Common Paediatric Problems

Ben Bolland
SpR Trauma & Orthopaedics
Overview

- Developmental Dysplasia of the Hip (DDH)
- Slipped Capital Femoral Epiphysis (SCFE)
- Legg-Calve-Perthes disease
- Congenital Talipes Equino Varus (CTEV)
- Flat Foot
- Rotational malalignment
- Infections in children
Developmental dysplasia of the hip (DDH)

- DDH refers to any manifestation of dysplasia, instability or dislocation (dislocatable, irreducible).

- Dislocation can present
  - Early: birth or neonatal
  - Late: usually with a dislocated hip, >6mths age
Incidence

- Significant DDH = 2 per 1000 live births
- Unstable hips = 5-20 per 1000
- F:M = 7:1
- L > R
Aetiology

- Unknown for certain
- Balance between ligamentous laxity, maternal hormones, and positional factors.
- There is also some undefined genetic factor
## Risk Factors

<table>
<thead>
<tr>
<th>Definite risk factors</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breech positioning</td>
<td>16 (9)</td>
</tr>
<tr>
<td>Family history</td>
<td>20</td>
</tr>
<tr>
<td>Female sex</td>
<td>4</td>
</tr>
<tr>
<td>Oligohydramnios</td>
<td>3</td>
</tr>
<tr>
<td>Calcaneovalgus</td>
<td>3</td>
</tr>
<tr>
<td>Infantile muscular torticollis</td>
<td>?</td>
</tr>
<tr>
<td>Postnatal positioning</td>
<td>?</td>
</tr>
</tbody>
</table>

- Prematurity seems protective
Presentation – Neonatal examination

• Look
  – Skin creases
  – Galeazzi sign

• Feel
  – Trochanter / ASIS

• Move
  – Ortolani No force required
  – Barlow
Late Presentation

- **Look**
  - Hip flexion contracture / Lumbar Lordosis
  - Walks on one toe or with long knee bent
  - Assymetric skin folds

- **Feel**
  - Trocanter, ASIS

- **Move**
  - Galeazzi
  - Limited abduction
Diagnosis

- Clinical examination
- Ultrasound
- Radiographs
  - > 6 months
  - AI<30 at 1 year
- Arthrogram
  - Older children
  - Pre op planning
Arthrogram

• Mainstay of imaging for intraoperative decisions still
• Assess closed reduction
• Decide on need for open reduction
Management – First identify all at risk.

RISK FACTORS
- Breech
- Foot deformity
- +ve FHx

NEONATAL CHECK
- +ve Ortolani
- +ve Barlow or click
- Reduced abduction

6 week CHECK
- Clinical suspicion

Refer for USS

Protocol for selective ultrasound screening
Management - Neonatal

- Pavlik harness
  - Week 1-6: 24hrs a day
  - Week 7: 23hrs a day
  - Week 8: 22hrs a day
  - Week 9: 20hrs a day
  - Week 10: 16 hrs a day
  - Week 10+: Worn at night only
Pavlik harness – Monitoring essential

• Complications avoidable
  – Femoral n palsy (hyperflexion)
  – AVN (hyperabduction)
  – Posterior dysplasia (too long in harness without reduction)

• If hip not reduced in 3 - 4 weeks discontinue and go to closed reduction
Failed conservative treatment

- Wait until ossific nucleus appears (12-15mths)
- Closed vs Open reduction
- Hip spica (6 weeks)
- Broomsticks (6 weeks)
- Night splints (6 weeks)

- REGULAR FOLLOW UP
Treatment after 2 years

- Closed reduction not possible or wise
- Anterior open reduction
  - ± femoral shortening
  - ± pelvic osteotomy

AG aged 4.5
Summary

- Natural history known
  - Dysplastic hips become arthritic at 20 year follow up (worse than dislocated)

- Treatment is improvement on natural history
- Success based on effective early treatment and avoidance of complications
- Late presentations still occur
Slipped Capital Femoral Epiphysis

• Definition
  – Anterolateral displacement of the femoral neck in relation to the proximal femoral epiphysis
Classification

- **Weight bearing**
  - Stable
  - **Unstable**
    
    (Loder et al – 55pts; stable 0% AVN, unstable 47%)

- **Temporal**
  - Acute <3wks
  - Chronic >3wks
  - Acute on chronic

- **Radiology**
  - Grade 1 (0-30)
  - Grade 2 (30-60)
  - **Grade 3 (>60)**
Aetiology

- **Weight** - >50% over 90\textsuperscript{th} centile for age
- **Age** - teenagers
- **Race** - ↑ Afro Americans
- **Sex** - ↑ males
- **Side** - ↑ right
- **Endocrinopathy** – Thyroid, GH, renal rickets.
Bilaterality

- 20% present bilateral
- 30% more develop subsequent SCFE in other side
Physical Exam

- Body habitus
- Externally rotated extremity
- Obligatory external rotation in flexion
- ROM limited by pain
- Healing arthroscopy portals on ipsilateral knee
Diagnosis - Radiology

