

AAPA/ AAOS Musculoskeletal Galaxy

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Upper Extremity and Cervical Spine
Physical Exam Techniques

Tom Gocke, MS, ATC, PA-C, DFAAPA
Travis Randolph, MS, ATC, PA-C

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Elbow Physical Examination

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Physical Examination

Inspection

- Carrying angle
 - Normal 5-8° (10-12° females)
- Edema
- Ecchymosis
- Frank deformity
 - Higher-energy
 - Additional injuries

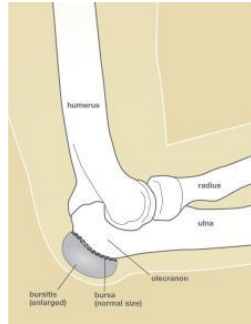


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Physical Examination

Palpation:

- Distal biceps and triceps tendons
- Medial and lateral Epicondyles
- Distal Humerus
- Olecranon process
- Radial and Ulnar collateral ligaments
- Radial Head

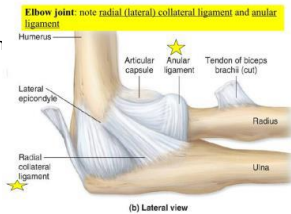


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Physical Examination

Range of Motion:

- Normal: 0-140/150°
- Functional
 - flexion: fingertips touch anterior deltoid
 - extension: elbow straight
- Pronation- 80°
- Supination - 80°



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Physical Examination

Strength:

- Elbow
 - Flexion & extension
 - Pronation & supination
- Wrist
 - Flexion & extension
 - Pronation & supination

Shoulder -

- Depends on location of suspected injury

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NEUROLOGIC EXAM

Reflex Testing

- Biceps Reflex – C5
 - Deltoid & Biceps strength
- Brachioradialis Reflex- C6
 - Brachioradialis & wrist extension strength
- Triceps Reflex – C7
 - Triceps & wrist flexion strength
- C8 – no reflex
 - Distal phalanx strength Index & Long fingers

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Physical Examination

Orthopaedic Tests

Ulnar Collateral stress test

•Provide a valgus stress to the elbow joint

•**Positive test:** reveals pain and laxity. The amount of laxity will determine grade of Ulnar Collateral Ligament injury



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Physical Examination

Orthopaedic Tests

• Radial Collateral stress test

– Provide a varus stress to elbow joint

– **Positive test:** reveals pain and laxity. The amount of laxity will determine grade of Radial Collateral Ligament injury



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Physical Examination

Orthopaedic Tests

- **Hook Sign**
 - Patient resistively & forcefully flexes **elbow**
 - **Positive test:** reveals pain, deformity and inability to contract distal Biceps tendon.
 - Unable to “Hook” a finger under the distal Bicep tendon insertion.



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Physical Examination

Orthopaedic Tests

- **Cubital Tunnel Tinel**
 - Percussion over Ulnar nerve at Elbow
 - Positive test- radiates pain/numbness ulnar nerve distribution
- **Elbow Flexion Test**
 - Flex elbow > 90 degrees, supinate & ext wrist
 - Positive test- reproduces symptoms & paresthesias < 60 sec



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Wrist Physical Examination

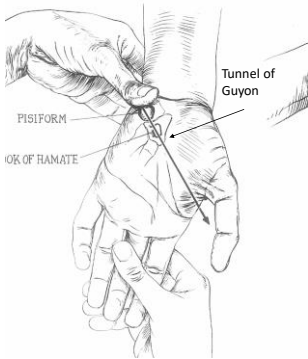
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Wrist Ligament Injuries

Physical examination-

- Inspection:
 - Look for swelling dorsal wrist
 - Finger deformities
- Palpation:
 - Start with distal Radius & Ulna & work proximal
 - Pain will dictate exam
 - Tenderness proximal carpal row
 - Scapholunate region
 - Anatomic Snuff Box
 - Metacarpals and Phalanges

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Pisiform and Hamate palpation

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Tunnel of Guyon

- Depression between pisiform and hook of hamate
- Contains ulnar nerve and artery
- Site of compression injuries
 - unusually tender if pathology is present

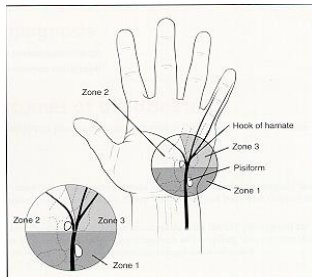


Figure 1 Distal ulnar tunnel showing the three zones of entrapment. Lesions in zone 1 give motor and sensory symptoms; lesions in zone 2 cause motor deficits, and lesions in zone 3 create sensory deficits.

