

Pediatric Orthopaedic Physical Exam



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Musculoskeletal Exam

- Establish a rapport
- Patient History
- Observation
- Examination of Motion/Movement
- Special Tests
- Reflexes and Sensory Exam
- Palpation
- Evaluating Diagnostic Imaging

Musculoskeletal Exam

- Each portion of the exam piggybacks off the last section
- Overlap of exam is fluid
 - Ask a question and observe the response
 - Palpate the area of interest and observe the response
- When in doubt, compare to the unaffected side!

Establish a Rapport

- Greet the parents
- Say hi to the child
- Handshake = Parents
- “Fist Bump” or Five = Child
- Get on the kids level or below
- Make the kid laugh
- Have fun
- Avoid White Coat



Establish Rapport

- Let the child have some control
- Make the child the “boss”
- Play games or make the exam a game
- Put down the phones/ipads
- Adjust your verbiage based on kids level of understanding (intellectual ability)

Patient History

- The best musculoskeletal physical exam should start out by listening!!!

Listening
=
Learning



Patient History

- Often the diagnosis can be made in this step
 - Even without an exam
- Simply listen to the patient
- Include the child when possible
- Rely on parents for clarification or more specifics
- Acknowledge the child
- Write things down – don't expect to remember everything



Patient History

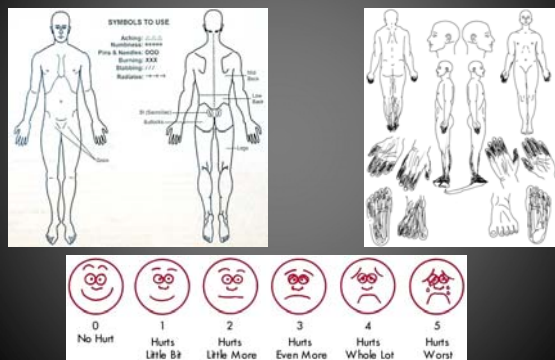
- Relevant history to present illness/injury
 - What – is the problem or what happened
 - When – time sequence
 - Where – does it hurt
 - Why – did the patient come in
 - How bad – better, worse, or stay same
 - Relieving factors
 - Aggravating Factors
 - Treatments attempted – help or no help
 - Functional effect



Patient History

- Past medical history
 - May not be written down on the forms
- Past surgeries
 - Ex: open heart surgery for congenital heart defect
- Social history – sports, school activities (band), dance, etc.
- Family History – similar problems
- Medications
 - Oftentimes present but no medical history
 - Esp: NSAIDS, anti-seizure meds, baclofen, botox,
- Allergies

Handouts/Questionnaire



History Taking Tips

- Ask open ended questions
- Don't lead kids with questions
 - Ex: What's going on with your knee?
 - What brings you into the office?
 - Ex: Does this increase your pain?
 - Preferred: Does this CHANGE your pain?
- Listen and Probe for Red Flags
- Keep the patient/parent focused
- Talk on the level of the child



Red Flags

- Night Pain (possibly)
- Weight Loss
- Fatigue
- Bowel or bladder changes
- Fever/Chills/Night Sweats
- Balance issues/ Recent Falls
- Coordination issues
- Weakness/Inability to stand up
- Lumps/Bumps that are growing



Observation

- Overall demeanor/attitude of child
- Interactions with parents
- Walking around room
 - Or Walking to the room
- Sitting on table (swinging legs)
- Laying on table
- Climbing on exam table/stool
- Currently in pain
- Overall alignment

Observation

- Expose the area of interest
 - Spine: Gown – open in the back
 - LE: shorts
 - UE: short sleeve/sleeveless shirt
 - Shoulder: Gown/Sports bra/ sleeveless shirts in girls
 - Shirt off in boys
 - Feet: shoes/socks off
 - No restrictions
 - Nothing hiding
- Have the Nurse/MA be the bad guy/gal !!!
- Allow child to put clothes back on ASAP after exam

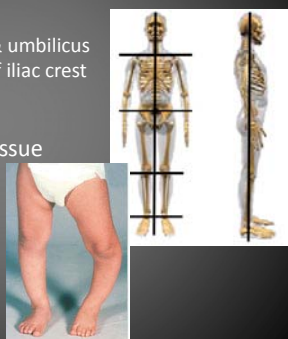


Observation

- Standing Postural Analysis
 - “Watch ‘em stand”
- Observational Gait Analysis
 - “Watch ‘em walk”
- Observe the affected an unaffected side
- Watch for facial expressions
- Reactions to questions or palpation
- Pattern of movement

Observation

- Body alignment
 - Nose, xiphoid process, & umbilicus
 - Tip ear, acromion, top of iliac crest & lateral malleoli
- Obvious Deformity
- Symmetric Body/Soft Tissue Contours
- Limb Positioning
- Skin color and texture
- Scars



Observation

- Use all your senses
 - Sight – self explanatory
 - Smell – abnormal odor
 - Hearing – Click or pop with joint motion
 - Touch – Defer to palpation portion
 - Taste – Defer all together!!!



Examination of Motion/Movement

- Test the unaffected side first
 - Sets a baseline for exam
 - Gains the patients trust and confidence
- Perform painful movements last
 - Prevents pain from overflowing to the next movement

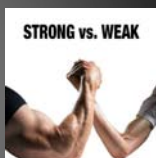
Examination of Motion/Movement

- AROM – Active Range of Motion
- PROM – Passive Range of Motion
- Resisted Isometric Motions = Strength Testing
 - Done with joint in neutral or resting position

- Do AROM → PROM → Resisted Motion

Resisted Isometric Motion

- Strong & Painfree
 - Muscle and nerve tested are normal
- Strong & Painful
 - Local lesion of muscle or tendon (Tendonitis/Muscle Strain)
- Weak and Painful
 - Severe Lesion around a joint (Fracture)
- Weak and Painfree
 - Rupture of muscle/tendon or nerve injury



Strength Grades

Muscle strength grading:

- 0 : No contraction
- 1 : Flicker of contraction
- 2 : Active movement; can't resist gravity
- 3 : Active movement against gravity
- 4 : Active movement against resistance
- 5 : Normal strength

Examination of Motion/Movement

- If AROM is full then give end range pressure for end feel of the joint and degree of motion
- Repetitive motions are done if symptoms are complained of with multiple repetitions
- Note what arc of motion causes pain
- Look for abnormal substitution patterns of movement

