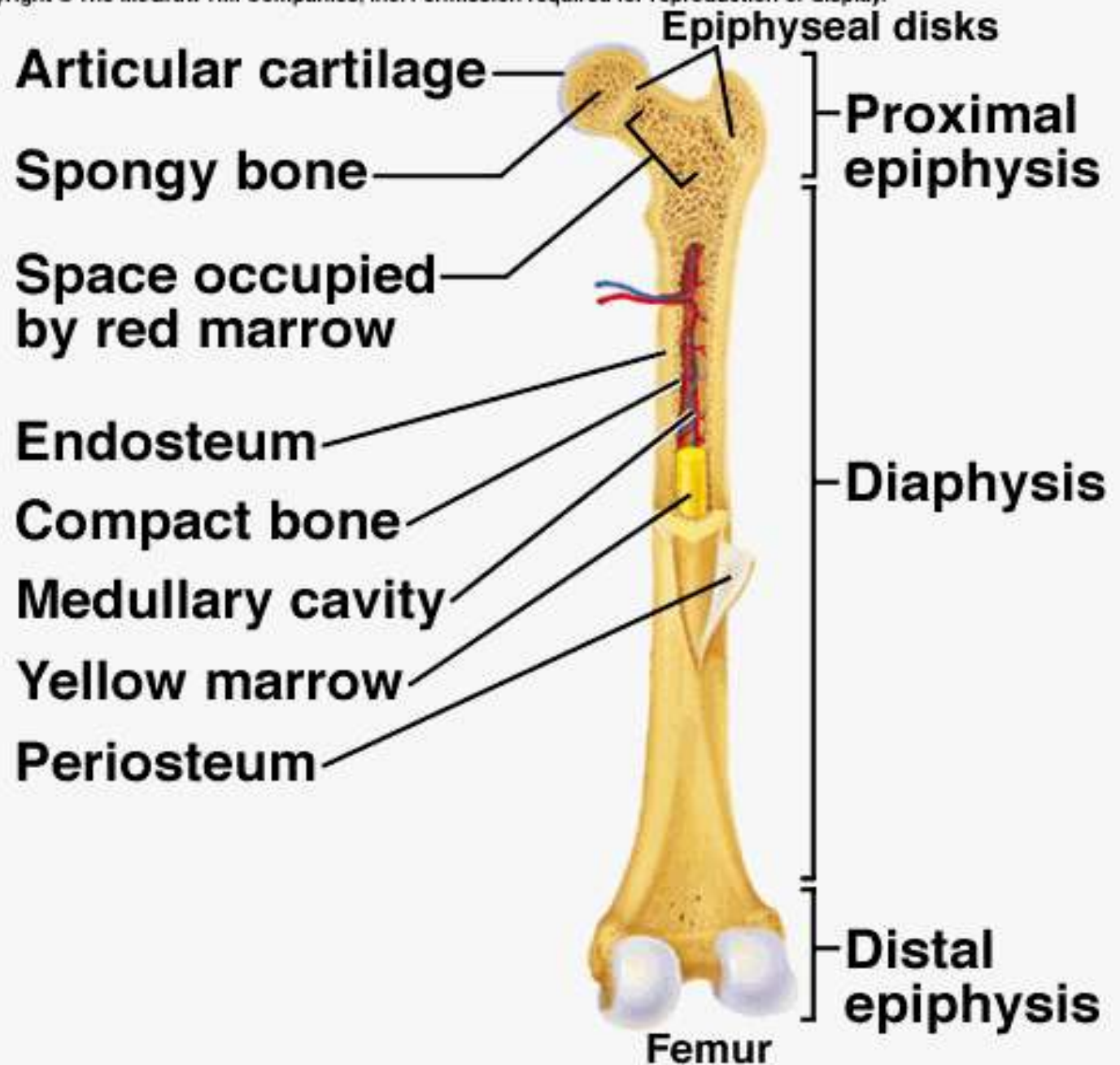


# A Tale of Four Traumas

Understanding how bones break

# Long Bone



# Bone Break Classifications

- First Classification

- *Based on whether the break is open to the environment or not.*
- CLOSED- not an open wound. Broken but not exposed to environment
- OPEN (COMPOUND) – Break is an open wound exposed to the environment.

