Normal Variants

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Normal Variants

- intoeing
- knock knees
- bow legs
- Flexible flat foot
- toe walking
- Night pains
Normal Variants

- Parental anxiety
  - more concerned, more aggressive, demand more second opinions

- Address parental concerns

- explain the Natural History
Principles of Management

• Common conditions
  – mean value plus or minus two standard deviations
• generally resolve spontaneously
  – intervention rarely changes natural history
• Resist overinvestigation and overtreatment
• watchout for those children with specific pathology
History

- Who is worried about what?
  - Different from referral letter
- Watch the child
  - Gowers sign
  - arm movements
- Intermalleolar and intercondylar separation
History

• Mr Jackson’s Questions
  • Is the child disproportioned?
  • Is the deformity asymmetrical or unilateral?
  • Is there a family history?
  • Has it progressed too far?
  • Is it in the wrong direction for that age?
Mr Jackson’s Questions

- **Disproportioned?**
  - Bone dysplasia
  - Endocrine disturbance
  - Hand span to height

- **Asymmetry?**
  - Growth plate damage
    - Trauma or infection

- **FH?**
  - Bone dysplasia
  - Syndromes

- **Not Normal?**
  - Outside 2 SD
  - Blount’s

- **Opposite?**
  - Suspicious mind
Examination

• Through examination reassures parents and helps detect those with pathology
  – dislocated hip
  – hemiplegia
• Walk on heels, toes, hop
  – Hop on one leg
  • after four years
  • estimate agility
  • exaggerate spasticity or increased tone
Examination

• Foot progression angle
• Torsional profile
  – Show and tell
  – Forefoot to hindfoot
    • Adducted, abducted (CP)
  – Thigh foot angle (tibial torsion)
  – Hip rotation (femoral anteversion more internal rotation relative to external)
ligamentous laxity

• party trick
• shoulder, subluxing, dislocating joints
  – producing load clunks or clicks
• trochanteric area
  – clunking or jerking movements
• knee
  – clicking sensations
• cervical spine
ligamentous laxity

• Normal

• innocuous

• discouragement
Wynn-Davies Tests

- Hyperextension of elbow (10) 2 pts
- Hyperextension of knee (10) 2 pts
- Hyperextension of little finger (>90) 2 pts
- Thumb can touch forearm 2 pts
- Ankle dorsiflexion (>45) 2 pts
Intoeing

- Commonest presenting symptoms to Paediatric orthopaedic clinics
- Parental concerns
  - appearance
  - long-term sequelae
  - clumsy, trips frequently
- child never demonstrates as much intoeing
FOOT? TIBIA? FEMUR?

• Present different age groups

• Different
  – assessment
  – management
  – Natural History
FOOT?

- Presents
  - At birth or early
- Forefoot adducted
  - Kidney shaped
  - bilateral, not symmetrical
  - mobile
- Intrauterine position, prone sleeping
Metatarsus adductus

- Distinguish from CTEV
  - position of heel
    - CTEV varus heel
    - Doriflexion of ankle
- Metatarsus adductus and DDH
  - U/S of hips
Metatarsus adductus

• Spontaneous resolution
• 15% slow or incomplete
• Splintage
  – strapping
  – serial casts 3 casts at two week intervals
• >5 yrs Medial release
• >7yrs Metatarsal osteotomies
Internal Tibial Torsion

• Very common in toddlers
• presents 1-3 yrs as intoeing
• intrauterine positioning?
• SPONTANEOUS RESOLUTION
• Denis Browne splints
  – not proven to work, distressing, disturbing
Internal Tibial Torsion

![Graph showing the relationship between age, thigh-foot angle, and normal range.](image)
Internal Femoral Torsion

Persistent femoral anteversion
Inset hips

• Present 3-10yrs
• Symmetrical intoeing
• Look awkward and trip
• Joint laxity
• Internal rotation 80-90 degrees
• External rotation 0-10 degrees
  – ‘W’ position
Internal Femoral Torsion

- SPONTANEOUS RESOLUTION
  - during growing years
- NO EVIDENCE
  - orthotics
  - exercises
- >10 degrees of EXTERNAL ROTATION
Ryder method

• of clinical estimation of femoral torsion
  – 1) The greater trochanter is palpated
  – 2) the lower limb is externally rotated until the greater trochanter reaches the most lateral position
  – 3) degree of rotation of the femoral transcondylar plane is estimated
Internal Femoral Torsion

• mean Internal rotation for
  – girls 40 degs
    • range 15 to 60 degs
  – boys 50 degs
    • range 25 to 65 degs

• mean external rotation for both sexes
  – 45 degs
    • range 25 to 65 degs
Internal Femoral Torsion

• **SURGERY**
  – NOT at early age
    • spontaneous recovery
    • recurrance

• 8-10 yrs improvement unlikely

• **DO NOT DELAY** as will produce secondary compensatory tibial external torsion
External rotation femoral osteotomy