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Wrist Ligament Injuries

Physical examination

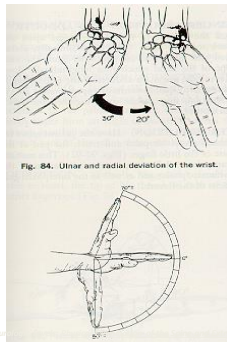
- Range-of-Motion (ROM)
 - Maybe limited 2nd to swelling or pain
 - Decreased flexion/extension ROM wrist
- Strength
 - Usually diminished 2nd to pain & swelling
 - Decreased grip strength
- Neurovascular
 - Check gross sensory function & compare to contralateral side
 - Assess Radial & Ulnar pulses

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RANGE OF MOTION

Wrist-

- Flexion- 60-80°
- Extension- 60-70°
- Radial deviation - 10°
- Ulnar deviation- 30°
 - **Ulnar deviation is greater than radial**
- Pronation & Supination - 90°



Hoppenfeld S: Evaluation of Wrist. Prentice-Hall, Saddle Brook, NJ

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Wrist Ligament Injuries

Orthopaedic Tests:

- Lunotriquetral Shuck test
 - (Kleinman shear test)
 - Place thumb and index finger over Lunate region wrist
 - Apply force across Luno-Triquetrum
 - Positive test elicits pain, crepitation & laxity @ Lunotriquetral joint



Berdia S, Gellman H: Carpal Ligament Instability Presentation, MedScape, May 20, 2016

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Wrist Ligament Injuries

Orthopaedic Tests:

- Watson Test
 - Pressure over volar scaphoid produces clunk 2nd to subluxation scaphoid @ Radioscaphoid joint
 - Move wrist in Radial & Ulnar deviation

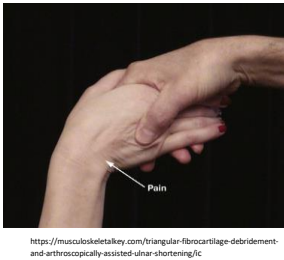


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Wrist Ligament Injuries

Orthopaedic Tests:

- TFCC Load Test
 - 'hand shake position': ulnar deviates the wrist, & compressing TFCC.
 - Compressing TFCC, rotate the wrist to feel for crepitus, clicking and pain



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Carpal Tunnel Syndrome

- Examination
 - Palpation/Inspection
 - ROM
 - Ortho Tests
 - Phalen Maneuver
 - Durkan's Test (direct pressure)
 - Tinel Test
 - Allen's Test
 - Froment's Sign
 - Neuro/Vascular
- X-Ray – low yield
- EMG/NCV



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Cubital Tunnel Syndrome

Physical Exam

- Specific Tests
 - **Froment's sign**
 - Test Adductor Pollicis (innervated by Ulnar Nerve)
 - Forcible hold paper between thumb & index finger
 - **Positive test-** thumb IP joint flexes



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Hand - Finger Physical Examination

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Physical Examination

- Inspection: deformities, skin, lacerations
- Palpation: Metacarpals, Joints, Phalanges
- ROM:
 - Wrist: Flex/Ext, Pronate/Supinate, Radial/Ulnar deviation
 - Finger/Thumb: Flex/Ext & circumduction, Apposition/Opposition
- Strength: Wrist & Fingers (Forearm, CET, CFT)
- Neurovascular
 - **Radial:** Sensory-Thenar / Motor-Wrist/finger extension
 - **Median:** Sensory – Fingers tips I-Ring /Motor –wrist/finger flexors
 - Wrist Pronators
 - **LOAF:** Lumbricals 1&2, Opponens Pollicis, ABD Pollicis, FPB
 - **Ulnar:** Sensory – Small finger / Motor – FCU, Ulnar ½ FDP
 - Hypothenar Muscles
 - **FAIL:** FPB-deep, Adductor Pollicis, Interossi, Lumbricals 3&4
- Orthopaedic Tests