# Classification 1

**Closed Fracture**



**Open Fracture**

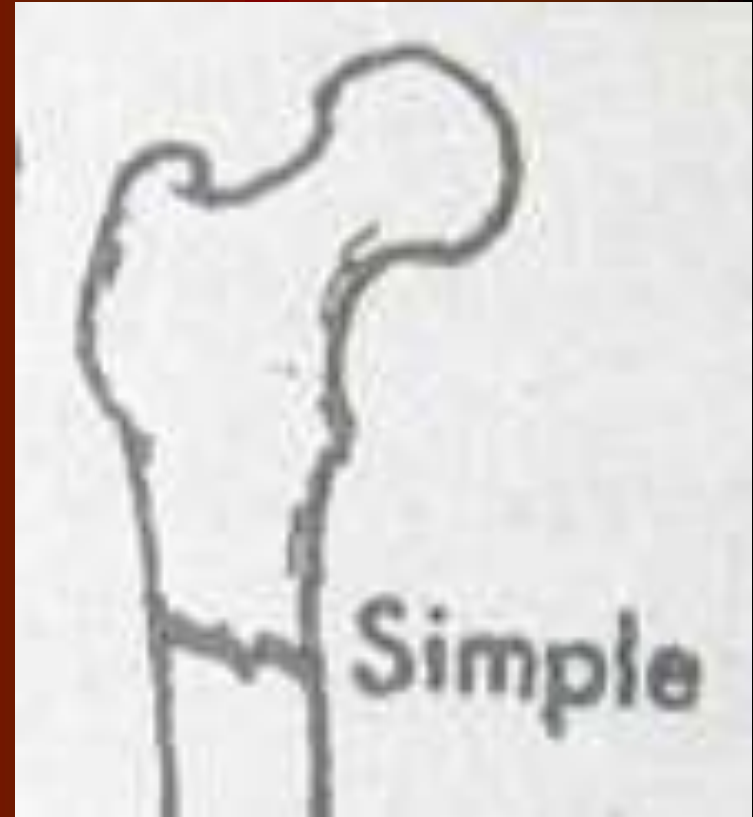


# Bone Break Classifications

- Second Classification
  - *Based on the actual break within the bone*
    - Four General Breaks
      - Simple
      - Greenstick
      - Oblique
      - Comminuted

