



Neck Pain and Upper Extremity Numbness and Weakness

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HPI

- 78 year old female
- 16 year history of numbness and tingling in the right upper extremity
 - Progressively getting worse
- 4 month history of weakness in the right arm
 - Rapidly getting worse
- Pain at the neck and shoulder, numbness worse in the distal arm

Question 1

- The constellation of numbness and weakness best represents:
 - A. A joint condition
 - B. A muscle condition
 - C. A nerve condition
 - D. A vascular condition

Answer 1

- C
 - Numbness and weakness best represents a nerve condition.

Question 2

- The preliminary differential diagnosis for this patient's pain, numbness and weakness includes all except:
 - A. Nerve root impingement (radiculopathy)
 - B. Rotator cuff tear (strain)
 - C. Brachial plexus injury (plexopathy)
 - D. Peripheral nerve injury (neuropathy)

Answer 2

- B
 - A rotator cuff tear may involve weakness, but should not involve numbness.

What's Next?

- Get more information
 - PMHx
 - Past Medical History
 - PSHx
 - Past Surgical History
 - PE
 - Neurologic Exam
 - Musculoskeletal Exam

PMHx/PSHx

- History of breast cancer
 - Bilateral mastectomy 1972
 - Extensive radiation therapy to chest
- Right clavicle fracture 1997
 - Failed percutaneous pinning
 - Open reduction internal fixation right clavicle
- Near occlusion of right distal subclavian vs axillary artery 2008
 - Emergent right carotid to right brachial bypass

PE - Neurologic

- Reflexes (2+ is normal, 0-4 scale)
 - 1+ right biceps, triceps and brachioradialis
 - 2+ left biceps, triceps and brachioradialis
- Sensation (light touch)
 - Decreased right upper extremity from shoulder to hand
 - Normal left upper extremity
- Motor (5 is normal, < 5 is weak, 0-5 scale)
 - 4/5 right elbow flexion, elbow extension, wrist flexion, wrist extension, finger abduction, thumb abduction
 - 2/5 right shoulder abduction
 - 5/5 entire left upper extremity

PE - Musculoskeletal

- Observation
 - Marked right shoulder girdle atrophy
 - Marked skin thickening/scarring over the right chest wall and shoulder girdle
- Range of Motion (ROM)
 - Severely limited active and passive ROM of the right shoulder in abduction, internal and external rotation
- Provocative Tests
 - Positive shoulder impingement tests

Question 3

- Shoulder impingement tests are used to test for rotator cuff tendonitis or subacromial bursitis, and utilize the following shoulder motions:
 - A. Adduction and external rotation
 - B. Adduction and internal rotation
 - C. Abduction and external rotation
 - D. Abduction and internal rotation

Answer 3

- D
 - Abduction and internal rotation are used to test impingement. These motions decrease the space between the humeral head and the acromioclavicular joint, “pinching” the supraspinatus and/or subacromial bursa.

The history and physical exam is complete – now what?

- Revisit initial differential diagnosis
 - Add or delete possible diagnoses
 - Put diagnoses in order of most likely to least likely
- Determine if the available information is adequate to make the diagnosis
- If the information is not adequate, what further information is needed

Question 4

- The best working differential diagnosis for this patient's numbness and weakness, in most likely to least likely order is:
 - A. Radiculopathy, plexopathy, neuropathy, strain
 - B. Plexopathy, radiculopathy, strain, neuropathy
 - C. Strain, neuropathy, radiculopathy, plexopathy
 - D. Plexopathy, radiculopathy, neuropathy, strain

Answer 4

- B
 - Plexopathy is more likely than radiculopathy, as the motor weakness represents multiple myotomes and multiple nerve distributions.
 - A radiculopathy would show abnormalities in multiple nerve distributions and a single myotome.
 - A neuropathy would show abnormalities in multiple myotomes and a single nerve distribution.
 - A strain may involve weakness, usually pain-related, but should not involve numbness.

