Orthopaedic Congenital Problems

- Structural – first trimester. Associated visceral problems
- Developmental – “fetal arrest”
- Packaging or molding abnormalities
- Traumatic
Orthopaedic Developmental Problems

- Genetic predisposition
- Late manifestation of fetal injury
- Packaging or molding abnormalities
- Traumatic and overuse

Orthopaedic Exam of the Newborn

- Head and Neck
- Shoulders and Upper Extremities
- Spine
- Hips
- Knees
- Feet
**Torticollis**

- Sternocleidomastoid contracture
- Head tilt toward and rotation away from affected side
- Large babies / first born
- Prolonged labor
- Association with other packaging abnormalities - especially DDH

**Klippel-Feil Syndrome**

- Congenital synostosis of the cervical vertebrae
- Accompanying abnormalities of the genitourinary, cardiopulmonary and nervous system
- Synkinesis – involuntary mirror motion of the extremities
Pseudarthrosis of the Clavicle

Other Clavicular Anomalies
- Birth Fracture
  - Shoulder dystocia
  - Generally a good thing

Arm and Hand Problems
- Corollaries in the lower extremity
- Upper extremity manifestations always more problematic
Congenital Constriction Band Syndrome

Radioulnar Synostosis
- Unilateral - leave alone
- Bilateral - improve extremes
- Dominant extremity: 30 pronation
- Nondominant extremity: 30 supination
- Older child/teen: leave alone

Congenital Radial Head Dislocation
**Congenital Radial Head Dislocation**

- Frequently bilateral
- Ulnar & wrist
- Motion same with growth
- Excision doesn’t change motion
- Excision improves pain and cosmesis
- Excise after maturity

**Failure of Formation – Transverse Deficiencies**

**Terminal failure of formation – congenital amputation**
The Floating Thumb

Duplication of Digits

Syndactyly
In-toeing and out-toeing

- Typically 
  **tibial torsion** in those walking less than one year
- Increased **femoral anteversion** in those over age 2
- Bottom line: 98% resolve to normal limits

Bottom line: 98% resolve to normal limits
Physiologic Genu Varum & Valgum

- Early infancy: Lateral tibial bowing
- Early childhood: Common knock-knees
Pathologic Angular Deformity

Non Resolving or Progressive Varus

- Tibia Vara (Blount’s Disease)
- Unresolved physiologic varus

Blount’s Disease

- Infantile and Juvenile varieties
- Associated with early walking and heavier weight in the infantile form
- A disorder of uncertain etiology involving the medial proximal tibial physis
Blount's Disease
A clinical and radiographic diagnosis.

Pathologic Angular Deformity
Varus or Valgus
- Trauma - malunion, physeal arrest
- Metabolic - Rickets, renal disease
- Osteopaenia - Osteogenesis imperfecta, rheumatoid arthritis
- Epiphyseal dysplasias
Scoliosis

- Scoliosis is a three-dimensional deformity – rotational abnormalities are evident.
- A lateral curvature of the spine. More than 10 degrees defines scoliosis.

Scoliosis

- Congenital
- Neuromuscular
- Idiopathic
Congenital Scoliosis

Diastematomyelia

Idiopathic Scoliosis

Infantile 0 - 3 years
Juvenile 3 - 10 years
Adolescent 10 years and up
Scoliosis is a physical finding – not a diagnosis

Indications for MRI Scanning in Scoliosis
- All significant curves under age 10
- Painful curves
- Curves accompanied by neurologic findings
- Rapidly progressive curves
- Unusual curve patterns
- Stiff curves – preoperatively

Treating Scoliosis – General guidelines
- Observation – less than 25
- Bracing – 25 – 40 in growing
- Surgery – over 40 degrees
Goal of Bracing

- Prevent progression
- Preserve household harmony
- Maintain self esteem during brace period

Providence Brace
Goals of Operative Management

- Fuse the spine
- Maintain or achieve balance
- Restore kyphosis / lordosis
- Cosmetic improvement
Common Hip Disorders

- Developmental Dysplasia and Congenital Dislocation of the Hip
- Legg-Calve-Perthes Disease
- Slipped Capital Femoral Epiphysis

Developmental Dysplasia a.k.a. Congenital Dislocation of the Hip
**Demographics**

- 1 per 1,000 with frankly dislocated hips
- 1 per 100 with subluxable or dislocatable hips

**Risk Factors**

- Female
- Breech
- Family history
- 1st born
- High birth weight

**Diagnosis**

- Physical Exam
  - Ortolani
  - Barlow
  - Galeazzi
  - Slide
  - Pistoning
Imaging