- Warn of exacerbation of symptoms at end of exam

Joint End Feels

- Soft – soft tissue being compressed
– Ex: knee or elbow flexion
- Hard – Bony – bone hitting bone - painless
– Ex: elbow extension
- Firm/Springy – soft tissue at the limit of stretch
– Ex: Shoulder ER
- Guarding – muscle contraction and pain
- Empty –no resistance – stopped by patient report of pain



Examination of Motion/Movement

- ROM can be tested with a goniometer
- PROM can unmask generalized hypomobility or hypermobility/laxity



Functional Movement Test

- Have patient do the reported activity that causes pain/symptoms
 - Squat
 - Run
 - Pick up object
 - Get out of bed

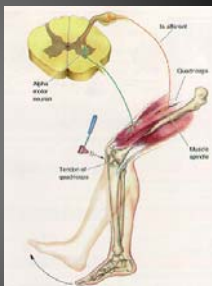
Special Tests

- Many special tests for each joint/body area
- Many are almost pathognomonic for a diagnosis
- (+) findings can strongly suggest a type of injury, condition, or disease
- (-) findings do not rule out an injury, condition, or disease



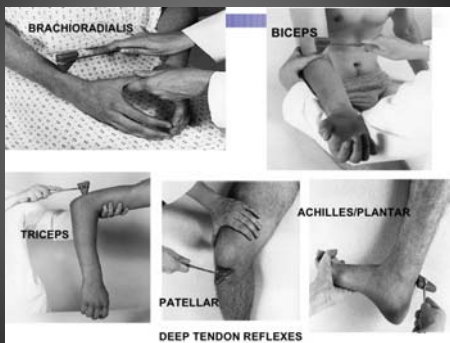
Reflexes and Sensory Exam

- Deep Tendon Reflexes
 - Pt. Relaxes
 - Tendon in slight stretch position
 - If trouble eliciting response then have patient squeeze hands together
- Superficial Reflexes
 - Stroke the skin with a moderately sharp object



Common Deep Tendon Reflexes

- C5
- C6
- C7
- L4
- S1



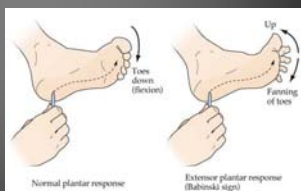
Grading Deep Tendon Reflexes

- 0 – Absent
- 1 – Diminished
- 2 – Average (normal)
- 3 – Exaggerated
- 4 – Clonus/Very Brisk

GRADING OF MUSCLE REFLEXES	
4	HYPERACTIVE WITH CLONUS
3	HYPERACTIVE WITHOUT CLONUS
2	NORMAL
1	DIMINISHED REFLEXES
0	ABSENT

Common Superficial Reflexes

- Babinski
 - Normal Infant – Upgoing Big Toe & fan other toes
 - Usually changes at 1-2 yrs of age
 - Normal Child/Adult – Flexion of toes



Common Superficial Reflexes

- Hoffmann – “Flick” distal phalanx of index/middle finger and watch thumb
 - Normal = no movement
 - Abnormal = flexion of distal phalanx of thumb



Common Superficial Reflexes

- Abdominal – Separate abdomen into quadrants with vertical and horizontal line through umbilicus
 - Stroke each quadrant away from umbilicus
 - Normal = Moves toward the direction being stroked
 - Abnormal = Moves away from the direction being stroked

Common Superficial Reflexes

- Abdominal Reflex



Motor Neuron

- Upper Motor Neuron Lesion
 - Spasticity
 - Hyperreflexia
 - Hypertonicity
- Lower Motor Neuron Lesion
 - Flaccidity
 - Hypo/Areflexia
 - Hypotonicity
 - Fasciculation/Fibrillations
 - Weakness and atrophy

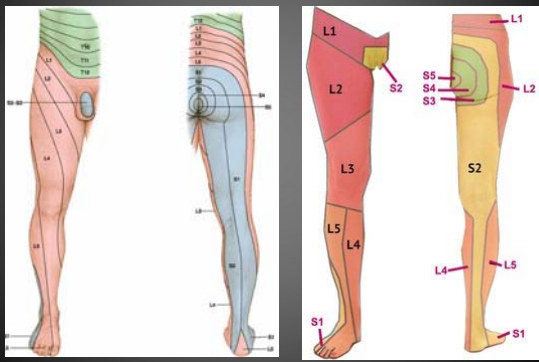
Sensory Exam

- Run fingers firmly over the skin to be tested
- Ask if they can feel it?
 - Make it a game
- Is there any difference compared R to L?
- 2 Point discrimination can also be tested more specifically in a certain area
 - Use Paperclip
 - Test normal side first so child knows what to expect
- Last resort – needle to see if sensory intact

UE Sensory Dermatome Levels



LE Dermatome Levels



Palpation

- Ensure area is as relaxed as possible
 - Make sure area is supported
- Start with the noninjured/contralateral/area far away from area of interest
- Watch the child's face during palpation
- Child may withdraw and not be as trusting so put this towards the end of the exam
- Start with light pressure and then deeper pressure as tolerated

Palpation

- Edema
- Effusion
- Skin tension
- Adhesions
- Bony Prominences/Areas
- Temperature Difference
- Pulses
- Abnormal Lumps/bumps



Evaluating Diagnostic Imaging

- Xrays – at least 2 orthogonal views –
 - views at 90° to each other
 - Evaluate the entire xray
 - When in doubt xray the contralateral side
 - Physis and epiphysis make interpreting xrays hard




Things to Note of Xrays

- Size and shape of the bone
- Thickness of the cortex
- General density of the bone
- Margins of local lesions
- Soft Tissue Changes
- Periosteal Changes
- Joint space
- Break in continuity of bone




Things you can see on Xrays

- Fracture
- Dislocation
- Effusion
- Tumors
- Bone Quality
- Open/Closed Physis
- Infections
- Heterotopic Bone
- Foreign Body
- Air
- Leg Length Discrepancy
- Lower Extremity alignment (angular deformity)
- Bone age (hand xrays)