Next step – testing our hypothesis

- Diagnostic studies
 - Imaging
 - CT
 - MRI
 - X-rays
 - Bone Scan
 - Ultrasound
 - Electrodiagnostic studies
 - Nerve conduction studies
 - Electromyography
 - Labs

Question 5

- Appropriate diagnostic studies to evaluate rotator cuff pathology include all except:
 - A. X-rays
 - B. MRI
 - C. Bone scan
 - D. Ultrasound

Answer 5

- C
 - Bone scans are non-specific and best used to evaluate bone pathology.
 - MRIs and ultrasound can evaluate muscle.
 - An x-ray may show degenerative changes consistent with chronic rotator cuff injuries

What Further Diagnostic Studies Do You Want?

- ?

AP of Cervical Spine



Lateral of Cervical Spine



Question 6

- Assume the disc space narrowing on the x-rays is associated with neuroforaminal narrowing and nerve root impingement. Weakness would be expected at all muscles except:
 - A. Deltoid
 - B. 2nd Lumbrical
 - C. Brachioradialis
 - D. Biceps

Answer 6

- B. The hand intrinsics are innervated by the C8 and T1 nerve roots. Disc space narrowing is seen at C34, C45 and C56. The deltoid, brachioradialis and biceps are all innervated by the C56 nerve roots. Therefore nerve root impingement at the degenerative levels should not cause lumbrical weakness.

AP of Shoulder



Question 7

- The shoulder x-ray shows a total shoulder replacement and a clavicle plate. The best test to assess the rotator cuff is:
 - A. MRI
 - B. CT scan
 - C. Ultrasound
 - D. Bone scan

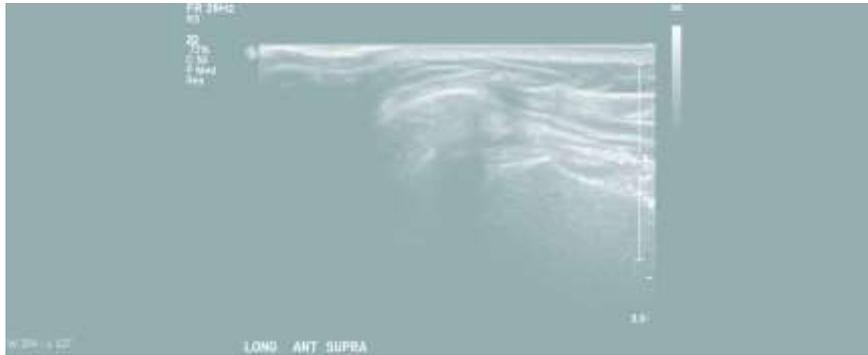
Answer 7

- C – Ultrasound
 - The shoulder and clavicle hardware will distort the image on the MRI and the CT. The CT does not image soft tissues well. The bone scan will not image soft tissues. Ultrasound can evaluate superficial and moderately deep soft tissues and will be minimally affected by the hardware.

