Cervical Spine Evaluation and Treatment: Classics and Controversies

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Annual Review in Family Medicine

Objectives

- Enlightening
- Entertaining
- Educational
- Treatment
- Referrals

Objectives

- Anatomy
- Physical & Neurological Exam
- Electrodiagnostics
- Imaging
- Differential DX
- Referral or Observation
Surgical Indications

• Neurological Compromise
• Instability (acute/anticipated)
• Deformity
• Infection/Tumor
• Radicular/Myelopathic (refractory)
• Pain

PAIN

• P – Pain
• Q – Quality
• R – Radiation
• S – Severity
• T – Temporal

Cervical Spine Anatomy

• Function
  – Support & Stabilize Head
  – Allow Head Range of Motion
  – Contain and Transport Spinal Cord and Vertebral Arteries
Spinal Cord Anatomy

- Normal AP Cord Diameter = 9mm
- CSF and Dura = 1mm (on 4 sides)
- Minimal Canal Diameter ≥ 13mm
- Lordotic (Extension) Curve
- Anterior and Posterior Spinal Arteries

Cervical Axial MRI

Neuro-Anatomy

- Upper Motor Neuron (UMN)
  - Corticospinal/Corticobulbar
  - Descends From Cerebral Cortex to Brain Stem/Cord, or From Brain Stem to Cord
  - Synapses with LMN
  - Weakness, Spasticity, Hyperreflexia, +Babinski
- Lower Motor Neuron (LMN)
  - Cell Body Within CNS, Axon Innervates Muscles/Glands
  - Anterior Horn Cell/Cranial Nerve Motor Neuron
  - Flaccidity, Atrophy, Hyporeflexia, Weakness

Spinal Cord Tracts
**Inspection**

- Posture/Attitude
- General Health
- Facial Grimacing
- Peculiar Mannerisms
- Gait
- Scars/Swelling/Discoloration

**Range of Motion**

- Flexion/Extension
  - 50% O-C1, 50% C2-T1
  - Chin to chest
  - Ceiling
- Lateral Rotation
  - 50% C1-C2 (Atlas-Axis)
  - Chin to shoulders
- Lateral Flexion
  - Ear to shoulder (45 degrees)

**Palpation**

**Anterior**

- Hyoid Bone
- Thyroid Cartilage
- 1st Cricoid Ring
- Carotid Tubercle

**Posterior**

- Occiput
- Inion
- Superior Nuchal Line
- Mastoid Processes
- Spinous Processes
- Facet Joints
Neurologic Exam
• Deep Tendon Reflexes
• Sensory
• Motor
• Gait

Deep Tendon Reflexes
• Biceps, Brachioradialis, Triceps, Patellar, Achilles
• Absent(0), Trace(1+), Normal(2+), Brisk(3+), Hyperactive(4+)
• Clonus
  – Ankle (Achilles)
  – Sustained/Unsustained
• Facilitation

Pathologic Reflexes
• Babinski
  – Sharp Instrument Across Plantar Lateral Foot From Heel To Forefoot → Great Toe Extension, Lesser Toes Plantarflex
• Hoffman
  – Sudden Hyperextension Middle Fingertip → Reflexive Finger and Thumb Flexion

Pathologic Reflexes
• Chvostek
  – Percussive Tapping of Parotid Gland @ Masseter → Facial Muscles Contract/Twitch
• Jaw Reflex
  – Hammer Tapping Fingertip On Mental Area of Chin With Mouth Slightly Open → Closes Mouth (Absent/Diminished = 5th Cranial Nerve Pathology)
C5
- Reflex - Biceps
- Sensory - Lateral Arm
- Motor - Deltoid, Biceps

C6
- Reflex – Biceps, Brachioradialis
- Sensory – Lateral Forearm
- Motor – Biceps, Wrist & Thumb Extensors

C7
- Reflex – Triceps
- Sensory – Middle Finger
- Motor – Triceps, Wrist Flexors, Finger Extensors

C8
- Reflex – (none)
- Sensory – Ring and Little Fingers & Distal Ulnar Forearm
- Motor – Finger Flexors (Grip)
T1

- Reflex – (none)
- Sensory – Medial Arm/Elbow
- Motor – Finger Abductors (Dorsal Interossei, Abductor Digiti Quinti)

Special Tests

- Axial Compression
  - Downward Pressure On Head—Neck &/or Arm Pain/Paresthesias
- Axial Distraction
  - Lifting Upward On Occiput and Chin—Relieves Neck/Radicular Symptoms
- Valsalva Test
  - Breath-holding and Bearing Down (Simulated Forced Bowel Movement)

Special Tests

- Spurling Maneuver
  - Root Compression From Oblique Extension (Extension w/Lateral Rotation)
- L’Hermitte Sign
  - Sudden/Rapid Neck Flexion—Electrical Shock-Like Sensation Extremities and Trunk

Special Tests

- Adson Test
  - Radial Pulse Obliteration w/Abduction, Extension, External Rotation While Head Rotated Opposite
Electrodiagnostics

• EMG (Electromyogram)
  – Denervation/Reinnervation = Radiculopathy
• NCV (Nerve conduction studies)
  – Neuropathy
• SSEP (Somatosensory Evoked Potentials)
  – Controversial diagnostic
• DEP (Dermatome Evoked Potentials)
• MEP (Motor Evoked Potentials)
  – Better Intraoperative Reliability

