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MUSCULOSKELETAL PEDIATRIC CONDITIONS

NOTES

Ref. Davies Chapter 14 & 19

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Developmental Dysplasia of the Hip DDH

- *Old terms: 'Congenital Hip Dislocation' or 'Developmental Hip Dislocation'*
- Early Detection and Intervention
- Barlow and Ortolani –Which is which?

Does it really click?

Ortolani's test



- Occurs in infancy
- Aka congenital hip dislocation
- Birth defect that is a deformation
- Tissue normal (nothing wrong with development during embryonic period 1st 8 weeks)
- Poor approximation of acetabulum to head of femur
- More common in girls
- Risk factor includes macrosomia due to maternal diabetes mellitus

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- DDH
 - Incidence: 1.5/ 1,000
 - M:F=1:4-8
- Definition: Progressive malformation of the hip joint
- Etiology:
 - ?? multifactorial etiology
 - Dysplasia - bone molding
 - Several risk factors

Dysplasia of the elements of the hip joint due to inappropriate bone molding
Multifactorial etiology :
Endocrine, traumatic, and genetic risk factors. Effect of relaxin, fetopelvic disproportion, **dystocia**, breech delivery

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- DDH – RISK FACTORS**
- > **Endocrine (relaxin, estrogen)**
 - > **Perinatal trauma**
 - > **Genetic / Female gender / Family history**
 - > **Fetopelvic disproportion**
 - > **Dystocia**
 - > **Breech delivery**
 - > **Cesarean delivery**
 - > **Congenital muscular torticollis**
 - > **Congenital foot abnormalities**
 - > **Neuromuscular disorders**

Dysplasia of the elements of the hip joint due to inappropriate bone molding

Multifactorial etiology : Endocrine, traumatic, and genetic risk factors. Effect of relaxin, fetopelvic disproportion, **dystocia**, breech delivery

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- DDH – Presentation**
- Positive orthopedic findings (see next slide)
 - Decreased hip abduction
 - Asymmetrical thigh folds
 - Delayed walking
 - Waddling gait: Trendelenburg limp
 - Painless limp

Dysplasia of the elements of the hip joint due to inappropriate bone molding

Multifactorial etiology : Endocrine, traumatic, and genetic risk factors. Effect of relaxin, fetopelvic disproportion, **dystocia**, breech delivery

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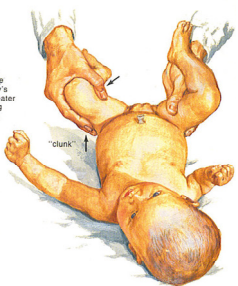
- DDH - DIAGNOSIS**
- **Orthopedic tests:** Ortolani's test and Barlow's test, Allis test
 - **Ultrasonography:** in infants < 6 months
 - **X-ray:** in infants > 6 months

ossification of the capital femoral epiphyses
Allis test- unequal height of knees
Barlow- dislocation test

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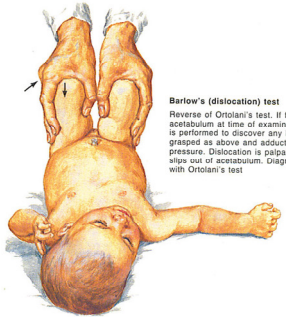
Recognition of Congenital Dislocation of Hip

Ortolani's (reduction) test
With baby relaxed and content on firm surface, hips and knees flexed to 90°. Hips examined one at a time. Examiner grasps baby's thigh with middle finger over greater trochanter and lifts thigh to bring femoral head from its dislocated posterior position to opposite the acetabulum. Simultaneously, thigh gently abducted, reducing femoral head into acetabulum. In positive finding, examiner senses reduction by palpable, nearly audible "clunk"




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Barlow's (dislocation) test
Reverse of Ortolani's test. If femoral head is in acetabulum at time of examination, Barlow's test is performed to discover any hip instability. Baby's thigh grasped as above and adducted with gentle downward pressure. Dislocation is possible as femoral head slips out of acetabulum. Diagnosis confirmed with Ortolani's test

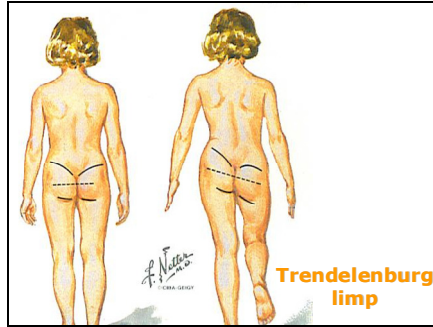


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Allis' or Galeazzi's sign
With knees and hips flexed, knee on affected side lower because femoral head lies posterior to acetabulum in this position