- Widened physis (hypertrophic zone)
Treatment

• **Goals**
  - Arrest further slip
  - Restore anatomy
  - Avoid complications

**AVN**  **Chondrolysis**
Treatment options

- Pinning in situ
- Proximal femoral osteotomy
Treatment Algorithm

- **Stable**
  - Grades 1 or 2: Screw in situ
  - Grade 3: Screw in situ, neck osteotomy

- **Unstable (<24hrs)**
  - Gentle repositioning, then as above

- **Unstable (>24hrs)**
  - Grades 1 or 2: Screw in situ
  - Grade 3: Traction 3/52, reassess
Conclusion

• Early diagnosis leads to simple effective treatment

• Late diagnosis leads to more deformity and therefore more OA

• Acute slips have a bad prognosis regardless of treatment
Legg Calve Perthes Disease

• Idiopathic avascular insult(s) to developing femoral head
• Age range 4 to 8 years commonly, has been reported 2 to 15 years
• M:F = 5:1
• Bilateral 10%
Demographics

• Lower SES
• Later born children
• Higher parental age
• Skeletal maturation delay ~ 2 years
• Rare in Blacks, Native Americans, Aborigines
Unifying hypothesis

• “Lack of thrombolysis in the venous drainage of the femoral neck increases pressure in the femoral head circulation, resulting in AVN. Antecedent trauma might precipitate the avascular event”

Tachdjian
Clinical Presentation

- Limp
- Marked pain not a feature
- Mild groin pain or anteromedial thigh or knee
- Usually activity related, relieved by rest
- History of trauma ~20%
Clinical features

- Limited ROM
  - Internal rotation
  - Abduction
  - Fixed flexion present
- Positive Trendelenburg
- Limb length inequality
Wasting
Abduction
Diagnosis

- Radiographs – AP, frog lateral

- Bone Scan – good in early stage when diagnosis in doubt.
  Not good for degree of involvement and prognosis

- MRI - undefined
Radiology

- All agree on stages of evolution
- Waldenstrom
  - Initial
  - Fragmentation
  - Reossification
  - Healed
• Negative radiograph

Joint space widening

Smaller, more dense epiphysis
Fragmentation

- Increased and decreased density
- Alteration of femoral head shape

Classify at this time

Treatment effective at this time
Ossification

- Healing occurring
- Deformity can be readily appreciated

Healed

- Normal bone density
- Can assign Stulberg classification

2-5 years to pass through all 4 stages
Residual deformity

- Coxa magna, Coxa breva
- Central arrest
- Lateral arrest
- Flattening
- Hinge abduction
- Osteochondritis dissecans
Head at risk signs (Poor prognosis)
Prognostic factors

• **AGE (>6yrs)**
  Most predictive prognostic factor in all studies

  • Related by most to remodelling potential
    – In **DDH** the head remodels the acetabulum
    – In **Perthes** we expect the acetabulum to remodel the head
Treatment options

- Hattage
- Continued ROM
- Crutches
- Petrie casts
- Bracing
- Femoral osteotomy
- Pelvic osteotomy
Initial treatment

- Rest +/- traction
- Avoid impact
- Pain relief
- Maintain ROM (physio, hydro)
? Losing containment

- Get an arthrogram
Surgical treatment

• Surgical options

Femoral side

Pelvic side
Outcome – Natural History

• 20 to 40 years, 70% to 90% pain free
• 93% Iowa hip scores > 80
• 50 year follow up (Weinstein)
• 40% Iowa hip scores > 80
• About half have had arthroplasties
Congenital talipes equino varus (CTEV)
Definition

- Displacement of the navicular, calcaneus and cuboid around the talus, characterised by equinus, internal rotation and varus of the hindfoot with adduction and supination of the forefoot.
Incidence

- Usual: 1 per 1,000
- M:F: 2.5 : 1
- Bilateral: 50%
- Maoris: 7 per 1,000
- Risk: 2-5% in siblings
  25% if both parent and sibling affected
Associated conditions

• Neurological
  – Myelomeningocele
  – Spina bifida occulta

• Arthrogryposis Congenita Multiplex

• Congenital defects
  – Sacral agenesis

• Chromosomal anomalies
  – (Trisomy 13 & 18, Diastrophic dwarfism)
Questions to ask

- Is there a generalised abnormality
- Is the spine normal
- Are hips normal
- Is there abnormal joint laxity
- Are there constriction bands
Diagnosis

- Prenatal ultrasound (2nd trimester)
- Postural or positional
- Structural (typical or atypical)

Classification

- soft > soft Grade 1 postural
- soft > stiff Grade 2 reducible some resistance
- stiff > soft Grade 3 partially reducible
- stiff > stiff Grade 4 resistant
Examination

- Aids classification (Pirani)

Remember general examination

- Posterior crease
- Empty heel
- Rigid equinus
- Curved lat border
- Medial crease
- Lateral head of talus
Treatment - Ponseti
First Cast
Week 3