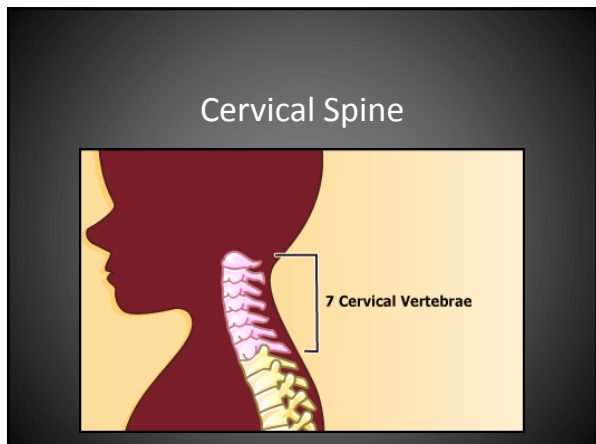


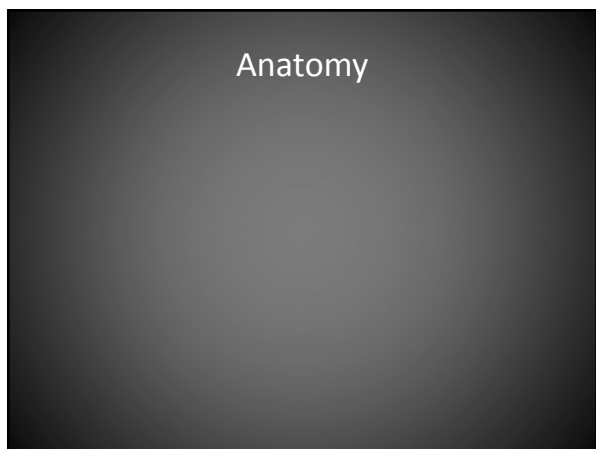
Things you can see on Xrays

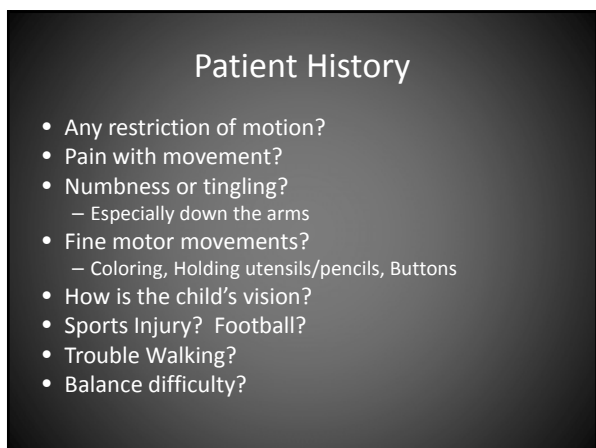


Evaluating Diagnostic Imaging

- CT scan – gives better bony detail
 - Shows growth plate closure
- MRI – gives soft tissue/cartilage details
 - When concerned for soft tissue injury
 - Shows bone edema/joint effusion/infection
 - If infection/Tumor – always order with/without contrast
- Ultrasound – can show cartilaginous structures easily
 - Can show an effusion







Observation

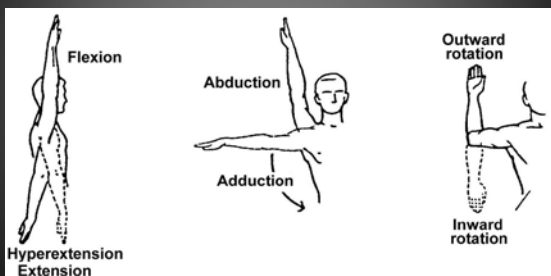
- Head and neck posture
 - Midline
 - Head tilt
 - Head rotation
 - Forward head
 - Muscle Prominence (SCM)
- Shoulders
 - Level – dominant usually elevated slightly
 - Rounded
 - Atrophy

Examination of Motion/Movement

- Flexion
- Extension
- Sidebend
- Rotation

Examination of Motion/Movement

- Check shoulder ROM also



Examination of Motion/Movement

- Nodding occurs in upper cervical spine
- Flexion occurs in lower cervical spine
- Only use mild overpressure at end ranges
- In sidebend ensure not moving shoulder toward ear

- Do resisted isometric movements
 - Cervical spine
 - Shoulder/UE

Examination of Motion/Movement

- C1/C2 – Neck Flexion
- C3 – Sidebend
- C4 – Shoulder Elevation/Flexion
- C5 – Shoulder Abduction
- C6 – Elbow Flexion
- C7 – Elbow Extension
- C8 – Thumb Extension
- T1 – Finger abduction

Special Tests

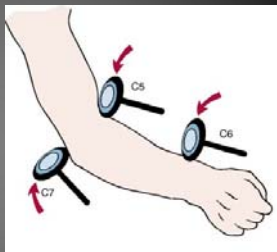
- Spurling's Test /Foraminal Compression
 - Sidebend head & extension +/- rotation
 - + test if radicular symptoms (not neck pain)
 - Indicates cervical nerve root impingement

Special Tests

- Romberg Test
 - Patient stands and Closes eyes
 - Position held x 20-30 seconds
 - + = excessive sway or loss balance
 - Indicates upper motor neuron lesion

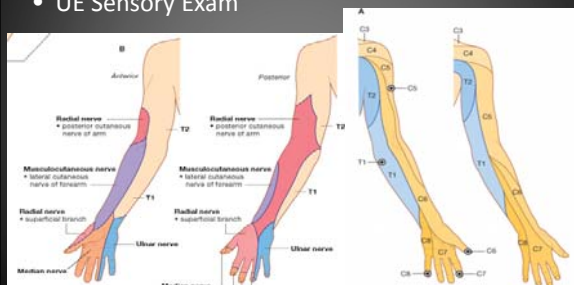
Reflexes and Sensory Exam

- Deep Tendon Reflexes
 - C5- Bicep
 - C6- Brachioradialis
 - C7 – Tricep
- Superficial Reflexes
 - Hoffman’s Reflex



Reflexes and Sensory Exam

- UE Sensory Exam



Palpation

- For maximal relaxation have pt. lie supine
- Spinous Processes
- Paraspinal Musculature
- Sternocleidomastoid muscles
- Upper Trapezius muscle
- Levator Scapulae muscle
- Scalenes



Evaluating Diagnostic Imaging

- Xrays - AP , Lateral, Open Mouth Odontoid
 - Cervical Lordosis is normal
 - Atlanto-dens interval



Thoracic and Lumbar Spine

Anatomy

Patient History

- Is there pain with inspiration/expiration?
- Is there pain with coughing/sneezing/straining?
- Any numbness or tingling?
- Any pain shooting down your legs?
- Any bowel or bladder difficulties?
- When was deformity noticed?
- Has the deformity been getting worse?
- Any family history of scoliosis?
- When was menarche?
- Any chest surgery? Heart surgery?