- intertrochanteric or distal
  - blade plate, DCP, or IM nail
- warn,
  - asymmetrical growth
    - stimulation and lower limb length disparity,
  - operative scars,
  - no evidence of increased OA with femoral anteversion
Internal Femoral Torsion

• Compensatory
  - EXTERNAL TIBIAL TORSION
  - squinting patellae
    • FPA normal

• surgery
  - bilateral combined femoral external rotation osteotomies and bilateral tibial internal rotation osteotomies
CORONAL PLANE DEFORMITIES

- Angular deformities are common in normal children
- Straight legs are rare
- Sequence of maturation
  - Bow legged infants and toddlers
  - Knock kneed between 3-8 yrs
  - Adult configuration
CORONAL PLANE DEFORMITIES

- Salenius and Vankka
  - 16 degrees VARUS tibiofemoral angle in NEWBORN
  - 27-11 degrees of VALGUS at 3 years
  - 5-6 degrees of VALGUS at 9 years
  - Adult 5-9 degrees of VALGUS
100 children with bow legs or knocked knees who attend an orthopaedic clinic have a definable disease causing deformity 2 have a definable disease causing deformity 1 requires operative correction
Bow legs

- Toddlers normal
  - accentuated by internal tibial torsion
  - pronounced in overweight
    - distribution of subcutaneous fat in chubby leg
  - broad based gait
  - internal rotation of the hip
  - recurvatum

- Examine on couch with patellae skywards
Bow legs

- Symmetrical
- not excessive
- improving with time
- Measure intercondylar distance
Bow legs

- **NO** Night splints
  - no influence on the natural resolution of condition

- Pathological
  - asymmetrical, severe, deteriorates
    - Blount’s disease
    - Rickets
    - Trauma
Bow legs

• Xrays
  – asymmetrical, unilateral
  – short stature, disproportionate
  – over aged 3 years

• standing AP
  – metaphyseal-diaphyseal angle
    • >11 degrees abnormal
Knock knees

- Genu valgum
- Normal for 3-8 year olds
  - symmetrical
  - not severe
  - improves with time
    - trauma
    - rickets
    - skeletal dysplasias
Knock knees

• 22% of 3 and 1/2 yrs have intermalleolar distance of >5cms

• 1 to 2% of seven year olds will have >5cms
  – must be an angular correction
Knock knees

• NO influence
  – exercise, night splints, shoe inserts

• Indications for persistent cases
  – discomfort Knee-swishing
  – appearance
  – progression of deformity

• weight loss
Knock knees

• Correction >10cm
  – Medial growth plate arrest
    • distal femoral
    • proximal tibial
  – hemiepiphyseal stapling
    • timing crucial within 2 yrs of maturity
      – published guidelines
      – close f/u, 10cm corrects in 1 yrs
      – remove staples if required
Flat feet

• All infants have flat feet
• Arch develops at 6 years

• Flexible flat foot
  – absence of medial longitudinal arch
  – hind foot valgus
Flexible flat foot

- Standing at ease
  - relaxed intrinsic muscles
- standing on tip-toes
  - long flexors and extensors muscles recruited
  - medial longitudinal arch reappears
  - heel tilts into varus or neutral
Toe-raising test of Jack

- wgt bearing hallux passively dorsiflexed
Flexible flat foot

• Management
  – majority improve with or despite treatment

• Wenger
  – three treatments and controls
  – 1-6 yrs
  – no influence on natural history

• Shoe wear was influenced
Flexible flat foot

• Surgery
  – rarely indicated
    • persistent pain with deformity, >12 yrs
  – Valgus heel
    • calcaneal osteotomy
  – Navicular-medial cuneiform joint
    • Miller procedure
      – arthrodesis, with advancement of Tibialis posterior
Toe Walking

- Normal progression of gait development
  - short period, intermittent toe walking
  - progress to flat foot heel strike
- Prolonged and pronounced
- otherwise normal
- idiopathic toe walkers
- Diagnosis of exclusion
Toe Walking

• Pathological causes
  – diplegic cerebral palsy
  – Duchenne muscular dystrophy
  – hereditary motor and sensory neuropathies
  – spinal dysraphism
Toe Walking

• Diagnosis of exclusion
  – history and examination
  – Investigations
    • creatinine phosphokinase
    • spinal radiograph
    • neurological tests
    • muscle biopsy
Toe Walking

• Management
  – observation
    • mild cases
  – casting, splinting
    • persistent cases
  – surgery
    • tendo Achilles lengthening

• > four years
Growing Pains and Night Cramps

• 15%
  – wake at night with leg pains
  – energetic day
  – multiple disturbed nights
  – no day pain
  – easily relieved by local treatment

• Osteoid osteoma

• Leukaemia
Thank you