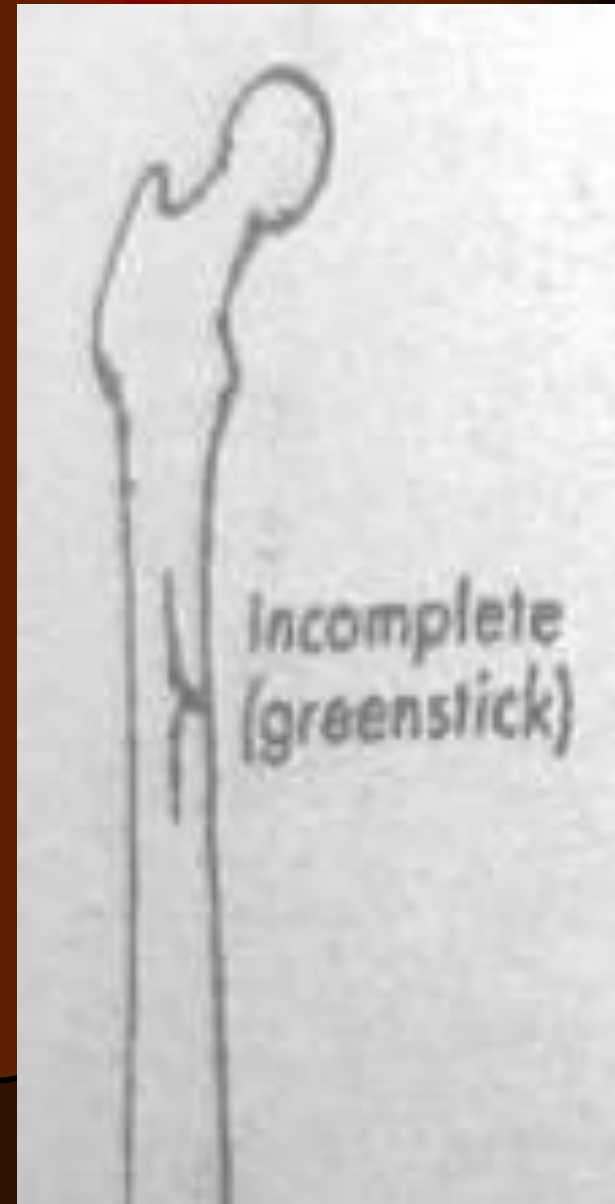
# Four Types of Breaks

- Simple fracture
  - The bone is broken in one or more places but the fragments stay in alignment caused by too much pressure on one side of the bone.



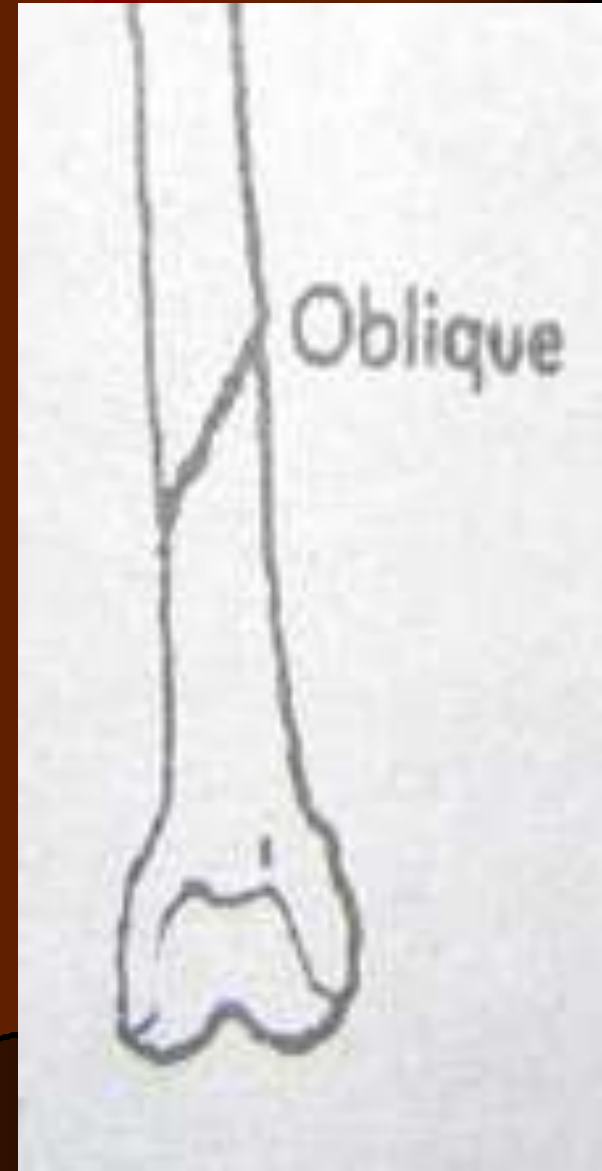
# Types of Breaks

- Greenstick Fracture
  - the bone cracks but does not break all the way through caused by the bending as if one was bending a twig



