated disc and carpal tunnel syndrome).
- Can also be helpful with other non-spine related pathology which mimic spine such as brachial plexus injury.
- Many times symptoms will need to be present for several weeks before changes can be present on EMG/NCV

Summary

- Patients presenting with cervical radiculopathy and or myelopathy should be followed closely
- Correlation between subjective complaints, physical exam, and advanced imaging for proper treatment is important
- Recognition of “red flags” such as progressive weakness, bowel bladder changes, acute motor deficits, require urgent evaluation and appropriate referral
- Recognition of these situations can prevent delay and decrease the potential of irreversible damage to the spinal cord or nerve roots.

A photograph of a beach with waves crashing onto the shore. The words "THANK YOU" are written in the sand in the foreground.

THANK YOU