Neonatal Orthopaedics - The Top 10 Diagnosis You Will or May See

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Learning Objectives
- To be cognizant of common musculoskeletal conditions seen in the newborn
- To be aware of conditions that need expedited orthopaedic referral

Orthopaedic Diagnoses in Intensive Care Nursery
- (not the focus of this talk)
- Referrals to tertiary care center
- Genetic syndromes
- Multisystem abnormalities
- Greater range of pathology

Orthopaedic Diagnoses in New Born Nursery
- Generally healthy
- Not dx'ed prenatally
- Isolated MSK findings
- Do not generally delay D/C w/ mother

Orthopaedic Diagnoses in New Born Nursery
- 3,396 newborns in 3 month period 2009 - per 1000 LB
  - 60 calcaneovalgus foot
  - 7.6 metatarsus adductus
  - 2.6 polydactyly/syndactyly
  - 2.4 clubfoot
  - 1.5 brachial plexus injury
  - 0.6 each DDH, skeletal dysplasia, osteogenesis imperfecta
  - 0.3 each congenital vertical talus & clavicle fx

Top 10 Diagnosis to Discuss
- DDH
- Calcaneovalgus foot
- Metatarsus adductus
- Clubfoot
- Polydactyly
- Syndactyly
- Clavicle fracture
- Humeral fracture
- Torticollis
- Brachial plexus injury
Developmental Dysplasia of Hip

- Termed DDH (not CDH - outmoded, inaccurate term)
- 10/1000 - some instability at birth
- 1/1000 - by 4-8 weeks of age (90% improvement)
- Incidence related to ethnic background:
  - 0.06/1000 LB in Africans
  - 76.1/1000 LB Native Americans
- Literature varies widely

DDH - Risk Factors

- Breech presentation
- Family history
- Female
- First born
- (curiously - less in premature & low-birth-weight infants)

DDH - Laterality

- ~60% left
- ~20% right
- ~20% bilateral

DDH - Exam

- Calm infant
- Firm surface
- Opposite hip stabilized w/ ring & long fingers beneath sacrum
- Examined hip abducted/adducted w/ ring & long fingers beneath greater trochanter, lifting hip “up” as hip passively abducted
- Ortolani +
DDH - Imaging

- No role for plain films in neonatal period
- Hip U/S - done at center with high volume
  - Suboptimal exam typically results in “false +” reading
  - Appropriate if suspected instability
  - If for screening (breech, + family history) - best to wait until 6 weeks, beyond physiological immaturity
- Disposition: refer to pediatric orthopaedics

Calcaneovalgus Foot

- Incidence 0.4-1.0/1000 LB
- (mild form in 30-40%)?
- exam: hindfoot dorsiflexes, abducts & externally rotates
- dorsum of foot may be in contact w/ anterior tibia

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Treatment - Calcaneovalgus Foot

- Gentle stretching into plantarflexion & inversion
- Regardless of treatment, most resolve spontaneously by 3-6 months.

DDx of Calcaneovalgus Foot

- Congenital vertical talus:
  - hindfoot is in equinus (plantarflexed) but forefoot dorsiflexed through talonavicular joint
  - rigid deformity w/ convex plantar surface & rocker-bottom deformity
  - genetics consultation may be indicated (up to 60% arthrogryposis or myelomeningocele)
**Metatarsus Adductus**

- Common, up to 10/1000 LB
- Believed related to intrauterine positioning
- Exam:
  - adducted forefoot
  - curled lateral border
  - neutral heel
  - “bean shape” sole of foot

**Treatment - Metatarsus Adductus**

- Observation/stretching
- 90-95% will resolve spontaneously (regardless of Rx)
- If rigid deformity - serial manipulation & casting ≤ 6 months
- Surgery rarely required
  - ≥ 3 yrs & rigid deformity

**Clubfoot**

- 1-2/1000 LB
- Wide spectrum:
  - mild/postural
  - severe/rigid (syndromic)
    - arthrogryposis
    - myelomeningocele
    - Larsen syndrome (multiple joint dislocations)

**Exam - Clubfoot**

- **CAVE**
  - Cavus - high arch
  - Forefoot Adduction
  - Hindfoot Varus
  - Ankle Equinus
Exam - Clubfoot

- CAVE
- Cavus - high arch
- Forefoot Adduction
- Hindfoot Varus
- Ankle Equinus

Treatment - Clubfoot

- Dr. Ignacio Ponseti - University of Iowa
- Revolutionized the treatment from surgically based methods - historical now

Clubfoot - Ponseti Method

- Serial manipulation and casting (5-6 treatments)
- Percutaneous Achilles tenotomy
- Foot abduction bracing
  - full time x 3 month
  - Night & nap time x 3-4 years
- Occ tibialis anterior tendon transfer
  - > 2-3 yrs

Metatarsus Adductus vs. Clubfoot

- It’s NOT a clubfoot:
  - If the ankle can be dorsiflexed (e.g. upward),
  - If the plane of the forefoot is perpendicular to the tibia

Polydactyly

- Developmental anomaly: supernumerary digits on hand or foot
- Poss. associated genetic syndromes
- Most often as isolated trait, A.D. w/ variable penetrance
- 10X incidence in African Americans vs. Caucasians
Polydactyly - Hand