Week 6 (tenotomy)
Series of casts & outcome
Maintain correction – Boots & Bar

Worn day and night 4/12

Weaning for 2 yrs
Relapse
Surgical options
Outcome

• Southampton 97 feet (surgery)
  M G Uglow, N M P Clarke. JBJS 2000

  Grade 2  1 relapse
  Grade 3  30% relapse
  Grade 4  >70% relapse

• Prospective study (Ponseti)
Flatfoot

- Group of deformities characterised by a reduced medial longitudinal arch
Classification

• Flexible
  – Physiological
  – Hyperlaxity of ligaments
  – Tib post insufficiency

• Rigid
  – Tarsal coalition

• Neuromuscular
  – CP, spina bifida
History

• Symptoms
  – midfoot ache
  – pretibial pain
  – excessive shoe wear
  – pain and callosity over talar head.

• FHx
  – Bilateral and familial
Examination

• Is it flexible
• Is it correctable

Hallux extension

Arch corrects
Treatment - flexible

- Painless
  - Leave alone
  - No evidence that intervention helps

- Painful
  - Arch orthosis/ custom made
  - Achilles tendon stretches if tight

- If refractory
  - wedge or sliding calcaneal osteotomy
  - +/- Achilles tendon lengthening
Flexible flatfoot

• Progressive development
  – midfoot arthritis
  – tibialis posterior rupture
  – Neurological dysfunction
Rigid flatfoot

- Get an x-ray

Tarsal coalition
Rotational malalignment

• Definitions

  – Femoral version: angular difference between axis of femoral neck and trans-condylar axis

  – Tibial rotation: angular difference between transmalleolar and transcondylar axis; +ve when external rotation
Development

• the newborn- there is marked femoral anteversion but this is masked by external rotation contracture due to intrauterine positioning.

• the contracture causes out-toeing which is maximum at the age of cruising and early walking and resolved by age 18 months
Intoeing

• Definition - the longitudinal axis of the foot during stance phase of gait is internally rotated in relation to the direction of progression.
• Incidence - one of the commonest reasons for presentation to paediatric orthopaedic surgeons
Intoeing

• Site of problem- anywhere from hip to toes

• Common causes of intoeing
  
  • femoral torsion  
  • internal tibial torsion  
  • metatarsus adductus
History

• family concern-who?- parents, grandparents
  regarding current problem or future disability
• pregnancy and neonatal history
• sitting and sleeping posture
• family history
Examination

- standing, walking, running- estimate foot progression angle (-ve for intoeing)

- lying prone- measure hip rotation (normal IR<70 deg for girls and < 60 deg for boys), measure thigh-foot angle (-ve for internal tibial torsion)

- a general exam to exclude serious disease
Natural History

• Maximum intoeing age 4-6 then improves

• Disability- no increased incidence of OA; patellofemoral pain may be increased if combined with external tibial torsion
Femoral Torsion

• Incidence: common
• Sex: female
• Natural Course – reduces with age
  • Age 1yr – 39deg
  • Age 2yrs – 31deg
  • Age 10yrs – 24deg
  • Age 16yrs – 16deg
Femoral Torsion

• Symptoms: intoeing, clumsiness, cosmesis

• Signs: squinting patellae
  ↑IR, ↓ER
  compensatory ext torsion tibia, valgus hindfoot

• Measurement: clinical usually sufficient
  (Ryder method: rotate leg until GT most lateral, look at degree of rotation of transcondylar plane)
Femoral Torsion - Rx

• Exclude serious disease- CP; DDH

• Reassurance and observation

• indications for operative Rx- after 8 yrs for severe symptomatic deformity, >50 deg anteversion, >80 deg IR

• intertrochanteric or subtrochanteric derotation osteotomy
Internal Tibial Torsion

- Incidence – rare in isolation
- Sex – Equal
- Features - often asymmetrical
  - 1/3rd have metatarsus adductus
  - intoeing with patella facing straight ahead
  - may trip
- Measurement - clinical measurement thigh foot angle (-ve)
Compensatory changes

- Centre of gravity falls lateral to 2\textsuperscript{nd} MT. Therefore child compensates by

  Evert and abduct forefoot
  Ext rotate hip
Normal values

- *Tibia rotates laterally with age*

- Transmalleolar axis
  - increases from 2 degrees at birth
  - to 10 to 20 deg in adults
  - a wide range of normal (0-40 deg) in adults
Internal Tibial Torsion: Rx

• non-operative Rx is effective

• operative Rx rarely necessary; should not be done until after age 10

• indications- thigh-foot angle< -10 deg but depends also on rotational profile of the femur

• supramalleolar osteotomy is preferred
Natural History

• spontaneous resolution most rapid in infancy

• disability?- sprinters often have internal tibial torsion
Paediatric Infection

Knee pain - *think hip*
Who Do I Xray?

- Rotational problem
- Bowing
- Flexible flat feet
- Fatigue pains
- Child with a limp

- No
- Only if progressive
- No
- Only if persistent
- Always
Best Rx – TV and milk

Questions