# Types of Breaks

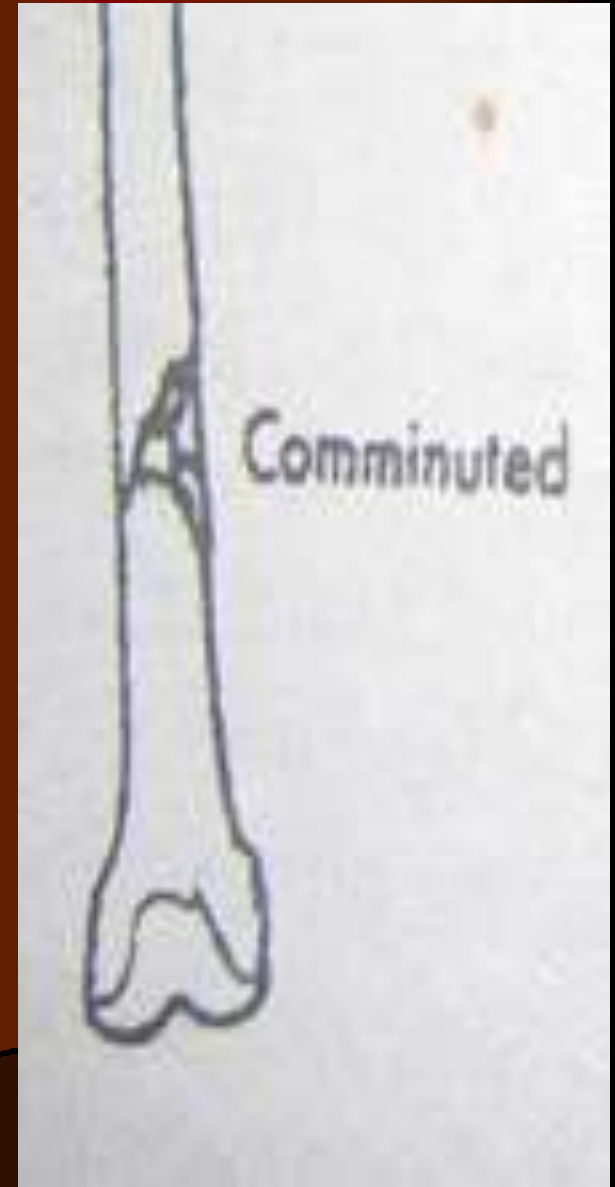
- Oblique Fracture
  - A slanted fracture of the shaft along the bones axis caused by a twisting motion or a sharp, angled object.





# Types of Breaks

- Comminuted Break
  - A bone is broken, splintered or crushed into multiple pieces.



# QUIZ TIME



A

B

C

D

# Answers to Quiz



A

Oblique



B

Comminuted



C

Simple



D

Greenstick



# Orthopedics & Fractures

# Orthopedics

“Orthopedics” is:

that branch of medicine and surgery that is specially concerned with the preservation and restoration of the function of the skeletal system, its joints, and associated structures like ligaments and tendons

# What Do Bones Do? More Than You Think!

1. Support/protection for body's vital organs (for example, skull protects the brain, rib cage protects the heart & lungs)
2. Serve as levers in conjunction with joints, tendons, ligaments, and muscles for movement
3. Production of blood cells in bone marrow
4. Storage site for calcium & phosphorus



Your bones are living tissue. Cells called osteoclasts break down old bone and cells called osteoblasts replace it with new tissue.



# Bone Re-Modeling



- *Osteoblasts* – secrete a matrix made up of calcium phosphate crystals
- *Osteocytes* – retired osteoblasts; found within bony wall that they have deposited around themselves
- *Osteoclasts* – break down bone; release acids to dissolve crystals and enzymes to break down matrix



# Bone Remodeling (cont.)

- Goes on throughout life
  - One fifth of young adult bone is re-built every year
  - Bones of femur completely rebuilt every 6 months
  - Bones in skull may take 10 years to rebuild
- Drink your milk (and sunshine for vitamin D)



# Bone Reacts to Stresses Put on It

- Greater physical stress placed on a bone at a particular site results in more bone deposition by osteoblasts at that site
- Another theory suggests electrical- field change created by physical stress stimulates osteoblasts & matrix formation

# Normal Fracture Healing



White zone is area of new bone deposit

# Abnormal Fracture Healing

- **Mal-union** – a fracture that heals with abnormal alignment
- **Non-union** – fracture healing has STOPPED before completely healed
  - elephant foot “hypertrophic non-union”
  - tapered “atrophic non-union”
- **Sequestrum** – a dead bone fragment separated from the rest of the bone
- **Osteomyelitis** – infection of bone

# Malunion



In the wrist



In the elbow

# Non-union



Metal  
fragments? From  
shotgun?