Cervical Myelopathy

• Progressive Disorder
• Multiple Etiologies
• Spinal Cord Compression
• Vascular Compromise/Ischemia
• Single/Multiple Levels
• Grey Matter Vascular Demands 4-5x >> White Matter (explains LMN findings)

Cervical Myelopathy

• Cord Signs/Symptoms >> Focal Radicular
• Motor Loss >> Sensory Deficit
• LMN w/Upper Extr Atrophy @ Level
• UMN w/Lower Extr Spasticity & Hyperreflexia Below Level
• Sensory Sparing (Posterior Columns)
• Analgesia > Anesthesia > Proprioceptive Loss
• Hyperreflexia Legs >> Arms
• Babinski Sign & Hoffman Reflex
Cervical Myelopathy

Cervical Radiculopathy

- Arm Pain >>> Mechanical Neck Pain
- Proximal Pain and Distal Paresthesias
- Neurologic Deficit(s) in Dermatomal Pattern
- Isolated Numbness/ Motor Deficit Without Sensory Pain/Numbness
- Sxs Relieved by Overhead Arm Abduction

Cervical Radiculopathy

Cervical Radiculopathy
Myelopathy & Radiculopathy

• History, History, History
• Neurological Examination
• MRI, X-ray
• ??? Electrodiagnostics
• R/O Polyneuropathy vs CNS Disorder

Torticollis

• Rotational Deformity of Head and Neck
  – Spastic/Contracted Sternocleidomastoid
  – Head Tilted Ipsilateral
  – Chin Rotated Contralateral
  – Infants: Palpable Fibrous Mass
  – R/O Congenital Abnormalities
  – Rx=Mostly Conservative, Occasional Surgical

Tumors (Peds)

• Primary Osseous – Uncommon
• Metastatic – Rare
• Radiographic Dx
• Most Common Benign:
  – Aneurysmal Bone Cyst (ABC)
  – Osteoblastoma
  – Eosinophilic Granuloma
  – Osteochondroma
  – Hemangioma
  – Histiocytosis
**Congenital**
- Klippel-Feil
- Odontoid Dysplasia
- Kyphosis
- Arnold-Chiari Malformation

**Metabolic Dz/Bone Dysplasia**
- Odontoid Dysplasia & AtlantoAxial Dislocation, Subaxial Subluxation
  - Morquio’s, SED, Diastrophic Dwarfs
- Vertebra Plana (Platyspondylysis)
  - Spondyloepiphyseal Dysplasia
- Congenital Stenosis
  - Achondroplasia (short limbs)

**Rheumatoid Arthritis**
- Sero-Positive Diffuse Inflammatory Arthropathy
- Synovial Tissue Invasion/Destruction Joint Surfaces → Ligamentous Laxity
- Exacerbated by Osteoporosis and Steroid Therapy
- Atlanto-Axial &/or Subaxial Dislocation
- Asymptomatic → Pain, Myelopathy, Quadriaparesis, Cardiac/Respiratory Distress, Apnea, Sudden Death

**RA Radiographic Predictors**
Rheumatoid Basilar Invagination

Ankylosing Spondylitis

- STIFFNESS
- “Bamboo Spine”
- Hypolordosis/Kyphosis
- Spontaneously or Mild Trauma → Fracture and Worsening Deformity (Chin-on-Chest)
- Fracture Thru Disc Space (+/- Paralysis)
- BEWARE Massive Epidural Hemorrhage

Tumors (Adult)

- Primary
  - Rare, Usually Benign: Osteoid Osteoma, Osteoblastoma, ABC, Eosinophilic Granuloma, Giant Cell Tumor, Fibrous Dysplasia, Hemangioma, Gorham Dz
  - Malignant: Chordoma, Chondrosarcoma, Osteosarcoma, MFH, Ewing, NonHodgkin Lymphoma, Plasmacytoma
Plasmacytoma

Tumors (Adult)

- Metastatic
  - 5% per year All Malignancies
  - Lumbar/Thoracic >> Cervical
  - Breast, Lung, Prostate, Kidney, Lymphoma, Myeloma Most Common Primaries
  - Venous Spread
  - Vertebral Body >>> Lamina and Pedicles
  - Anterior Cord Compression → Motor>Sensory

Multiple Myeloma

Cervical Spine Infections

- Less Prevalent vs Thoracic/Lumbar
- Higher Rate Neurologic Compromise
- Pyogenic vs Granulomatous
- Iatrogenic vs Hematogenous Diskitis & Osteomyelitis
- Penetrating vs Blunt Esophageal Trauma
- Epidural >>> Subdural Abscess
- WBC, ESR, C-Reactive Protein, Cultures
- MRI, X-ray, CT Scan, Radionuclide
Athletic Injuries

- Prevention/Identification
- Collision Sports: Football, Hockey, Rugby, Wrestling
- Non-Contact: Soccer, Track & Field, Diving, Surfing, Water Skiing, Water Polo, Body Surfing, Power Lifting

Football Injuries

- On-field Eval & Transportation
- Return-to-play criteria
- Spear-Tackling
- Stenosis
- Stingers

Referral Criteria

- Neurological Worsening
- Neoplasms
- Infections
- Acute Trauma
- Refractory Pain