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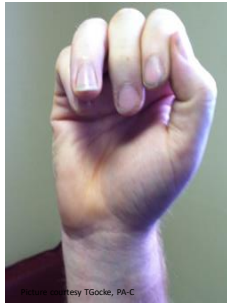
PALPATION of Fingers

- Finger Flexor Tendons
 - Trigger Finger- sudden audible/palpable snapping with movement of one of the fingers
 - Any finger/Thumb - Ring most common
- Extensor Tendons
- Tufts of Fingers
 - Felon- local infection
 - Paronychia- hangnail infection nail region

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Cascade sign

- Assure all fingers point to scaphoid area when flexed at PIPs
- Positive finding: injured finger malrotates & does not point to scaphoid region



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RANGE OF MOTION

Finger-

- Active range of motion (ROM)
 - Isolate MCP, PIP & DIP joints
 - Flexion MCP-85°, PIP-100°, DIP- 80°
 - Extension 0°
 - Tight fist and open
 - Do all fingers work in unison
 - ABDuction/ADDuction - MCP joint
 - Spread fingers apart and then back together
- Passive range of motion if unable to actively move joint
- Bilateral comparison
 - To determine degrees of restriction

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RANGE OF MOTION

Thumb

- Thumb flexion/extension at MCP and IP
 - Touch pad at base of little finger
- Thumb ABD/ADD @ Carpometacarpal joint
- Opposition
 - Touch tip of thumb to tip of each finger

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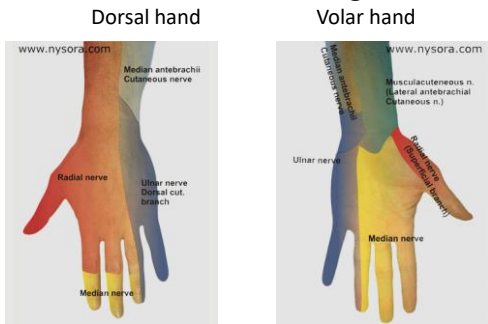
NEUROLOGIC EXAM

- **Sensation testing**
 - C5-6-7-8, T1
 - Radial – Ulnar – Median Nerves
- **Muscular assessment**
 - AROM, RROM
 - Pain complicates grading strength
- **Reflexes**
 - Biceps - C5
 - Brachioradialis – C6
 - Triceps – C7
- **Bilateral comparison essential to exam**

Repostfield S: Evaluation of Neurologic Levels: Physical Examination of the Spine and Extremities, Prentice-Hall, Caddis Books n3

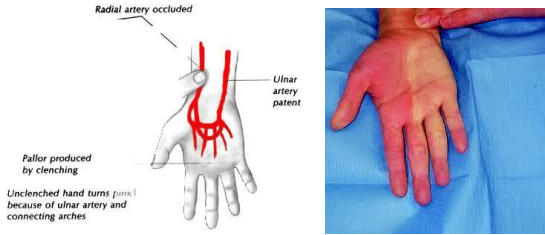
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Sensation Testing



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Allen's Test



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Specific Ortho Tests

Tendon Integrity tests

- **Flexor Digitorum Superficialis Test**
 - Flex finger at PIP
 - The only functioning tendon at the PIP
- **Flexor Digitorum Profundus Test**
 - Flex at DIP
 - The only functioning tendon at the DIP
 - Inability to flex = tendon laceration or denervated
- **Extensor Tendon Test**
 - Extend MCP, PIP, DIP
 - Active and resistive
 - Inability to extend = tendon laceration or denervated

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Specific Ortho Test

Finkelstein Test

- Used to assess tenosynovitis first dorsal compartment
 - Abductor Pollicis Longus
 - Extensor Pollicis Brevis
- Test:
 - Provider grasps thumb and passively palmar flexes and ulnar deviates the wrist
 - **Positive test:** sharp pain occurs along the 1st dorsal compartment (thumb extensor/ABD tendons)



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Specific Ortho Test

Finkelstein Test

- Alternate Test:
 - patient flexes their thumb and clench their fist over the thumb followed by ulnar deviation
 - **Positive test:** sharp pain occurs along the 1st dorsal compartment (thumb extensor/ABD tendons)