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DDH - DIAGNOSIS

Clinical examination will **miss many** hip dislocations and **ultrasonograms of high-risk** babies are indicated

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DDH - MANAGEMENT

- **Fixing the hip in abduction before 6 months of age:**
- Pavlik harness or von Rosen splint
- Patient must be < 8-9 months of age
- Harness must be adjusted every 2 weeks for growth and be kept on at all times
- Surgery if bracing is delayed or child > 8-9 months

- Refer patient out for treatment

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DDH - MANAGEMENT

Complications


- Defective development of acetabulum
- recurrent hip dislocation,
- premature osteoarthritis
- AVN

Prognosis

Good if treated within 6-12 months of age

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DDH - HIP FIXATION IN ABDUCTION



THE PAVLIK HARNESS WITH A SECOND FIT

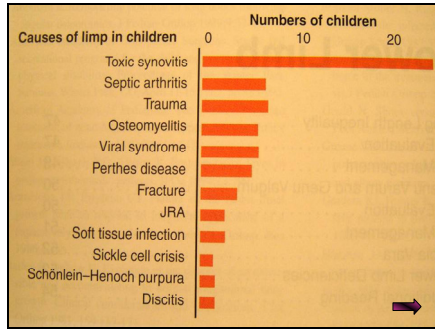
von Rosen splint

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LIMP - DEFINITION

- Gait abnormality
- Arrhythmic body movement when walking
- Painful OR painless
- Various causes – age related

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Toxic synovitis- most common cause of limp; autoimmune reaction following infection (GI, viral URTI, etc); after recovery from infection develop a limp; joint effusion but no destruction, unilateral; harmless process

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THE LIMPING CHILD

- Often associated with pain
- Unwillingness to walk or bear weight on the leg
- Small children may fracture bones due to minor trauma (CONSIDER PHYSICAL ABUSE)

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THE LIMPING CHILD

- Children have a difficulty localizing pain
- Always examine the hip joint when the chief complaint is pain in the groin, knee, or thigh
- Infection

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ACUTE LIMPING – MOST COMMON CAUSES IN A WELL CHILD

- toxic synovitis (synovitis simplex)
- septic arthritis
- trauma

← →

NEVER MISS SEPTIC ARTHRITIS AND OSTEOMYELITIS

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LIMPING - HISTORY

- Trauma
- Duration: chronic pain is unlikely caused by infection
- Any prodromal illness (e.g., sore throat)
- Presence and location of any pain, swelling, mass

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LIMP - TRAUMA

- The limping must have a realistic **causative** and **temporal** relationship with a recent accident
- Fracture
- Non-fracture:

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LIMP - TRAUMA
Fractures

- **PRESCHOOLERS : IMPACTION FRACTURES** depressed, compression, infraction fractures, torus fractures
- **TEENAGERS: AVULSION FRACTURES**
- **STRESS FRACTURES:** insufficiency fracture; athletes, overloading, inadequate conditioning, inadequate warm-up

- Torus fracture- breaks like a twig, portion of cortex intact

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LIMP – PHYSICAL EXAMINATION

- Vitals!
- Fever: suggests bone or joint infection
- Skin rashes
- Range of movement

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LIMP – PHYSICAL EXAMINATION

- Point tenderness or signs of inflammation
- Unequal leg length
- Spinal abnormality (e.g. hairy patch)
- Neurologic signs: check muscle tone & strength and tendon reflexes

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LIMP - INVESTIGATIONS

- Imaging: x-rays, ultrasonography of hip joint
- Nuclear medicine: bone scans
- Complete blood count, acute phase reactants (CRP)
- Blood cultures (if febrile)

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Causes of a limp	
Age group	Cause
All ages	Trauma Septic arthritis/osteomyelitis
1-2 years	Congenital dislocation of the hip (developmental dysplasia of the hip) Cerebral palsy
3-10 years	Transient synovitis (irritable hip) Perthes disease Rarities: juvenile idiopathic arthritis, leukemia
11-15 years	Slipped capital femoral epiphysis Osgood-Schlatter disease Rarities: bone tumors, juvenile idiopathic arthritis, hysteria