Answer 7 – MRI of shoulder, marked distortion from hardware



Answer 7 – US of shoulder, able to visualize rotator cuff



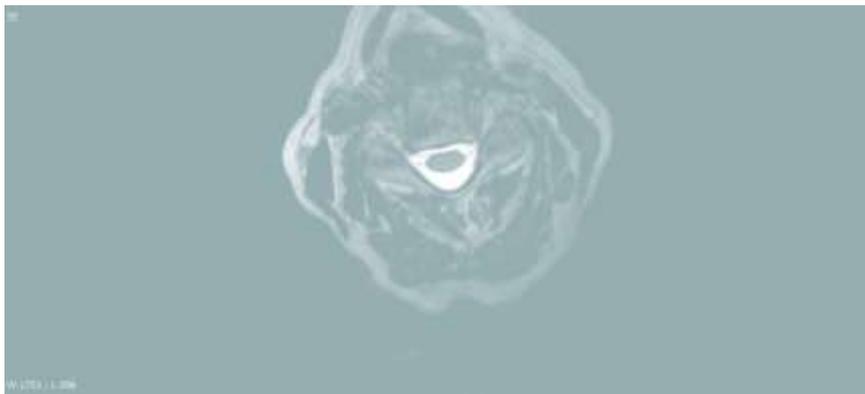
Sagittal view of the Cervical Spine



Question 8

- An MRI of the cervical spine is obtained to evaluate nerve root compression as a cause of muscle weakness. The axial views (next slide) do show narrowing of the nerve root exit due to a “squaring” of the vertebral body. This squaring is caused by the:
 - A. Odontoid process
 - B. Transverse process
 - C. Uncinate process
 - D. Styloid process

Question 3 (gRAT) – Axial view of Cervical Spine



Answer 8

- C – Uncinate process
 - The uncinate process is a the raised lateral edge of the surface of the cervical vertebral body.
 - With degeneration of this process, can form an uncovertebral joint with the adjacent vertebral body, and “squaring” of the vertebral body, leading to nerve root impingement.

Electrodiagnostic Studies - NCS

Nerve Conduction Studies

Nerve Stimulated	Stimulation Site	Recording Site	Amplitude (mV, Sensory-µV)			Distal Peak Latency (ms)			Conduction Velocity (m/s)			F-wave Latency (ms)	
			Rt	Lt	NL	Rt	Lt	NL	Rt	Lt	NL	Rt	Lt
Median (S)	Wrist	Index	15	80	>90	3.7	3.7	+3.5	64				
Median (S)	Wrist	W-Mid	7			3.5							
Ulnar (S)	Wrist	Ulna	30	25	>9	3.4	3.4	+3.2	68				
Ulnar (S)	Wrist	W-Uln	9			3.3							
Tibial (S)	Forearm	Heel	11	38	>12	2.8	2.8	+2.8	40				
Lat. antebrachial (S)	Elbow	Forearm	3	7	>18	4.7	4.8	+6.8	54				
Med. antebrachial (S)	Elbow	Forearm	100	5		100	5.5						
Median (M)	Wrist	APB	4.4		<5	4.3		+4.0	34			29.6	
Median (M)	Elbow	APB	3.8			8.2					100		
Ulnar (M)	Wrist	ADM	5.1		>1	2.9		+3.1	46			29.0	
Ulnar (M)	Wrist	EDB	3.7			7.2			46		100		
Ulnar (M)	Ankle	ADM	4.2			5.5			51		100		

(NR) = No Response; Rt = right, Lt = Left; APB = Abductor Pollicis Brevis; ADM = Abductor Digiti Minimi; EDB = Extensor Digitorum Brevis; AP = Abductor Pollicis

Question 9

- An electrodiagnostic test is performed to evaluate the cause of the right arm weakness. The difference of the sensory nerve action potential amplitudes on the right side compared to the left side is most consistent with:
 - A. Brachial plexopathy.
 - B. Cervical radiculopathy.
 - C. Median neuropathy.
 - D. Neuromuscular junction disorder.

Answer 9

- A – Brachial plexopathy
 - The decreased amplitude of the right side sensory nerve action potentials (SNAP) is consistent with a lesion distal to the dorsal root ganglion.
 - A radiculopathy would cause compression proximal to the dorsal root ganglion, with subsequent sparing of the SNAPs.
 - A median neuropathy would result in an abnormal median SNAP, but would not cause the other SNAPs to be abnormal.
 - A neuromuscular junction disorder would not affect the SNAPs, they would be normal.

Question 10

- Determination that a brachial plexopathy is caused by radiation as opposed to compression is supported by the presence of _____ on the needle electromyography exam.
 - A. Myotonia
 - B. Fasciculations
 - C. Myokymia
 - D. Complex repetitive discharges

Answer 10

- C – Myokymia
 - Myokymia are repetitive discharges of a single motor unit action potential.
 - Myokymic discharges are often seen in examination of the muscles affected by radiation plexopathies.
 - The absence of myokymia does not rule out radiation as the cause of the plexopathy.