- Post axial (ulnar side)
  - More common in African Americans
  - Uncommon in Caucasians - poss underlying syndrome (chondroectodermal dysplasia or Ellis-van Creveld)

- Central

Polydactyly - Hand

- Pre axial (thumb side)
  - More common in Caucasians

Polydactyly - Foot

- Location of duplication:
  - Post axial (lateral side) 79%
  - Pre axial (medial side) 15%
  - Central duplication 6%

Polydactyly - Foot

- Phelps & Grogan J Ped Ortho 1985
- 125 pt w/ 194 supernumerary toes
- Unilat. 54%, bilateral 46% (~2/3 symmetric)
- 34% assoc hand polydactyly
- 22% syndactyly of toes
- 30% + family history
- Location of duplication:
  - Post axial (lateral side) 79%
  - Pre axial (medial side) 15%
  - Central 6%

Treatment - Polydactyly - Foot

- Surgery for cosmesis & shoe wear
- Typically resect
  - the most medial
  - or lateral
Syndactyly

- Abnormal connection between adjacent digits
- One of the most common hereditary limb malformation - 3-10/10,000 births
- Clinical manifestation variable (not always symmetric)
  - Partial vs. complete
  - Cutaneous vs. bony
  - Only the phalanges vs. extension proximally
  - Isolated vs. syndromic

Syndactyly - Syndromes

- Poland syndrome:
  - Ipsilateral breast/nipple hypoplasia/aplasia
  - Absent sternal head of pectoralis major
  - Hypoplasia of rib cage
  - Hypoplasia of upper extremity
  - Symphalangism w/ syndactyly

Syndactyly - Syndromes

- Apert syndrome:
  - Rare, autosomal dominant
  - Craniosynostosis
  - Craniofacial anomalies
  - Severe symmetric syndactyly (cutaneous & bony fusion) of hands and feet

Treatment - Syndactyly

- Hand syndactyly:
  - Surgical
  - Timing - variable
  - If multiple – ulnar digits first (differential growth)
  - Never both sides of a digit at same sitting (vascular issues)
Treatment - Syndactyly

- Foot syndactyly:
  - Mostly cosmetic
  - 2nd-3rd webspace
  - If nail plate overlap, w/ functional issues

Birth Fractures

- Birth fractures not uncommon
- Risk factors:
  - Breech presentation
  - Macrosomia
  - Vaginal delivery

Clavicle Fracture

- 1.1% of all live births
- Presents w/ immobile UE (pseudoparalysis)
- Spongy mass over fracture site
- Confirmed w/ xray
- If neg, U/S can be useful to locate occult fx’s
- Treated w/ immobilization for comfort
  - Ace bandage around chest w/ gauze or pad in axilla
  - Consider Tubinette around chest instead

Congenital Pseudarthrosis of Clavicle

- Rare condition – “<200 cases in English literature” (but I’ve seen at least 10)
- Etiology?
  - failure of central shaft formation
  - related to pulsation of (R) subclavian, more cranial on this side & closer to clavicle
  - Virtually only seen on (R)
  - If (L), poss. situs inversus/detrocardia

Humeral Fractures

- Another birth fx
- Same risk factors
- Same Rx as clavicle fx’s

Congenital Pseudarthrosis of Clavicle

- Birth
- 3 wks
- 2 mon
Congenital Muscular Torticollis

- Unilateral tightness/shortening of sternocleidomastoid
- 0.4% of all births
- Etiology? Intrauterine or perinatal compartment syndrome → fibrosis
- Exam:
  - Head tilted toward involved muscle
  - Chin rotated toward opposite shoulder
  - Olive-shaped mass can be felt in 1st-3 months
  - Later replaced by tight fibrous band

Congenital Muscular Torticollis

- Initial treatment:
  - Massage & stretching program
  - If no response, c-spine films to r/o Klippel-Feil syndrome, etc.
  - Missed/older children may require surgical lengthening
  - Use of Botox (AAPS meeting 2015): effective in 2/3 of pts, avr. age 2yrs → Ø surgery

Brachial Plexus Palsy

- Relatively common (2.5/1000 LB)
- Risk factors:
  - Maternal diabetes
  - High birth weight
  - Prolonged labor
  - Forceps delivery
  - Shoulder dystocia
- Associated w/ clavicle & humeral fx's

Brachial Plexus Palsy

- Most common type: upper trunk (C5 & C6) – Erb palsy
  - "Walter's tip"
- Total plexus involvement:
  - Often completely flaccid limb
  - Horner syndrome (ptosis, miosis, enophthalmos) if sympathetic chain affected
  - If severe: CXR → r/o diaphragmatic paralysis from phrenic nerve dysfunction
- R/O fx's
- Moro test: BPBP vs. infection, fx

Brachial Plexus Palsy

- Majority of newborns – good prognosis
- If no recovery of biceps function by 3 mon, complete recovery rare
- Microsurgical repair appears to improve functional outcome, if done ~3-6 mon
Neonatal Forearm Compartment Syndrome

- Rare, but can mimic derm/infectious condition (cellulitis)
- Journal Hand Surg. '05: 24 pts, ALL had sentinel lesion
- Immediate recognition & transfer for urgent fasciotomy

Thank you!