# Osteomyelitis



# Fracture Reduction Goals

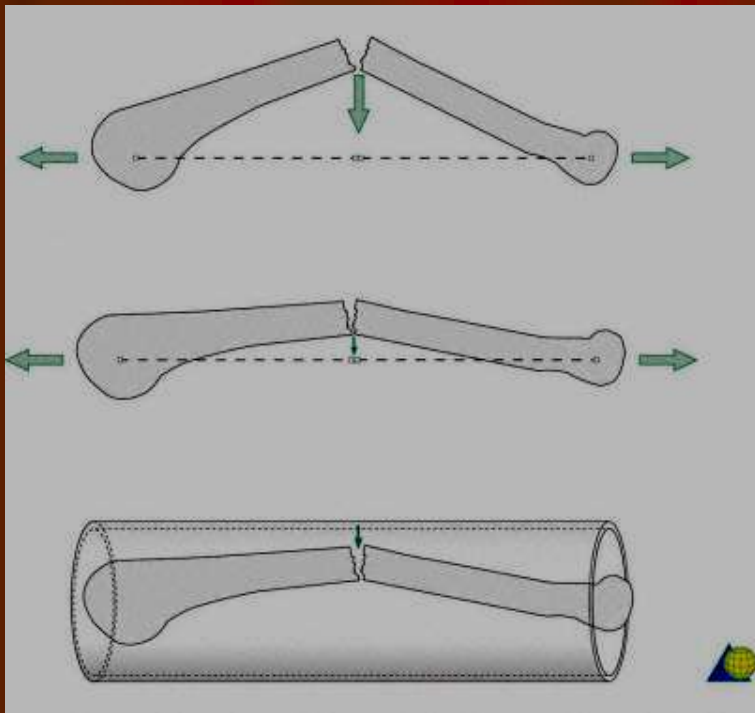
- Get bones close enough to heal
- Proper alignment
  - avoid mal-union + loss of function
- Avoid additional trauma
  - further fracture
  - infection