- Radiographs
  - can be misleading
  - femoral ossific nucleus forms at 3 - 6 months
Imaging

- Ultrasonography
  - Overly sensitive if overused
  - Technician dependent
  - Useful to age 6 months
Legg-Calve-Perthes Disease

- a.k.a. Perthes Disease
- Transient avascular necrosis of the femoral head
Demographics

- Most common between ages 4 and 8
- Reported as young as 2, and in teens
- Boys > Girls by 4.5 : 1
- Bilateral 10 - 12% and asynchronous

Demographics

- No evidence for heredity playing a role
- 90% have delayed bone age
- Increased incidence in Asians, Eskimos and Central Europeans
- U.S. incidence 3-5 per 10,000

Pathogenesis

- Interruption of blood supply
- Bone death
- Creeping substitution
- Collapse
- Deformity
- Healed head
Diagnosis

• Insidious onset of a “painless limp”
  • spasm
  • atrophy
  • antalgic gait

Treatment

• Restore motion
• Staging
• Containment
• Bottom Line: Younger the better relative to prognosis
Slipped Capital Femoral Epiphysis

a.k.a.
S.C.F.E.

- A failure or dehiscence of the proximal femoral physis
- Acute vs. Chronic
- Stable vs. unstable
**S.C.F.E.**

- Femoral head is held securely in the acetabulum and the femoral neck displaces, usually anteriorly creating an apparent varus deformity at the proximal femur.

**Epidemiology**

- 0.71 to 10.08 per 100,000 (ave. 2) *
- Boys > Girls 2.4:1
- Peak incidence 2 years earlier in girls
- Patients often have delay in skeletal maturation & tendency toward obesity
- 50% at 95th percentile for weight

  * Kelsey, Keggi & Southwick – JBJS 1970

**Diagnosis**

- First – high index of suspicion
  - History
  - Habitus
  - Medial Knee pain
    - Referred pain from hip capsule via branch of obturator nerve
Diagnosis

- Second - physical exam
  - limp
  - inability to bear weight
  - external rotation of hip with flexion
  - Decreased quad girth
  - Leg length discrepancy

Diagnosis

- Third - radiographs
  - A/P Pelvis
  - Lateral of hip (Frog may not be good enough if motion is decreased)

Bottom Line: Don’t miss this one! Be Suspicious

Treatment Options

- One well placed 6.5 – 7.3 mm cannulated screw
  - Central in epiphysis
  - Perpendicular to physis
Common Pediatric Foot Conditions

- Talipes equinovarus
- Congenital vertical talus
- Metatarsus adductus
- Symptomatic pes planus
Demography

- Incidence - racial variance: 1.2/1000 white, 3.5/1000 black, .57/1000 Asian, 7/1000 Polynesian live births
- Males : Females 2.5 : 1
- Bilateral 50%; right more common in unilateral cases
**Genetic Transmission**

- Multifactorial
- Patient male, risk to sibling 2%
- Patient female, risk to sibling 5%
- Patient and parent affected, risk to sibling 25%

**Pathogenesis**

- Intrauterine factors - fetal packing
- No relationship to *structural* clubfoot - only to *postural* clubfoot
- Fetal developmental arrest
  - "Physiologic" clubfoot at ninth week of gestation

**Talipes Equinovarus**

- Treatment starts with casting
- Resurgent interest in "Ponsetti Technique" and better understanding of pathoanatomy – less surgery
Congenital Vertical Talus

- Classic rocker bottom deformity
- Association with syndromes
  - arthrogryposis
  - spinal dysraphism
- Differentiate from severe plano valgus or calcaneovalgus foot with lateral plantar and dorsiflexion views
Metatarsus Adductus

- Mostly a residual of intrauterine molding
- Treatment dependent on flexibility
- Normal hindfoot
- Association with DDH 10-12% of the time

Metatarsus Adductus

NORMAL  VALGUS  MILD  MODERATE  SEVERE
Pes Planus

- Arch will usually develop by age 4-5 if it is genetically programmed
- Although it may take as long as ten years
- Shoe wear makes no difference in arch development
- No treatment necessary if asymptomatic

More Issues of the Spine...