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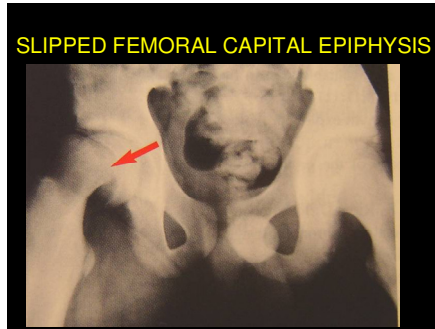
THE LIMPING CHILD - DDX:
OSTEOMYELITIS, SEPTIC ARTHRITIS,
INFLAMMATORY ARTHRITIS, OSTEOID
OSTEOMA, BONE MALIGNANCY,
OSTEOCHONDROSES - AVN - FRACTURE

IMPORTANT CONDITIONS WITH LIMPING:

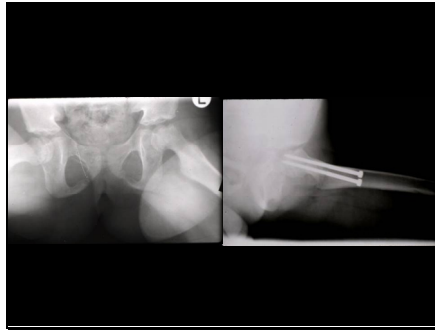
1. Legg - Calve' - Perthes Disease
• AVN; 50% well without intervention

2. Slipped Femoral Capital Epiphysis
• **Surgical emergency**

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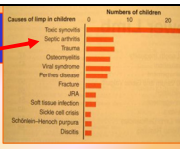


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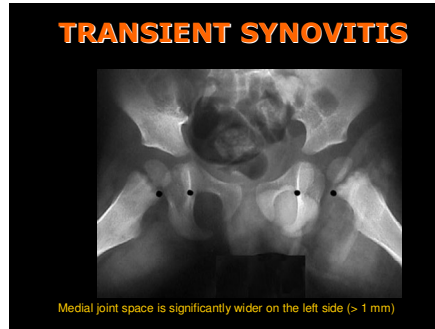
TRANSIENT SYNOVITIS (TS)
COXITIS SIMPLEX = toxic synovitis



Cause of limp in children	Number of children
Toxic synovitis	18
Septic arthritis	12
Trauma	10
Osteomyelitis	8
Viral synovitis	6
Perthes disease	4
Fracture	3
JRA	2
Cell tissue infection	1
Slipped capital epiphysis	1
Schönlein-Henoch purpura	1
Osteitis	1

- **What is TS? Arthralgia and arthritis secondary to a transient synovitis of the hip.** Biopsy reveals nonspecific inflammation and hypertrophy of the synovial membrane. **Ultrasonography** may demonstrate **joint effusion** causing bulging of the anterior joint capsule.

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TRANSIENT SYNOVITIS - Physical Diagnosis
Hip

- Mildly restricted ROM (abduction and internal rotation) in 2/3 of cases
- Usually painless ROM
- The hip may be tender to palpation
- The most sensitive test for TS is the **log roll**: patient supine & examiner gently rolls the involved limb from side to side \Rightarrow involuntary **muscle guarding** of one affected side

Check the Knee!
Any effusion or joint abnormality within the knee should suggest another disease process.

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TRANSIENT SYNOVITIS - TREATMENT

- Apply ice or heat and massage
- Advise **bedrest** for 7-10 days, allowing the patient to rest in a position of comfort.
- No weight bearing **on affected limb**
- Follow up after 24 hours and one week
- How dangerous is TS ?** Excellent prognosis w/ correct management

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THE PAINFUL LIMB

- RECURRENT LIMB PAIN "Growing Pains"
- LIMB PAIN OF ACUTE ONSET
 - Trauma –accidental OR nonaccidental
 - Osteomyelitis
 - Sickle-cell disease

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Features of growing pains

Common between 5 and 11 years of age
Occur in evening and night
Predominantly lower limbs, calves, shins
Normal examination

Never:
Functional disability
Limp
Morning symptoms

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THE PAINFUL JOINT

- **Septic arthritis** is a medical emergency
- **Joint destruction** < 24 h if not treated
- X-rays are not helpful in early diagnosis
- Bone scan
- Joint space aspiration is indicated if septic arthritis is suspected

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SEPTIC ARTHRITIS -NATURAL COURSE




- *Haemophilus influenzae* type b
- *Staphylococcus aureus* - MRSA
- Group B *Streptococci*
- *Gonococci*
- *Meningococci*
- *Pseudomonas* spp.
- *E. coli*

- Infant with septic arthritis of the left hip.
- Hip rigidly held in the classic position
- Hip joint remains immobile in this position

of flexion, abduction, and external rotation, a position that maximizes capsular volume. The patient is relatively comfortable as long as the hip joint remains immobile in this position.