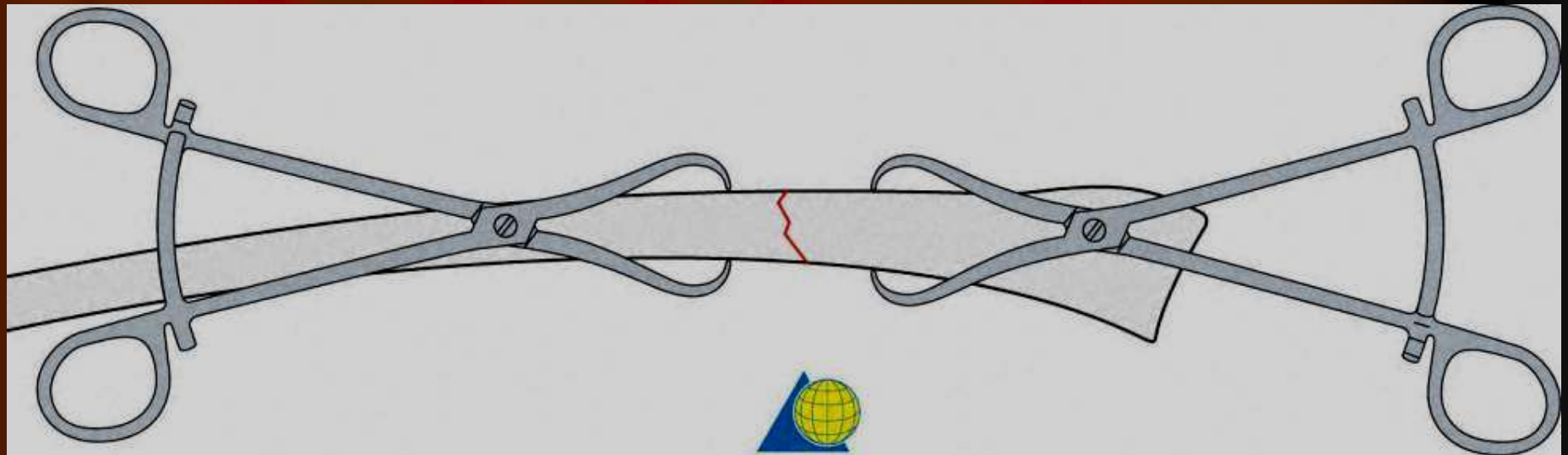
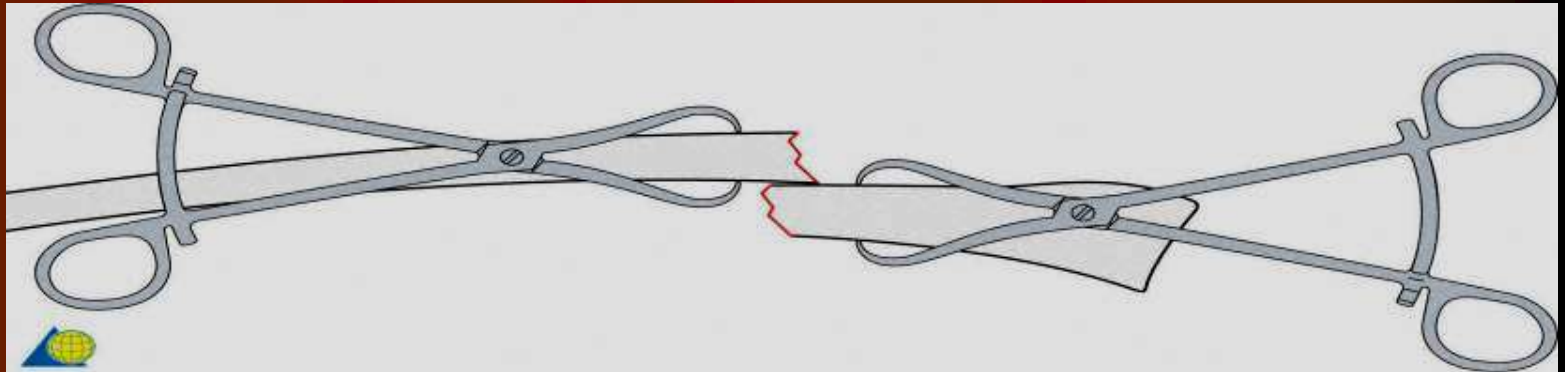
# Treatment Options

- Fracture Reduction
  - Closed
    - \* temporary (until surgery)
    - \* permanent (cast or splint)
  - Open (orthopedic surgery)
- Intramedullary Fixation
- Cerclage
- External Fixation Devices