Backpacks and Back Pain

- Mackenzie, et al. (CORR, April 2003).
- Cause back pain in 46% of children.
- Book bag weighing more than 15-20% of body weight associated with pain.
- Does not cause scoliosis or kyphosis.
- Limit backpack load to 10% of body weight.
Spondylolysis

- Stress fracture of pars interarticularis.
- Repetitive hyperextension of lumbar spine.
- Gymnasts, football linemen, weight lifters, dancers, divers, rowers.
- 80% have tight hamstrings.

Treatment Options:
- Activity restriction
- NSAIDs
- Lumbosacral corset
- Muscle strengthening
- Risser cast (Ha!)

Return to full activity in 3-6 months.

Surgery for pain, spondylolisthesis.
Spondylolisthesis

Treatment

- Conservative therapy !!!
- Mild spondylolisthesis
  - 80% successful

Surgery

- Severe, painful
- Unresponsive to conservative treatment
- Options
  - Decompression
  - Fusion
  - +/- Instrumentation
Pediatric Overuse Injuries

- Activities today different from when “we” were young
  - Back in my day...
- More opportunity for organized sport
- More year-round sports
- Over-involved parents
- Frequent injuries

Pediatric Overuse Injuries

- Tendon Strains
- Ligament Sprains
- Bursitis
- Apophysitis
- Growth Plate Injuries
- Osteochondritis

The knee is a microcosm of the rest of the joints—Learn the knee and everything else makes sense...

- Shoulder
- Elbow
- Hip
- Ankle
Osgood-Schlatter Disease

- Quadriceps musculature creates significant force
- Force transmitted through patella to patellar ligament to tibial tuberosity
- Sever’s Disease of Heel is a corollary

- Common
- Males more affected than females
- Jumping sports often trigger discomfort (soccer, gymnastics, basketball, etc)
- Discomfort worsened with bends, jumps, runs, squats, or bumps the area
- Age – 10-15 years
- Apophysitis

Physical Exam
- May note swelling or even palpable bump to tibial tuberosity
- Point tender to palpation
- Pain worsened with jumping
Osgood-Schlatter Disease Gone Wild

Sinding-Larsen and Johansson Disease

• Proximal patellar tendonitis
• At patellar attachment
• Apophysitis of the distal pole of the patella
• Repetitive micro trauma
• Jumping sports
• Less common than OGD
• Adolescent boys

Sinding-Larsen and Johansson Disease

• Imaging
  – Fragmentation
  – Ossification
  – May be normal
Collateral Ligament Strain

- Examination/Imaging
  - Varus/Valgus stress
  - Effusion
  - Be wary of exquisite pain
  - Radiographs
  - Have high index of suspicion for...

Collateral Ligament Strain

- MCL – valgus stress
- Common
- Direct blow to lateral knee
- LCL – varus stress
- Less common

Anterior Cruciate Ligament

- Direct traumatic event
- Twisting injury
- Sports with cutting, jumping, sudden changes with direction and velocity
- Knee “giving away”
- May hear a pop
Anterior Cruciate Ligament

- Examination/Imaging
  - Effusion – hemarthrosis
  - Lachman test
  - Anterior drawer test
  - Pivot shift test
  - Radiographs warranted in skeletally immature
  - Have high index of suspicion for…

Osteochondritis Dissecans

- Knee most common
- Adolescent
- Lateral aspect medial femoral condyle
- Patella
- “Quiet necrosis”
- Repetitive micro trauma
- May cause loose body

Patellofemoral Instability

- Increased patellar motion
- Subluxation/dislocation
- “Knee goes out of place”
- 3:1 female:male
- Early adolescence
- Bilateral
- Family history
- Pain
  - Chondromalacia patella
Little League Shoulder
Little League Elbow

Conclusion

- Overuse injuries in children are quite common
- Kids are different from adults
- Have high index of suspicion for injuries that are specific to children
The greatest risk factor for the presence of DDH is:
- A) Male Gender
- B) High Birth Weight
- C) Breech Positioning
- D) Caesarian Section

Scoliosis over 20 degrees in the skeletally immature:
- A) Should be followed
- B) Should be braced
- C) Cannot progress
- D) Will always progress
- D) Usually requires surgery
Scoliosis over 20 degrees in the skeletally immature:

• A) Should be followed

Shoewear's most important function is to provide:

• A) Ankle stability
• B) An arch to prevent pes planus
• C) Foot protection
• D) A fashion statement

Shoewear's most important function is to provide:

• C) Foot protection
Metatarsus adductus is found in association with

- A) Tight fetal packing / high birth weight
- B) DDH
- C) Increased tibial torsion
- D) All of the above

Metatarsus adductus is found in association with

- D) All of the above

The End