Musculoskeletal Disease

Long Bone Formation

Membranous Bone

Articular Joint Formation
Bone Metabolism

Congenital Problems
- Matrix problems
- Premature epiphyses closure
- Pituitary
- Malabsorption

Osteogenesis Imperfecta
- Brittle Bones Dis.
- Multiple Subtypes
  - Auto Dominant
  - Auto Recessive
  - Collagen defect
  - Bad bone matrix
  - Blue sclera

Osteopetrosis
- Rock-like bones
- Actually ‘Chalk’
- Osteoclast defect
- Can’t resorb
- Many Frxs
Lamellar Bone vs. Woven

Achondroplasia
- Premature closure of epiphyses
- Auto dominant
- Homozygous is lethal

Osteochondroma
- Mechanical injury to growth line.
- Continues to grow as a unit for years.
- Problem of diagnosis.
Enchondroma
- Small rest of hyaline cartilage
- Developmental
- Bony defect
- Fractures
- Syndrome of multiple enchondromas
- Very disfiguring

Multiple Enchondromas

Nonossifying Fibroma
- Very common
- Developmental
- Fibrous cortical defect
- Size determines what we call them.
  - 5-6 cm

Osteoporosis
- Loss of bone mass
- Not problem of calcium metabolism
- Peak bone mass
- Women
- Fractures
- HRT

Osteoporosis
Osteoporosis
- Collapse of vertebral bodies
- Kyphosis
- Loss of height
- Hip fractures
- Peak bone mass
- Physical activity
- Genetics

Vitamin D Deficiency
- Rickets
  - Developing bone
  - Can't convert cartilage model to bone
  - Permanent deformity
- Osteomalacia
  - Adults
  - Can't remodel
  - Softening of bone

Hyperparathyroidism

Renal Osteodystrophy
Paget’s Disease

- Viral infection
- Destructive and proliferative
- Sclerosis of marrow space
- Skull and pelvis
- Increased incidence of primary bone tumor

Clubbing

- Hypertrophic osteoarthropathy
- Soft tissue and periosteal bone
- COPD
  - Pure emphysema, rare
  - Lung cancer
  - Heart defects

Avascular Necrosis, Legg-Perthes

- Weight bearing jts.
- Developmental?
- Physically active.
- Compression and necrosis of bone and articular cartilage.

Osteomyelitis

- Direct infection of bone.
- Bacterial most often
  - Staphylococcus
  - Salmonella
  - Sickle Cell Disease
  - Tuberculosis
    - Spine first
    - Syphilis
    - Periosteum

Legg-Perthes

- Spine first
Fractures
- Anthropology
- Forensics
  - Identification
  - Pattern in child abuse
- Bumper height
- Pathological
  - Tumor
  - Gumma
  - Developmental defect

Greenstick Fracture

Pseudoarthrosis

Bone Tumors
- Benign vs. Malignant
- Primary vs. Metastatic
- Symptoms
  - Pain
  - Enlargement
  - Fracture at site of tumor

Fibrous Dysplasia
- Developmental
- Monostotic
- Polyostotic
- Bones
  - Rib, femur, jaw, humerus
- McCune-Albright
  - Polyostotic
  - Café-au-lait spots
  - Sexual precocity
  - Hyperthyroidism
  - Pituitary adenomas
**McCune-Albright**

- Fairly common
- Benign
- Ribs
- Weakened area tends to fracture

**Bone Cysts**

**Osteoid Osteoma**

- Tibia
- Injury?
- Cortical
- Very painful
- Aspirin

**Malignant tumors, metastatic**

- From practically any cancer
  - Breast
  - Prostate
  - Lung
- To any bone
  - Vertebrae
  - Long bones

**Osteosarcoma, Primary Malignancy**

- Weight bearing
- Long bones
- Young people
- Osteoblast is malignant cell
- Genetics of tumor being unraveled
  - Rb gene
  - P53
  - MDM2
  - St. Bernards and Great Danes
Osteosarcoma, Primary Malignancy

- Tumor

Codman’s Triangle

- X-Ray finding
- Lifting of periostium by tumor

Chondrosarcoma

Ewing Sarcoma

- ‘Small blue tumor’
- Primitive neuroectodermal tumor (PNET)
- Children and young adults.
- Oseous and extra-oseous
- ‘Fusion genes’
- t(11;22)(q24;q12)

Giant Cell Tumor

- Osteoclasts
- Benign
- Locally destructive
- Epiphyses
  - Adolescents
- Metaphyses
- Knee
- Solitary
Arthritis
- Inflammation of the joints
  - Articular surface and/or joint capsule.
- Infectious
  - GC
  - Lyme & others
- Immune mediated, rheumatic fever
  - Streptococcal trigger
- Autoimmune, rheumatoid arthritis
- Wear and Tear, osteoarthritis
- Crystal arthritis, gout

Rheumatic Heart Disease

Rheumatoid Arthritis - Systemic Disease
- Genetically susceptible
- Trigger
  - Virus? EB
- Autoimmune destruction
  - Rheumatoid factor
- Loss of articular cartilage
- Joint fusion

Rheumatoid Arthritis

Rheumatoid Factors
- Present in about 80% of cases
- Some healthy people and other CT diseases
- RA need titer
- Don’t screen with this
- IgM generated against persons IgG
  - Rarely IgG or IgA
  - Targeted against Fc portion of antibody
- Self-associate to form immune complexes
  - Activate complement, causing cartilage destruction
  - These circulating immune complexes bring about many of the extra-arthritic symptoms
- TNF, IL-1, IL-6, IL-15
Rheumatoid Factor

Rheumatoid Arthritis

Rheumatoid Nodules

Rheumatoid Arthritis

Rheumatoid Nodule
Ankylosing Spondylitis

Reiter’s Syndrome

Osteoarthritis

- Wear and tear on joint cartilage
- Normally there is very little friction.
- Minimal damage leads to cartilage fractures.
- Synovial fluid into underlying bone.
- Microcysts and bone necrosis.

Osteoarthritis

- Weight bearing joints
- Injury to cartilage
- Progressive
- Middle-age and older
Crystal Arthritis

- Gout
- Uric acid crystals
- Genetics and diet
- Crystals in joint space and soft tissues
  - Tophi in soft tissue
  - Intense inflammatory reaction in joint
  - Very Painful

Gout
Gout or Pseudogout?

- Similar symptoms
- Calcium pyrophosphate
- Smaller

Tumors of Soft Tissue

Nodular Fasciitis
Fasciitis

Myositis Osificans
- Legs
- Palms
  - Auto mechanics
  - Hematoma that becomes calcified
  - Overt bone formation
    - Even bone marrow

Desmoid

Liposarcoma

Rhabdomyosarcoma

Fibrosarcoma