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SEPTIC ARTHRITIS -NATURAL COURSE




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Age 22 months: The child had been symptomatic for a week before this radiograph was obtained. No bone changes are seen, but the left hip is laterally subluxated.

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SEPTIC ARTHRITIS -NATURAL COURSE




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10 days later: No bone changes yet, but the hip joint is further subluxated.

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SEPTIC ARTHRITIS -NATURAL COURSE




Three weeks after presentation:

- The left hip is dislocated
- New periosteal bone formation
- This last finding is characteristic of an associated osteomyelitis of the left femur

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SEPTIC ARTHRITIS -NATURAL COURSE




Seven weeks after onset:

- Increased opacity is noted in the central portion of the proximal femoral metaphysis and in the proximal femoral epiphysis.
- Avascular necrosis of proximal femur (AVN)

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SEPTIC ARTHRITIS -NATURAL COURSE




Five months after onset:

- The femoral head has been completely resorbed, but the femoral shaft has regenerated.

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SEPTIC ARTHRITIS -NATURAL COURSE



- At age 11 (9 years after onset of the infection)
- The hip joint and the proximal femoral growth plate are destroyed.
- A profound limb-length discrepancy is noted, in addition to severely impaired hip function.

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NORMAL POSTURAL VARIANTS

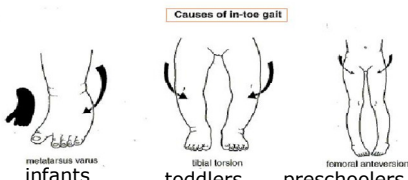
- Bow legs (**genu varum**): common in infants and toddlers up to 2 years
- Knock knees (**genu valgum**): the physiologic knock-knee pattern is seen during the third and fourth years
- **Flat feet (pes planus)**: often present in toddlers
- Intoeing: **metatarsus varus** in infants, **medial tibial torsion** in toddlers, **femoral anteversion** in children

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IN-TOEING
NORMAL POSTURAL VARIATIONS

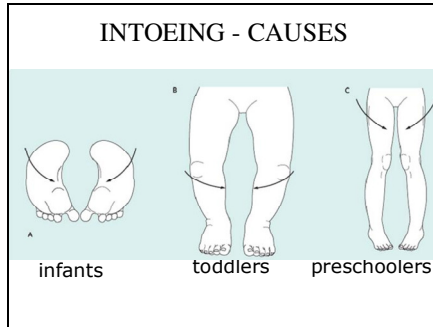
These are common problems which arouse much parental anxiety. Reassurance is usually more appropriate than expensive shoe modifications or unnecessary physiotherapy.

Causes of in-toe gait



metatarsus varus infants tibial torsion toddlers femoral anteversion preschoolers

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GENU VARUM - BOWLEGGEDNESS

- Normal finding in the newborn (must be B/L):
Physiological genu varum
- Bowing of the lower extremity (B/L most often)
- External rotation of femur
- Internal rotation of tibia

A photograph showing the lower legs and feet of a child. The knees are bowed outward, and the feet are turned inward, characteristic of genu varum.

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GENU VALGUM - KNOCK KNEES

- Normal course (if no other underlying condition is present)
Physiological genu valgum

Sign:

- Knock knees
- Lateral deviation of tibia, measured in degrees

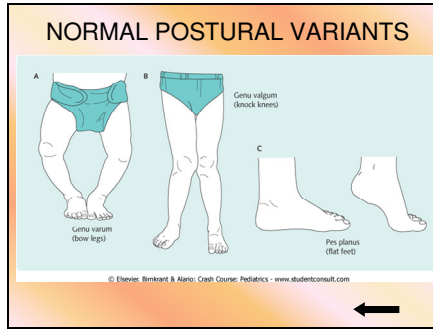
➤ **Presentation at birth:** Maximal **varus** (B/L) (Genu varum; see above)

➤ **Ages 3-4 years:** Maximal **valgus** (>10° angulation)

➤ **Age >10 years:** Anatomical **valgus** at 6°

A photograph showing the lower legs and feet of a child. The knees are close together, and the feet are turned outward, characteristic of genu valgum.