Observation

- Have the patient in a gown (open to the back)
 - Keep bra on (sports bra preferred)
 - Keep shorts/pants on

Observation

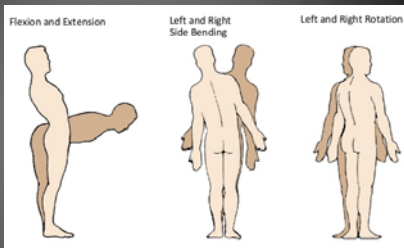
- Hip heights
- Shoulder heights
- Trunk shift
 - Can use a plumb line
- Rib hump
- Asymmetric waist
- Asymmetric scapula
- Asymmetric Trunk Rotation
- Excessive kyphosis
- Sitting posture
- Standing posture
- Hairy patches/Dimples

Observation

- ATR

Examination of Motion/Movement

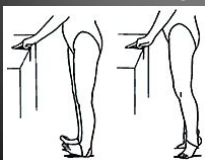
- Flexion
- Extension
- Sidebend
- Rotation



– Any pain with movements?

Examination of Motion/Movement

- Standing Motor Screen
 - Raise up on toes
 - Rock back on your heels
 - Squat down and come back up
 - Stand on one leg



Examination of Motion/Movement

- L2 – Hip flexion
- L3 – Knee extension
- L4 – Ankle Dorsiflexion
- L5 – Great Toe Dorsiflexion
- S1 – Ankle Plantarflexion

Scheuermann's Kyphosis



Scoliosis

Special Tests

- Straight Leg Raise

Reflexes and Sensory Exam

- Deep Tendon Reflexes
 - L4- Patellar Tendon
 - S1- Achilles
- Superficial Reflexes
 - Abdominal Reflex
 - Babinski Reflex



Reflexes and Sensory Exam

- LE Sensory Exam



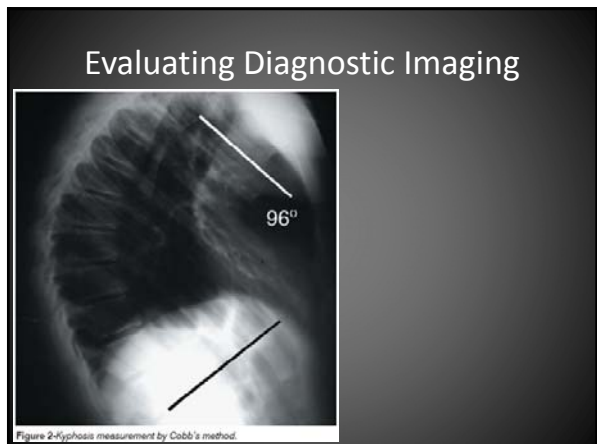
Palpation

- Spinous Processes
- Paraspinal Musculature
- PSIS
- Iliac Crest
- Scapula
- Ischial Tuberosity



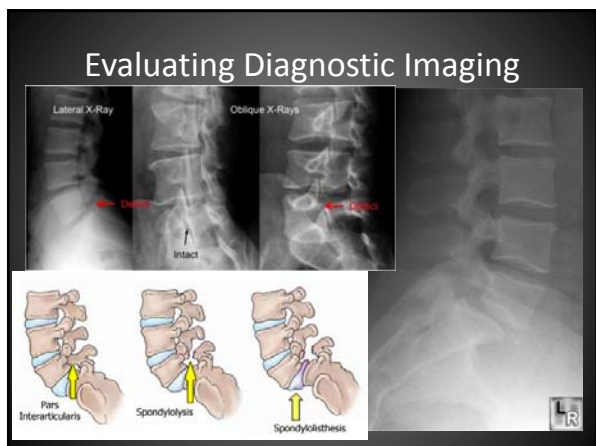
Evaluating Diagnostic Imaging

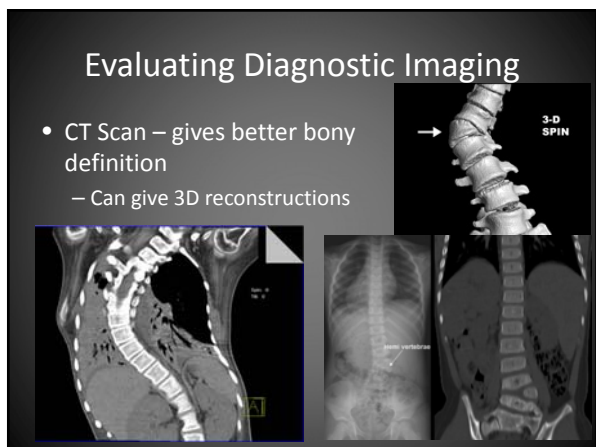
- Xrays - PA , Lateral, Entire Spine
 - PA & lateral thoracic spine
 - PA, lateral, and bilateral oblique lumbar spine

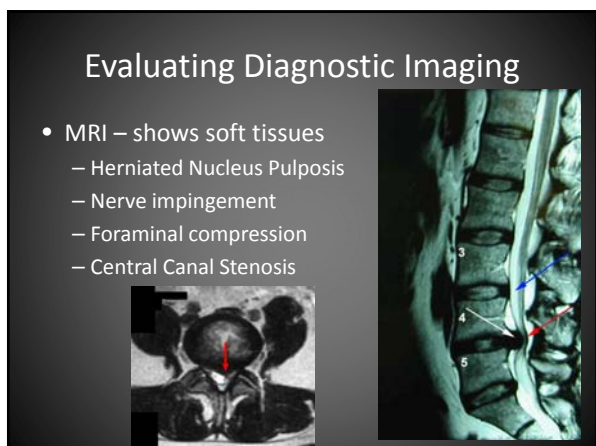




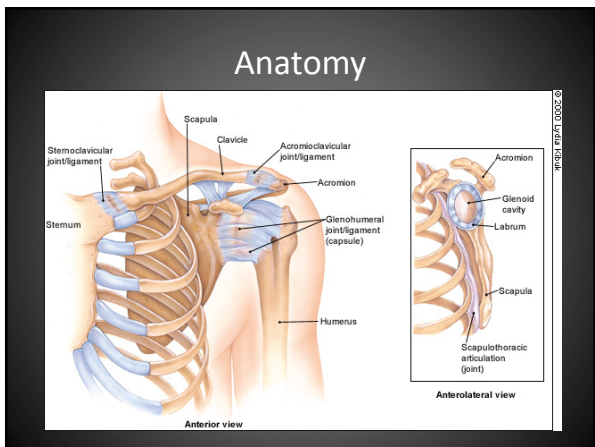
- ### Evaluating Diagnostic Imaging
- 12 thoracic vertebrae
 - 5 lumbar vertebrae
 - Thoracic Kyphosis
 - Thoracic vertebrae wedging
 - Lumbar lordosis
 - Partial/Hemi/Fused vertebrae
 - Scoliosis
 - Spondylolysis/Spondylolisthesis







Shoulder



Patient History

- Mechanism of injury?
- Weakness?
- Sporting Activities?
- Numbness or Tingling in arm?
- What hand is dominant?
- Any muscle wasting/atrophy?

