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COMMON MUSCULOSKELETAL PROBLEMS – GROWTH AND DEVELOPMENT – PATHOLOGIC VS. NORMAL

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M2 Musculoskeletal

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I. ANGULAR AND TORSIONAL DEFORMITIES OF THE LOWER LIMBS

Examination

Relaxed, define terms

Supine/sitting/walking

Each joint individually

Beware of asymmetrical findings

1. IN-TOEING:

- Metatarsus adductus --- newborn - 18 months
Limited to forefoot - 80% improve spontaneously
- Internal tibial torsion --- 6-18 months
Related to sleeping position
85% improve spontaneously
Transmalleolar axis: Infant 5°, adult 22°
- Femoral anteversion --- 3-9 years
Not a “hip problem”
Improves spontaneously until age 12
- Differential Diagnosis
 - Clubfoot
 - Atavistic first toe (“smart toe”)
 - Z-foot
 - Neurologic problems - i.e., myelodysplasia, cerebral palsy

2. OUT-TOEING:

- Calcaneovalgus foot improves spontaneously
- External tibial torsion
Uncommon, often associated with neurologic problems
i.e., CP, myelodysplasia
- External rotatory contracture of the hip
Improves spontaneously in the first year

3. BOWLEGS/KNOCK KNEES (Genu Varus, Genu Valgus)

- New Patient Evaluation

Clinical

- Presence or absence of knee joint laxity
- Motion of all lower extremity joints
- Location of the angulation - tibia, femur, joint
- Assessment of alignment - anterior-posterior, lateral and rotation

Radiographic

- Long films, anterior-posterior standing, neutral rotation for alignment
(?lateral)
- Avoid squeezing the patient onto the X-ray

Laboratory

- Renal function studies (BUN, serum creatinine), calcium, phosphorus, alkaline phosphatase

- **Bowlegs (Genu Varus)**

- Differential Diagnosis

Physiologic

Blount's disease, infantile and adolescent forms

Rickets

Metaphyseal chondroplasia

- Physiologic Bowlegs

- Normal in infants (avg. 15°) and should resolve, or at least attain neutral alignment by 18-24 mos.

- Salenius and Vankka chart is key to the clinical evaluation (enclosed).
- X-rays normal except for bowing.
- Infantile Blount's Disease
 - Clinical variables
 - Age, angle, Langenskold stage, degree of internal tibial torsion and obesity.
 - Etiology is currently believed to be internal tibial rotation coupled with bowlegs and early walking leads to increased shear stress on the medial plateau.
 - X-rays
 - Medial beak is the first radiographic finding.
 - If untreated, will progress through the Langenskold stages I-V (increasing depression of the medial plateau), culminating at Stage VI - medial fusion.
 - Metaphyseal/diaphyseal angle (Drennan). 11° or more indicates progressive deformity.
- Adolescent Blount's Disease
 - Typically obese, skeletally immature teenager.
 - Increasing varus deformity with widening of the epiphyseal plate medially.
 - Bracing seldom effective, osteotomy preferred.
- Other Causes

- Rickets - nutritional, vitamin D resistant, renal; usually can be diagnosed both clinically and radiographically
 - Metaphyseal chondroplasia - usually involves other long bones, and symmetric
- **Knock Knees (Genu Valgum)**
 - **Differential diagnosis:** late onset of bone weakness
 - Renal osteodystrophy
 - Metabolic disease
 - Bone dysplasia (storage diseases)
 - Tumor - osteochondroma, fibrous dysplasia
 - Trauma, idiopathic

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II. Developmental Dysplasia of the Hip (DDH)

Etiology - multifactorial - not always congenital or dislocated

“A continuum of dysplasia”

- Mechanical factors - small space (first born), tight abdominal wall, breech presentation (60%), left hip (67%), torticollis (20%), metatarsus adductus/calcanoevalgus (10%)
- Physiologic factors - female (6:1), hormones - estrogen, relaxin (inherited)
- Environmental - cradle boards, swaddling