# Closed Fracture Reduction



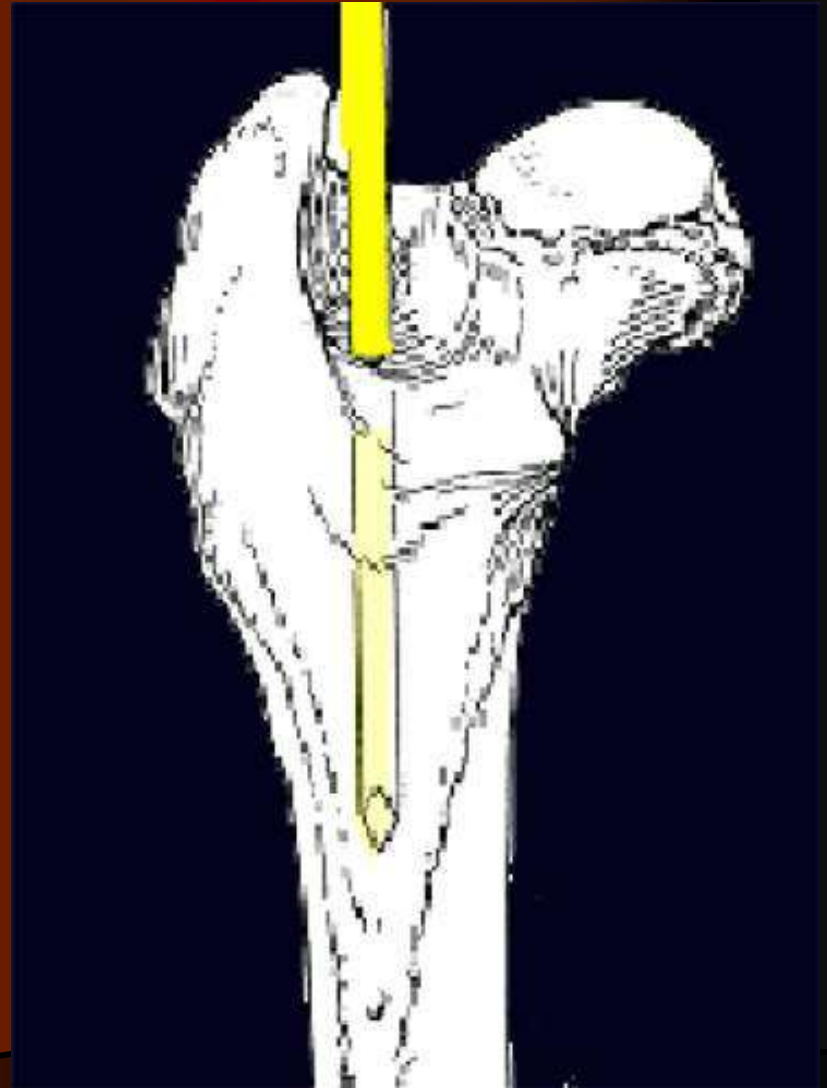
# Open Fracture Reduction



# Intramedullary Fixation

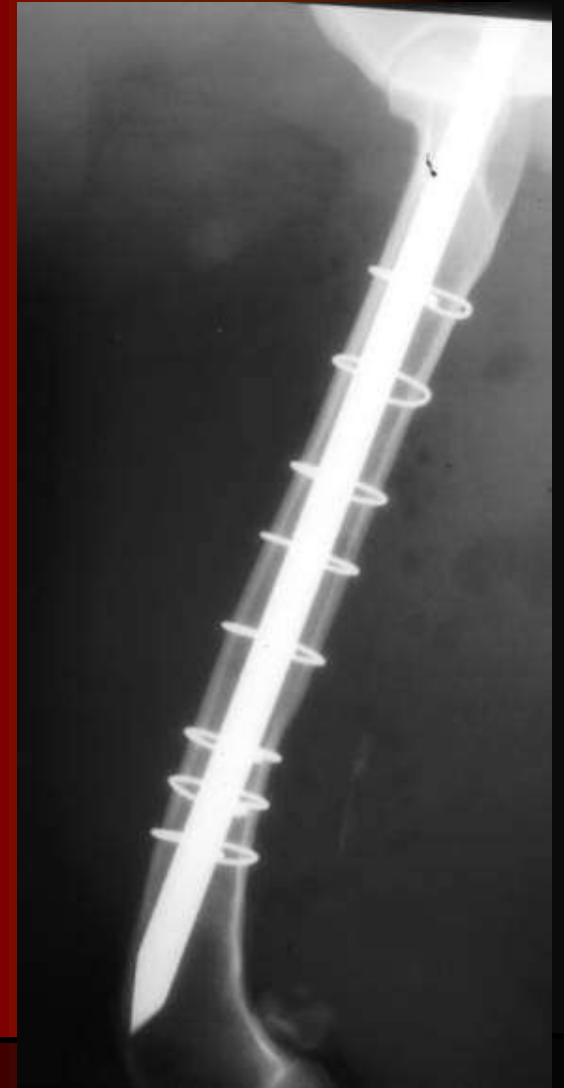
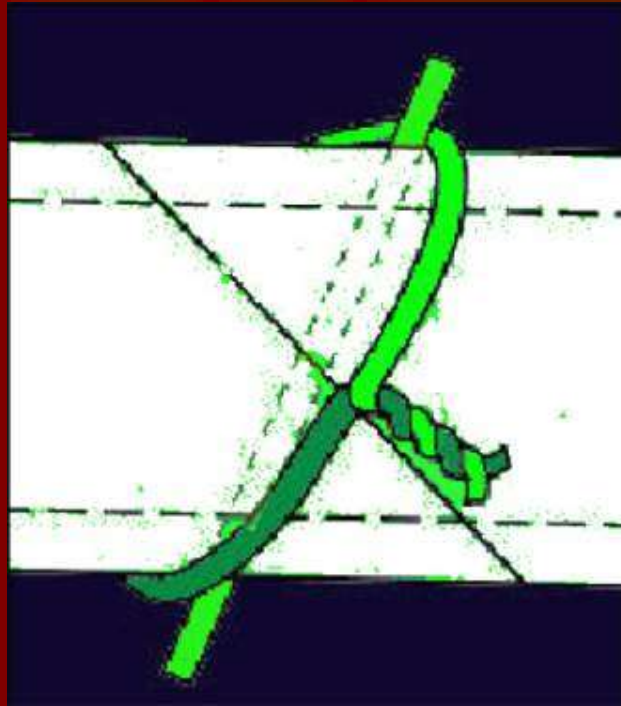