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CLASSIFICATION OF FOOT MALFORMATIONS:

- Resistant (= fixed)
- Correctable (= reducible)

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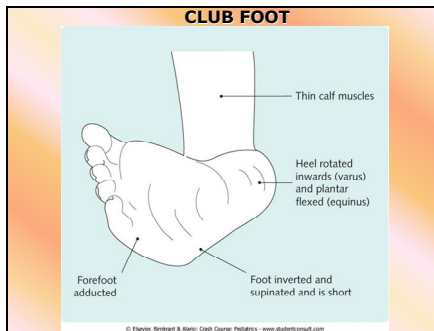
CONGENITAL TALIPES EQUINOVARUS - CLUB FOOT

- 1/1000 births
- M:F = 2:1
- **2 forms: correctable** and **resistant**

Treatment:

- Bracing without surgery (correctable type)
- Surgery (resistant type)
- **Prognosis:** Good, but must be managed early and correctly

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COMMON FOOT MALFORMATIONS

- Pes calcaneovalgus
- Pes adductus - metatarsus varus/adductus - intoeing
- Pes planovalgus - flat foot; fallen arches

(pes planovalgus is physiological in infants and toddlers and reaches a peak at age 1½ - 2 yrs)



The diagram shows two feet from a dorsal perspective. The right foot is labeled 'Calcaneovalgus' and shows the heel turned outward and the foot in a plantar flexed position. The left foot is shown in a normal position for comparison.

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ANYTHING WRONG?



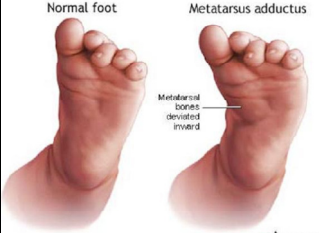
Image A shows a child's feet with a flat foot (pes planovalgus). Image B shows a child's feet with a normal arch.

A Pes planovalgus

B Normal at this age

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Normal foot Metatarsus adductus = Metatarsus varus



The image shows two feet from a dorsal view. The left foot is labeled 'Normal foot' and shows a straight line of metatarsals. The right foot is labeled 'Metatarsus adductus = Metatarsus varus' and shows the second, third, and fourth metatarsals deviated inward. A label 'Metatarsal bones deviated inward' points to the second, third, and fourth metatarsals on the right foot.

Metatarsal bones deviated inward

ADAM

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ABNORMAL POSTURAL VARIANTS

When pathology should be suspected

- Rapid or severe progression
- A positive family history
- Asymmetry

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PEDIATRIC ORTHOPEDIC AND TRAUMA

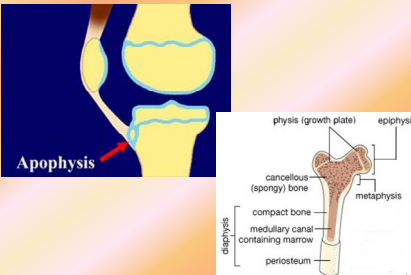
- **Apophyseal injuries**
- Significant **loading** and **tensile stresses** of the **structurally weak** apophyses ⇒ **apophysitis** or **avulsion fractures**

Treatment of apophysitis

- 'PRICE'
- anti-inflammatory medication/herbs
- then controlled stretching
- strengthening of the affected area

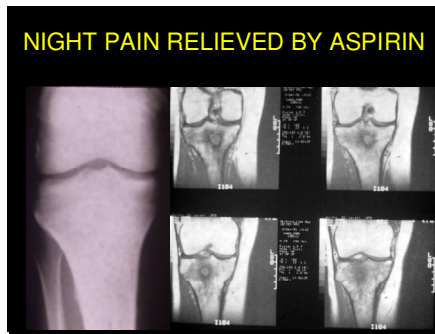
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APOPHYSIS



The slide contains two diagrams. The left diagram shows a cross-section of a joint with a red arrow pointing to a bony projection labeled 'Apophysis'. The right diagram is a detailed anatomical drawing of a bone with the following labels: 'physis (growth plate)', 'epiphysis', 'cancellous (spongy) bone', 'metaphysis', 'compact bone', 'medullary canal containing marrow', 'diaphysis', and 'periosteum'.

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