The photograph shows the back of a person with a tattoo on the left shoulder blade. A black arrow points to the scapula.

Observation

- Put patient in gown or “tube top”/tank top shirt if girl or have boys remove shirt
- AC joint – step deformity
- Dominant shoulder is usually lower
- Scapulae of equal size and position
- Winging of scapula
- Muscle atrophy
 - Supra/infraspinatus – suprascapular nerve
 - Serratus anterior – long thoracic nerve
 - Upper Trapezius – Spinal Accessory Nerve
- Clavicles Present/ bump
- Pectoral Muscles present/atrophy/absent

Observation

Examination of Motion/Movement

- Flexion
- Abduction
- Extension
- Internal Rotation
- External Rotation
- Scaption
- Adduction
- Pain with any of these motions
- Watch the quality of the movement
 - From anterior and posterior
- Can do resisted isometric muscle testing of movements also

Examination of Motion/Movement

- Gross Shoulder ROM screen
 - Field Goal
 - Jumping Jack
 - Hands Behind Head
 - Hands Behind Back

Special Tests

- Load and Shift Test
 - Load the humeral head into glenoid
 - Translate anterior and posterior
 - Normal is 25% or less translation

Special Tests

- Apprehension Test
 - Shoulder abducted 90o and ER
 - Feeling of apprehension/patient resistance/alarm on the patient face = + test
 - Anterior instability/dislocation

Special Tests

- Speed's Test
 - Resist forward flexion of straight arm up to 90o
 - + = pain in bicipetal groove
 - Indicative of bicipetal Tendonitis

Special Tests

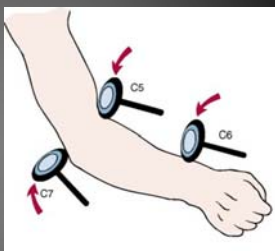
- Neer Impingement Test
 - Patients arm is passive elevated through forward flexion by examiner
 - + = pain
 - Indicative of shoulder impingement

Special Tests

- Hawkins Kennedy Impingement Test
 - Arm flexed to 90o & internally rotated maximally
 - + = pain
 - Indicative of shoulder impingement

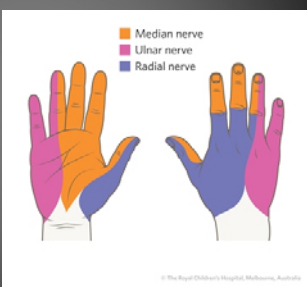
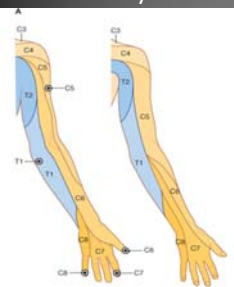
Reflexes and Sensory Exam

- Deep Tendon Reflexes
 - C5- Bicep
 - C6- Brachioradialis
 - C7 – Tricep
- Superficial Reflexes
 - Hoffman’s Reflex



Reflexes and Sensory Exam

- UE Sensory Exam

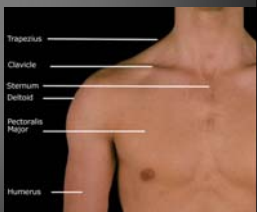


Common Brachial Plexus Injuries

- Erb’s Palsy
- Klumpke’s Palsy

Palpation

- Clavicle
- Sternoclavicular joint
- Acromioclavicular Joint
- Coracoid Process – often painful
- Humeral Head
- Scapular Spine
- Scapula

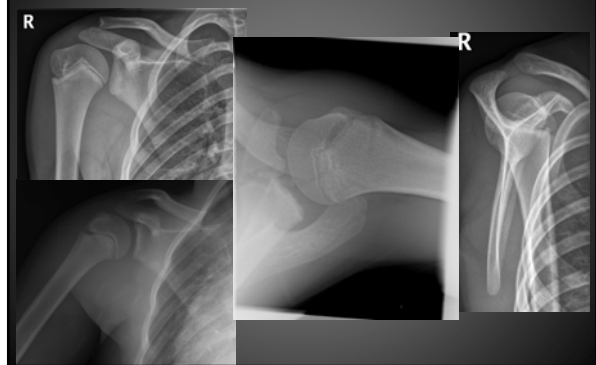


Evaluating Diagnostic Imaging

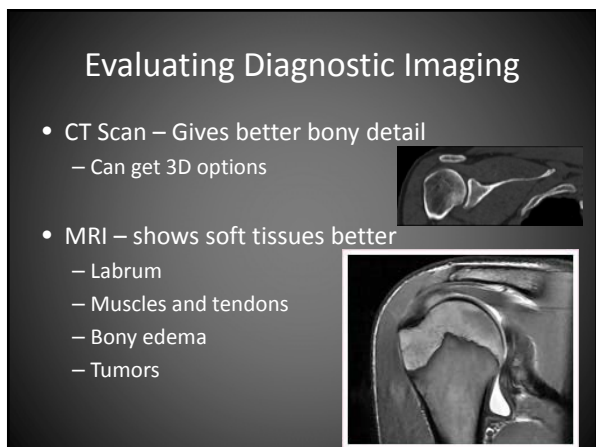
- Xrays: Routine AP, True AP (Grashey), Axillary, Scapular Y , Internal Rotation, External Rotation views
- Ensure shoulder reduced
- Evaluate physis to see if wide
- Ensure humeral head is round

