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!!!

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 and 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
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

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

• 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
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 xray)

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
Patient History

- Any restriction of motion?
- Pain with movement?
- Numbness or tingling?
  – Especially down the arms
- Fine motor movements?
  – Coloring, Holding utensils/pencils, Buttons
- How is the child’s vision?
- Sports Injury? Football?
- Trouble Walking?
- Balance difficulty?
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 of 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

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

- **CT Scan** – gives better bony definition
  - Can give 3D reconstructions

Evaluating Diagnostic Imaging

- **MRI** – shows soft tissues
  - Herniated Nucleus Pulposis
  - Nerve impingement
  - Foraminal compression
  - Central Canal Stenosis
Shoulder

Anatomy

Patient History

• Mechanism of injury?
• Weakness?
• Sporting Activities?
• Numbness or Tingling in arm?
• What hand is dominant?
• Any muscle wasting/atrophy?
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
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 90° 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 90°
  – + = pain in bicipetal groove
  – Indicative of bicipetal Tendonitis

Special Tests

• Neer Impingement Test
  – Patient’s arm is passive elevated through forward flexion by examiner
  – + = pain
  – Indicative of shoulder impingement
Special Tests

- Hawkins Kennedy Impingement Test
  - Arm flexed to 90° & 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
  - Median nerve
  - Ulnar nerve
  - Radial nerve
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
• **CT Scan** – Gives better bony detail
  – Can get 3D options

• **MRI** – shows soft tissues better
  – Labrum
  – Muscles and tendons
  – Bony edema
  – Tumors
Elbow

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
  – Child’s elbow slightly flexed and varus/va'gus stress applied
  – → excess motion
  – Indicates ligament instability/laxity

• Lateral epicondyritis Test
  – Pronate the forearm and resist wrist extension or long finger extension
  – → pain in lateral epicondyle area
  – Indicative of lateral epicondyritis

• Tinel’s at the Elbow
  – Ulnar nerve is tapped between olecranon & medial epicondyle
  – → tingling sensation in ulnar distribution of forearm
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

- 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?
- When was the injury?
  - Flexor tendons can be repaired if < 3 weeks
  - Flexor tendons require reconstruction 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

Ulnar Nerve  Radial Nerve  Median/AIN

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

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Reflexes and Sensory Exam

- **UE Sensory Exam**

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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

- Ulnar Nerve
- Radial Nerve
- Median/AIN
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
  – + = >10° 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

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
**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

Observation

Observation

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

- **Hamstring Contracture Test**
  - Child supine and hip flexed 90 degrees & attempt to extend knee

- **Thomas Test**
  - Child supine & flex contralateral hip to chest & look for flexion contracture in contralateral hip

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**Special Tests**

- **Barlow Test**
- **Ortolani Test**

  - Can only be Ortolani OR Barlow positive

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**Special Test**

- **Galeazzi Sign**
  - Child supine & hips / knees flexed 90°
  - 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

- X-ray – 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
Case Study

- 4 yo male with abnormal gait

Case Study

Physical Exam

- What do you see?
- What do you want to do next?
- What is going on?
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
- 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
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

• X-ray – 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 – evaluates soft tissue
  - Meniscus
  - Ligaments – ACL/PCL/MCL/LCL
  - Bone edema
  - AVN
  - Articular Cartilage
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
  - Antalgie
  - 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 40°
Special Tests

- Thigh Foot Axis

Special Test

- Anterior Drawer
  - Compare to contralateral side

Reflexes and Sensory Exam

- Deep Tendon Reflexes – L4 & S1
- Lower Extremity Sensory Exam
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
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

Observation

• 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 Sensory Exam

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 View – 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