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Physical Exam of the Shoulder

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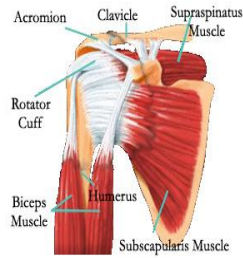
History: Subjective Complaints

- Age/ Occupation/ Hand Dominance/ Sports
- Mechanism of Injury (MOI)
- Previous injury or surgery on shoulder
- Provocative or Alleviating movements
- Location, rating (0-10), quality of pain
- Night pain (common complaint with RTC tears)
- Paresthesia

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Shoulder Exams

- Inspection/ Palpation
- Range of Motion
- Strength Test
- Neurovascular Test
- Special Test



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Shoulder Inspection

- Evaluate shoulder movements when patient moves during exam, shakes hand, removes shirt
- Assess for deformities or malalignment (biceps rupture, AC separation, pec rupture, scapula winging, rounded shoulder posture, sulcus, scoliosis, kyphosis)
- Look for any scars, abrasions, ecchymosis, swelling, muscle atrophy (Deltoid- Axillary N.)
- Be sure to compare to contralateral shoulder!

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Shoulder Palpation

Bony Landmarks

- AC Joint/ Clavicle/ SC Joint
- Acromion
- Greater Tuberosity
- Bicipital Groove
- Lesser Tuberosity
- Coracoid Process
- Sternum
- Scapula
 - Superior Medial/ Inferior Angle
 - Scapular Spine

Soft Tissue Structures

- Trapezius Muscle
- Long Head of Biceps
- Pectoralis Muscle
- Deltoid
- Axilla/ Lymph nodes
- Subacromial/ Subdeltoid Bursa
- Rotator Cuff
 - Supraspinatus
 - Infraspinatus
 - Teres Minor
 - Subscapularis

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Shoulder Range of Motion

- Evaluate both AROM and PROM (feel end point)
- Flexion- 180 degrees
- Extension- 45 degrees
- Internal Rotation- 55 degrees (vertebral level)
- External Rotation- 40-45 degrees
- Abduction- 90 degrees
- Adduction

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Shoulder Strength Testing

Manual Muscle Grading (+/-)

- 5 Normal:** Complete ROM against gravity with full resistance
- 4 Good:** Complete ROM against gravity with some resistance
- 3- Fair:** Complete ROM against gravity
- 2- Poor:** Complete ROM with gravity eliminated
- 1- Trace:** Evidence of slight contractility, no joint motion
- 0- Zero:** No evidence of contractility

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Shoulder Strength Testing

- Flexion: Anterior Deltoid/ Coracobrachialis
- Extension: Latissimus Dorsi/ Teres Major/ Posterior Deltoid
- Internal Rotation: Subscap/ Pec Major
- External Rotation: Infraspinatus/ Teres Minor
- Abduction: Middle Deltoid/ Supraspinatus
- Adduction: Pec Major/ Latissimus Dorsi
- Scapular Retraction: Rhomboid Major/ Minor
- Scapular Protraction: Serratus Anterior

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Shoulder Special Test

- Rotator Cuff/ Impingement/ Bursitis/ AC
 - Neer: Impingement
 - Hawkins/ Kennedy: Impingement
 - Drop Arm Test:
 - Hornblower’s Test
 - Jobe’s/ Empty Can Test: Supraspinatus
 - Crossbody Adduction
 - Bear Hug/ Belly Press/ Lift Off Test: Subscapularis

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Shoulder Special Test

- Instability/ Labral Test/ Biceps
 - Apprehension and Relocation
 - O’Brien’s Test
 - Speed’s Test
 - Yergason Test
 - Sulcus Sign
 - Crank/ Jerk for posterior/ Load and Shift Test

Assess for generalized laxity of joints

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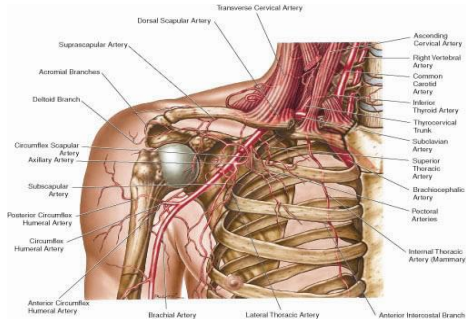
Shoulder Special Test