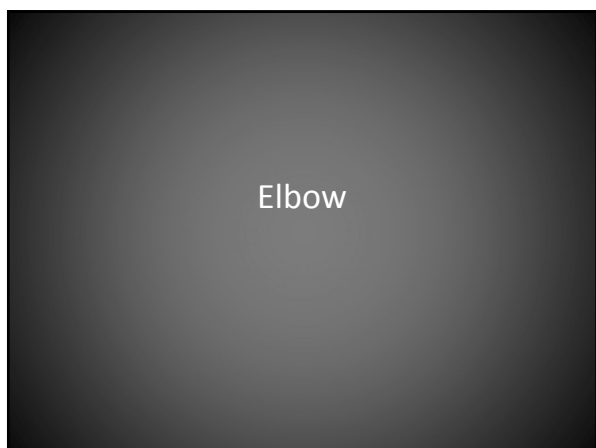


Evaluating Diagnostic Imaging









Anatomy

Patient History

- Mechanism of injury?
 - Fall on outstretched arm
 - Holding hands and child drops to knees
- Any deformity?
- Does it look similar to other side?
- What is the child not able to do?
- What sports/extracurricular activities does the child do?
- Any previous injuries/surgeries to arm?

Observation

- Expose the arm
- Carrying angle – angle of humerus and ulna created when elbow extended and full supination
- Swelling
- Joint effusion
- Resting position of the elbow

Examination of Motion/Movement

- Flexion
- Extension
- Supination
- Pronation

- Compare to contralateral side
- Can place pen/pencil in hand to more accurately assess supination/pronation

Special Tests

- Ligamentous Instability Test
 - Childs elbow slightly flexed and varus/valgus stress applied
 - + = excess motion
 - Indicates ligamentous instability/laxity

Special Tests

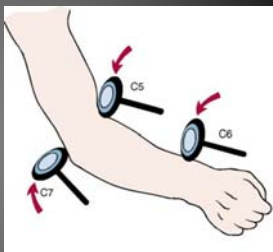
- Lateral epicondylitis Test
 - Pronate the forearm and resist wrist extension or long finger extension
 - + = pain in lateral epicondyle area
 - Indicative of lateral epicondylitis

Special Tests

- Tinel's at the Elbow
 - Ulnar nerve is tapped between olecranon & medial epicondyle
 - + = tingling sensation in ulnar distribution of forearm

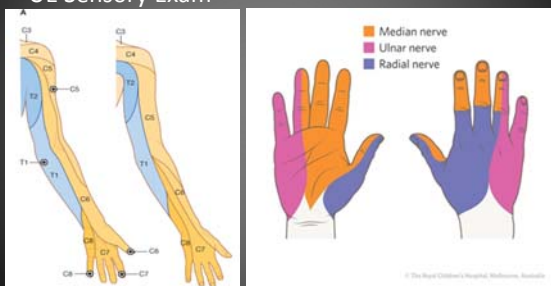
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Reflexes and Sensory Exam

- UE Sensory Exam



Reflexes and Sensory Exam

- Sensory Nerve Exam
- Median
- Ulnar
- Superficial Radial

Palpation

- Medial epicondyle
- Lateral epicondyle
- Supracondylar Humerus area
- Olecranon
- Radial Head
- Ulnar Nerve in cubital tunnel
- Biceps Tendon
- Triceps Tendon

Evaluating Diagnostic Imaging

- Xray – AP, Lateral, Internal Oblique
 - Fat Pad Sign/Sail Sign
 - Fractures
 - Internal oblique – lateral condyle fracture
 - Dislocations
 - Medial Epicondyle Fracture
 - Supracondylar Humerus Fracture
 - Radial neck fracture



Evaluating Diagnostic Imaging

- CT Scan
 - Gives more bone detail and 3D possibilities
- MRI
 - Evaluates soft tissue, cartilage, joint surface, ligamentous structures, osteochondritis dessicans lesions

Wrist

Anatomy

Patient History

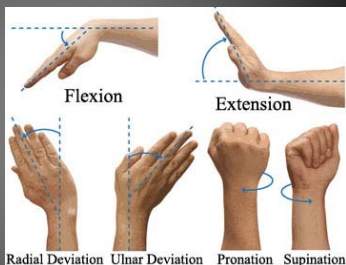
- Mechanism of injury?
- What sports or extracurricular activities is the child involved in?
- Which extremity is dominant?
- Previous injury or surgery?
 - Flexor tendons can be repaired if < 3 weeks
 - Flexor tendons require reconstructin if > 3 weeks

Observation

- Resting position
- Forearm alignment/deviation/deformity
- Soft tissue mass swellings
- Swelling

Examination of Motion/Movement

- Flexion
- Extension
- Radial Deviation
- Ulnar Deviation
- Supination
- Pronation



Examination of Motion/Movement

- Gross exam of Motor Function

Special Tests

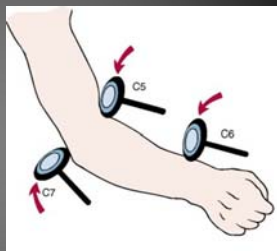
- Finkelstein's Test
 - Have patient actively put thumb in palm of fist and ulnar deviate wrist
 - + = pain at radial side of wrist
 - Indicates de Quervain's tenosynovitis
 - Have child do both hands as to have a baseline for pain comparison

Special Tests

- Tinel's at the Wrist
 - Tap over the carpal tunnel
 - + = tingling/paresthesia in to median nerve distribution

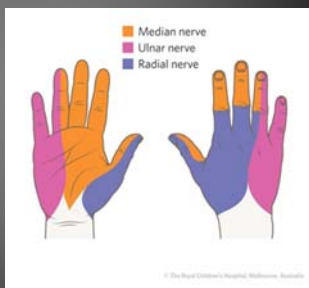
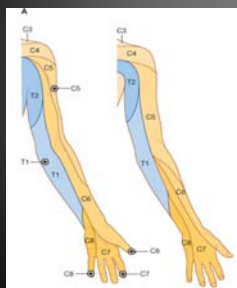
Reflexes and Sensory Exam

- Deep Tendon Reflexes
 - C5- Bicep
 - C6- Brachioradialis
 - C7 – Tricep
- Superficial Reflexes
 - Hoffman’s Reflex



Reflexes and Sensory Exam

- UE Sensory Exam



Reflexes and Sensory Exam

- Sensory Nerve Exam
 - Median
 - Ulnar
 - Superficial Radial

Palpation

- Anatomic Snuffbox
- Radial Styloid
- Ulnar Styloid
- Radial Pulse
- Radial metaphysis

Evaluating Diagnostic Imaging

- Xray – AP, Lateral, and Oblique
 - Scaphoid View – scaphoid fractures
 - Fractures, bone lesions, masses
- CT Scan – Shows bone anatomy better
 - Useful for fractures sometimes
- MRI – shows soft tissue better
 - Used to evaluate TFCC tears at tip of ulnar styloid

Hand

Anatomy

Patient History

- Mechanism of injury?
- Do fingers get stuck flexed?
- Do the fingers pop with attempt at extension?
- Do fingers overlap/underlap?
- Are the fingers curved?
- Have fingers always been fused?
- Extra digits?