Hip at Risk

Major

Abnormal clinical examination

Breech delivery

First born - female

Family history of DDH

Minor

Limitation of hip abduction at
birth or later

Sacral dimple

Foot deformity

Torticollis, scoliosis and other
postural deformities

Newborn to 2 months

Ortolani and Barlow tests most reliable

X-rays seldom diagnostic (false negative 50%)

Ultrasound - non-invasive (neonate to 6 months)

Operator dependent, may be too sensitive

(immature vs. abnormal)

Good for follow-up in brace

Method of Examination: (should be part of every well-baby exam)

1. Infant is in relaxed, supine position; one hand stabilized the pelvis
2. Hip is flexed to 90 degrees and adducted past the midline while gentler outward pressure is made with the thumb (Figure A)
3. Hip is then abducted and gently lifted toward socket (Figure B).
4. Hip may be felt (not heard) to dislocate or sublux (Figure A) or relocate (Figure B).

Not just a test of abduction

Figure A

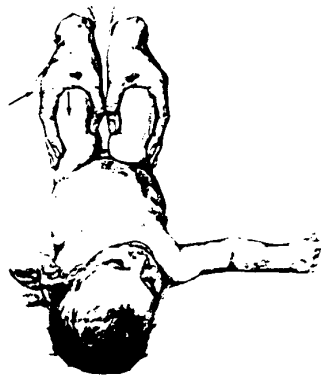


Figure B



Source: Undetermined

Two months to 2 years: Findings increase with age

Clinical:

Tight adductors	Uneven knees (Allis sign)
Shortening	Limp (+ Trendelenburg)
Positioning	Waddling gait
Abnormal skin folds	

Radiographic: More evident after six weeks of age (unreliable before)

Shenton's line broken

Proximal and lateral migration of the femoral head

False acetabulum (acetabular dysplasia)

Treatment: Newborn to 6 months (Ortolani positive - reducible)

Gentle reduce femoral head into acetabulum (Ortolani)

Maintain the abducted and flexed position (human position of Salter)

Satisfactory reduction must be documented (x-ray/ultrasound)

Pavlik harness

The Pavlik harness prevents redislocation, yet maintains the
flexed-abducted posture

Flex hip above 90 degrees

The posterior strap is a "checkrein" to prevent adduction
and allows the hips to fall loosely into abduction (safe
zone of Ramsey)

Excessive tightening of the posterior strap (frog position)

may lead to avascular necrosis

Document reduction with x-ray or ultrasound

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III Idiopathic Scoliosis

The incidence of idiopathic scoliosis is 22 per 1,000. However, only four of the 22 will require treatment, and only one will require surgery. As a consequence, “clinical sorting” is a significant problem in office management as the majority of children (85%) will require only observation.

Sorting should occur at every level of processing:

Discovery - School Screening

Initial Exam - Family MD or Pediatrician

Disposition - Orthopaedist

Etiology - Genetic

80% - Positive family history

Dominant - (? x-linked)

Variable expressivity

High degree of penetrance

Boys and Girls - equally affected

Clinical Evaluation

Anterior-Posterior Alignment

Types of curves - right thoracic, long dorsolumbar, double thoracic,
left double major (right thoracic, left lumbar)

Trunk alignment and “shift”

Rib hump, best evaluated with forward bending test. Documented

using flexicurve, Scoliometer (Bunnell), variety of photographic/computer techniques, Moire, ISIS, etc.

Sagittal Alignment

Thoracic lordosis - decreased pulmonary function

Kyphosis (normal up to 40 degrees)

Lumbar lordosis (spondylolysis/spondylolisthesis)

Radiological Evaluation

Standing PA and lateral x-rays (initial), long films preferred

Measurement of the curvature using Cobb method

Exact positioning, avoid repeat films, timing, shielding

Risser grading for skeletal maturity

Beware of:

Painful scoliosis

Progressive curvature in boys

Curve that goes the wrong way (left thoracic)

Rapid progression, i.e., more than 1 degree per month

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