- Thoracic Outlet Syndrome
 - Roos/ EAST Test
 - Adson: extend arm, lateral rotate head toward affected side, deep breath and hold, diminished pulse

Vascular Exam: Brachial and Radial Artery

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Shoulder Vascular Anatomy



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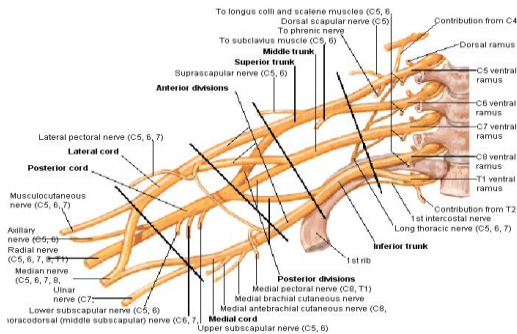
Shoulder Neuro Exam

- Deltoid: C5-C6/ Axillary Nerve
- Supraspinatus: C5-C6/ Suprascapular Nerve
- Infraspinatus: C5-C6/ Suprascapular Nerve
- Trapezius: Spinal Accessory N/ Cranial Nerve XI
- Rhomboids: C5/ Dorsal Scapular Nerve
- Serratus Anterior: C5, C6, C7/ Long Thoracic N.

- Reflex/ Sensation: Refer to C-spine exam

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Brachial Plexus



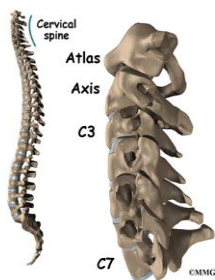
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Physical Examination of the C-Spine

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Physical Exam of the Cervical Spine

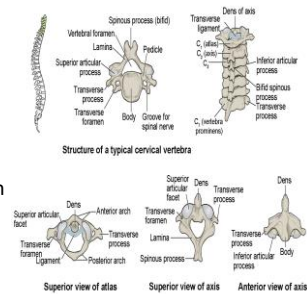
- General principles
- Inspection
- Palpation
- ROM
- Sensory function
- Motor function
- DTR
- Special Testing



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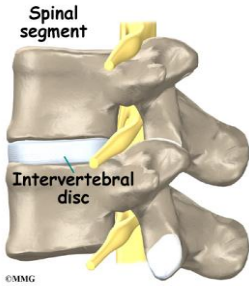
Cervical Anatomy

- Palpable bony landmarks
- Facet joints
- Atlas/Axis
 - Dens
- Ligamentous
- ALL, PLL, Ligamentum Flavum, etc
- Lordotic curve



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Vertebrae



- - 7 Cervical, 12 thoracic, 5 Lumbar, Sacrum, Coccyx

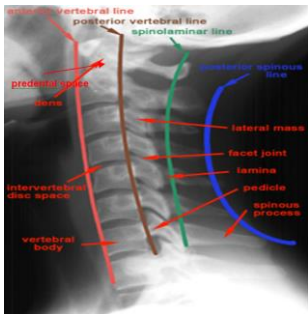
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Spinal Nerves



- 8 Cervical: Upper Extremity
- 12 Thoracic: Ribs
- 5 Lumbar: Lower Extremity
- 5 Sacral: Pelvic floor/bladder, bowel, etc.
- 1 Coccygeal

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Assessment

- Patients will complain of localized pain, spasm, +/- radicular pain/numbness, loss of motor function.
- Detailed history should include severity, timing, onset, etc.
- Previous treatment? MVA? Recent imaging? Pain management?
- Medications for pain/spasm relief?
- PE:
 - Inspection, Palpation
 - ROM
 - Neurologic exam
 - Special Testing

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Physical Exam

- Asymmetry, shoulder, scapula, rib hump, swelling, operative scars, skin lesions (café au lait spots - neurofibromatosis)
- Shoulder/Upper extremity function
- Grip
- Any point tenderness? Palpable spasm?
- Gait
 - Wide base, shuffle, tandem, heel/toe stand/walk, antalgic
- Extremities – muscle wasting/atrophy