Observation

- Muscle wasting
- Asymmetry of fingers
- Rotational or angular deformities of fingers
 - Check with making fist
- Mallet Finger
- Swan Neck Deformity – rupture of terminal extensor tendon (mallet finger)
- Boutonniere Deformity – rupture of central slip
- Trigger finger
- Simean Crease

Examination of Motion/Movement

- Finger Flexion
- Finger Extension
- Finger Abduction
- Finger Adduction
- Thumb Flexion
- Thumb Extension
- Thumb Abduction
- Thumb Adduction

Examination of Motion/Movement

- For flexed digits isolated which joint is flexed
– Ex: Trigger Thumb

Examination of Motion/Movement

- Gross Motor Exam of hand

Special Tests

- Ulnar Collateral Ligament Stress Test
 - Thumb held in extension & 30 degrees flexion and passive stress of distal phalanx radially on stabilized proximal phalanx
 - + = >10o difference
 - Indicates Skier’s thumb/Gamekeeper’s thumb

Special Tests

- Froment’s Sign
 - Child grasps a piece of paper between thumb & index finger & examiner tries to pull it away
 - + = DIP of thumb flexes to hold the paper
 - Indicates ulnar nerve paralysis due to weak adductor pollicis

Reflexes and Sensory Exam

- Deep Tendon Reflexes
 - C5- Bicep
 - C6- Brachioradialis
 - C7 – Tricep
- Superficial Reflexes
 - Hoffman’s Reflex

Reflexes and Sensory Exam

- UE Sensory Exam

Reflexes and Sensory Exam

- Sensory Nerve Exam
- Median
- Ulnar
- Superficial Radial

Palpation

- Finger Metacarpals
- Finger Phalanx
- Radial pulse

Evaluating Diagnostic Imaging

- Xray – AP, Fan Lateral, Oblique of Fingers
 - MCP joints, DIP joints, PIP joints
 - Can use AP image to determine skeletal maturity
 - Gruelich and Pyle Atlas
 - Fractures
- Rarely need CT scan or MRI

Hip

Anatomy

Patient History

- Any sporting or extracurricular activities?
- Any snapping with hip movement?
- Infant – Born breech?
 - First born?
 - History of hip dysplasia in family?
- Is patient able to ambulate on leg?
- Fevers or Chills?

Observation

- Ensure child in shorts or diaper
- Resting position of leg
- Standing posture
- Assess Weight Bearing amount on each leg
- Pelvis heights bilateral
- Single Leg Stance
 - Trendelenberg
- Leg length discrepancy
- Lumbar lordosis – excess if hip flexion contracture
- Thigh folds

Observation

- Gait pattern
 - Antalgic
 - Ataxic
 - Trendelenburg
 - Foot Progression angle
 - Patella position
 - Equal step length
 - Fat thigh gait

Observation

- DDH Gait video

Examination of Motion/Movement

- Flexion
- Extension
- Abduction
- Adduction
- Internal Rotation – best assessed prone
- External Rotation – best assessed prone

Examination of Motion/Movement

- Active Knee to Chest
 - Watch for obligatory external rotation
- Squat

Special Tests

- Trendelenburg Sign
 - Stand on one leg and assess the elevated hip/gluteal area for dropping

Special Test

- Thomas Test
 - Child supine & flex contralateral hip to chest & look for flexion contracture in contralateral hip
- Hamstring Contracture Test
 - Child supine and hip flexed 90 degrees & attempt to extend knee

Special Tests

- Ortolani Test
- Barlow Test
- Can only be Ortolani OR Barlow positive

Special Test

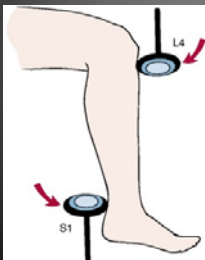
- Galeazzi Sign
 - Child supine & hips / knees flexed 90o
 - Look for one knee higher than the other

Special Test

- Gower's Sign

Reflexes and Sensory Exam

- Deep Tendon Reflexes – L4 & S1
- Lower Extremity Dermatome Levels



Palpation

- Iliac Crest
- Greater Trochanter
- ASIS
- PSIS
- Ischial Tuberosity
- Pubic Symphysis

Evaluating Diagnostic Imaging

- Xray – AP & Frog Lateral of Pelvis
 - Femoral head seated deep in acetabulum
 - Neck-shaft angle
 - Shenton's Line
 - Klein's Line
 - Femoral Head AVN
 - Risser Sign
 - Acetabular Index
- Arthrogram can outline cartilaginous femoral head

Evaluating Diagnostic Imaging

- Hip Ultrasound – evaluates a cartilaginous femoral head or for hip effusion
- CT Scan – Gives good bony detail
- MRI – shows soft tissue
 - Labral Tear
 - Hip effusion
 - Abscess
 - Details AVN
 - Can add arthrogram for more details

Knee

Anatomy

Patient History

- Popping/Clicking?
- Giving Way?
- Locking?
- Mechanism of Injury?
- Swelling?
- Sports or Extracurricular Activities?
- Limp?
- Knock kneed or bow legged?

Observation

- Lower Extremity alignment
 - Genu Valgum – intermalleolar distance
 - Genu Varum – intercondylar distance
 - Genu Recurvatum
- Ensure child in shorts or diaper
- Resting position of leg
- Standing posture
- Assess Weight Bearing amount on each leg

Observation



Observation

- Joint effusion
- Generalized Swelling
- Station of the knee
- Patella position
- Scars
- Rotational Deformity
- Tibial Tubercle Prominence
- Tibial Torsion

Observation

- Sitting Posture
 - W position
 - “Criss cross applesauce”
 - On knees

Observation

- Gait pattern
 - Antalgic
 - Ataxic
 - Trendelenburg
 - Foot Progression angle
 - Patella position
 - Equal step length
 - Fat thigh gait

Examination of Motion/Movement

- Flexion
- Extension
- Patellar Mobility
- Patellar Tilt
- Extensor Lag
- Flexion Contracture
- VMO activation

Special Tests

- Always test as compared to contralateral normal side
- MCL & LCL Stress Test

Special Test

- Lachman Test

Special Test

- Anterior Drawer

Special Test

- Posterior Drawer

Special Test

- Pivot Shift – ITB changes from an extensor to a flexor

Special Test

- McMurray's Test

Special Test

- Patellar Apprehension Test

Special Test

- Duncan-Ely Test

Reflexes and Sensory Exam

- Deep Tendon Reflexes – L4 & S1
- Lower Extremity Dermatome Levels

Palpation

- Patella
- Tibial Tubercle
- Medial & Lateral Joint Line
- Distal Femoral Condyle
- Proximal Tibial Plateau
- MCL
- LCL

Palpation

- Hamstring Tendons
- Pes Tendons
- Suprapatellar Pouch (Effusion)
- VMO

Evaluating Diagnostic Imaging

- Xray – AP, Lateral , Tunnel/Notch, Sunrise/Skyline Views
 - Fracture
 - Dislocation
 - AVN
 - Patella Position – Alta/Baja
 - Joint Effusion – on lateral
 - Physis
 - Trochlear Dysplasia/Aplasia
 - Osgood Schlatter Disease
 - Sinding Larson Johanson Disease

Evaluating Diagnostic Imaging

- CT Scan – Gives better bony detail
- MRI – evaluate soft tissue
 - Meniscus
 - Ligaments – ACL/PCL/MCL/LCL
 - Bone edema
 - AVN
 - Articular Cartilage

Ankle

Anatomy

Patient History

- Ankle sprains? Recurrent?
- Which way did it roll?
- Have you been able to walk on it since injury?
- Swelling?
- Sports or extracurricular activities
- Location of the pain
- What types of shoes does the child wear?
- Previous injury?

Observation

- Standing and Non weight bearing
 - Hindfoot position
 - Forefoot position
 - Patella position vs. foot position
 - Swelling
 - Bony prominences or soft tissue masses
 - Malleoli position
 - Foot arch
 - Shoe Wear
 - Pelvis Heights – Leg length discrepancy

Observation

- Gait pattern
 - Antalgic
 - Ataxic
 - Trendelenburg
 - Foot Progression angle
 - Patella position
 - Equal step length
 - Fat thigh gait

Examination of Motion/Movement

- Dorsiflexion
- Plantarflexion
- Inversion
- Eversion

Examination of Motion/Movement

- Raise up on toes
- Rock back on heels
- Squat Down
- Single Leg Stance
- Passive ankle dorsiflexion
 - With knee extended – Gastroc Tightness
 - With knee flexed – Soleus Tightness

Special Tests

- Transmalleolar Axis
 - Normal external 40o

Special Tests

- Thigh Foot Axis

Special Test

- Anterior Drawer
 - Compare to contralateral side

Reflexes and Sensory Exam

- Deep Tendon Reflexes – L4 & S1
- Lower Extremity Dermatome Levels

Palpation

- Tibia
- Medial & Lateral Malleoli
- ATFL & CFL ligaments
- Achilles Tendon
- Calcaneous
- Peroneal Tendons
- Ankle Joint effusion

Evaluating Diagnostic Imaging

- Xray – AP, Mortise, Lateral
 - Stress Test
 - Gravity
 - Physician Assisted
 - AVN
 - Fx
 - Ligament Instability

Evaluating Diagnostic Imaging

- CT Scan – More bony detail
 - Physeal arrest size
- MRI
 - Soft tissue – ligament/tendons
 - Articular cartilage
 - AVN
 - Infection
 - Effusion

Foot

Anatomy

Patient History

- Location of foot pain?
- Recurrent ankle sprains?
- Family history of disorders?
- Fixed or Flexible deformity of the foot?
- Shoe wear?
- Describe injury and position of foot?
- Previous Treatments (casts or surgeries)?

Observation

- Standing & Supine
- Foot Position
 - Hindfoot
 - Midfoot
 - Forefoot
- Resting Position
- Bony Prominences
- Syndactyly
- Polydactyly

Observation

- Gait pattern
 - Antalgic
 - Ataxic
 - Trendelenburg
 - Foot Progression angle
 - Patella position
 - Equal step length
 - Fat thigh gait
 - Foot Pronation/Supination
 - Dynamic Supination

Obseration

- Common Foot Deformities
 - Clubfoot
 - Congenital Vertical Talus
 - Metatarsus Adductus
 - Flatfoot
 - Hallux Valgus (Bunion)
 - Hammer Toe/Curly Toe

Examination of Motion/Movement

- Ankle – Dorsiflexion/Plantarflexion
 - Inversion/Eversion
- Foot
 - Toe Flexion/Extension
 - Subtalar Motion – Passive

Examination of Motion/Movement

- Raise up on toes
- Rock back on heels
- Squat Down
- Single Leg Stance
- Passive ankle dorsiflexion
 - With knee extended – Gastroc Tightness
 - With knee flexed – Soleus Tightness

Special Tests

- Heel Elevation

- Great Toe Passive Extension

Special Test

- Heel Squeeze
 - Medial/Lateral

Reflexes and Sensory Exam

- Deep Tendon Reflexes – L4 & S1
- Lower Extremity Dermatome Levels

Palpation

- Bone Prominences
- Base 5th metatarsal
- Navicular
- Metatarsal
- Phalanx
- Talar Head Prominence
- Medial arch
- Achilles Tendon
- Calcaneous
 - Medial/Lateral vs. Plantar vs. Achilles

Evaluating Diagnostic Imaging

- Xray – AP/Internal Oblique/Lateral
 - Single Toe Views – AP/Lateral
 - Os Calcis Vies – Hindfoot/Lateral
- Calcaneonavicular Coalition
- Talocalcaneal Coalition
- Fractures
- AVN
- Osteochondritis/Osteochondrosis (Kohler’s, Frieberg’s)
- Flatfoot
- Cavovarus Foot

Evaluating Diagnostic Imaging

- CT Scan – More bony detail
 - Calcaneonavicular coalition
 - Talocalcaneal coalition
- MRI – gives soft tissue details
 - Soft Tissue masses
 - AVN
 - Articular cartilage

Questions