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Range of Motion

- Flexion: normal = 50°
 - chin able to touch region of sternoclavicular joint.
- Extension: normal = 60°
 - primarily involves the atlanto-axial and atlanto-occipital joints.
- Lateral flexion: normal = 45° to both sides
 - restriction of lateral flexion is common in cervical spondylosis. Inability of lateral flexion without forward flexion at the same time suggests atlantoaxial and atlanto-occipital joint abnormalities.
- Lateral rotation: normal = 80° to both sides
 - normally just short of plane of shoulders at full rotation. Rotation is restricted and painful in cervical spondylosis

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Neurologic Evaluation

- C5 nerve root: Muscle weakness: shoulder abduction and flexion/elbow flexion. Reflex changes: biceps. Sensory changes: lateral arm.
- C6 nerve root: Muscle weakness: elbow flexion/wrist extension. Reflex changes: biceps/supinator. Sensory changes: lateral forearm, thumb, index finger.
- C7 nerve root: Muscle weakness: elbow extension, wrist flexion, Reflex changes: triceps. Sensory changes: middle finger.
- C8 nerve root: Muscle weakness: finger flexion. Reflex changes: none. Sensory changes: medial side lower forearm, ring and little finger.
- T1 nerve root: Muscle weakness: finger abduction and adduction. Reflex changes: none. Sensory changes: medial side upper arm/lower arm.

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Motor Function

- C4 Trapezius Shoulder elevation
- C5 Deltoid Shoulder abduction
- C6 Bicep/wrist extensors Elbow flex/wrist ext
- C7 Triceps Elbow extension/wrist flex
- C8 Finger flexors Hand grip
- T1 Hand interossei Finger abduction/adduction

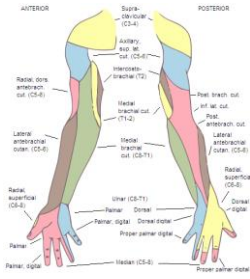
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Manual Muscle Testing (MMT)

- Grade key muscles groups from 0-5 (ASIA Grading System)
- 0: total paralysis
- 1: Palpable or visible contraction
- 2: Active movement, full ROM, gravity eliminated
- 3: Active movement, full ROM, against gravity
- 4: Active movement, full ROM, against gravity with some resistance
- 5: Active movement, full ROM, normal resistance
- NT: Patient unable to reliably exert effort – immobilization, pain on effort

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Dermatomes:



- C5 Lateral forearm
- C6 Thumb
- C7 Middle finger
- C8 Small finger
- T1 Medial forearm

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Sensory Testing

- Grade sensory in C5 to T1 dermatomes
 - score using ASIA Sensory Grading System
 - 0 - Absent
 - 1 - Impaired
 - 2 - Normal
 - NT - Not testable
 - score major sensory types in all patients
 - pain (prick with sharp object such as paper clip, broken cue tip)
 - light touch (stroke lightly with finger)
 - score minor sensory types for focused exam
 - Vibration, temperature, two-point discrimination

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Deep Tendon Reflexes

- C5: Biceps Tendon
- C6: Brachioradialis Tendon
- C7: Triceps Tendon

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DTR Scaling

- NINDS Scale (National Institute of Neurological Disorders And Stroke)
 - 0: Absent
 - 1+: Low normal, diminished, trace response
 - 2+: Normal
 - 3+: Brisk, more reflexive than normal
 - 4+: Very brisk, hyperreflexive, with clonus
 - 5+: Sustained clonus

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Special Testing

- Spurling Maneuver - Evaluates nerve root compression in foramen
 - Apply axial load to neck while laterally rotated toward side of pathology placed in extension
 - Positive when it recreates radicular symptoms (pain, numbness, tingling, paresthasias) in the appropriate dermatome
- Hoffman's Test
 - hold and secure the middle phalanx of the long finger; flick the distal phalanx into an extended position.
 - Involuntary contraction of the IP joint is a positive test, suspicious for Cervical Myelopathy.
- Testing of the Upper Extremity may be helpful to rule out cervical involvement (shoulder impingement, Phalen's, Tinell's, Rotator Cuff Pathology, Etc.)

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References

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 Johnson DL, Mair SD: Clinical Sports Medicine. 2006 Mosby Inc.
 AADS Comprehensive Orthopedic Review, Vol. 2, 2009
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 - Jeffrey S. Fischgrund, MD, Editor

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