# Pin Insertion

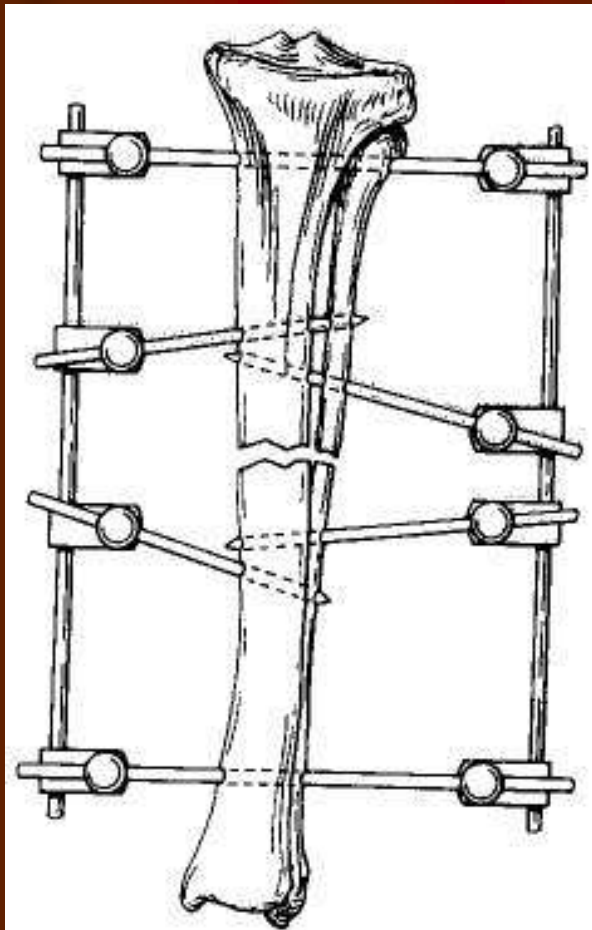




# Cerclage



# External Fixators



# External Fixators





# Animal Orthopedics as Human Model

- Animals are frequently used as models in clinical studies or experiments in the development of surgical procedures & drugs in veterinary medicine to be used in human medicine!

1<sup>st</sup> hip replacement surgery was developed in military dogs (German Shepherds have a genetic problem with hip joint being misaligned)

# Animals Sometimes Need New Joints



**Biomedtrix cementless (BFX) total hip replacement implants.** Long-term implant stability is achieved as the patient's bone grows into the porous portions of the implants.

Photo courtesy of Biomedtrix.



**Biomedtrix cemented (CFX) total hip replacement implants.** Long-term implant stability is achieved by placing bone cement inside the bones, then securing the implants into this bed of bone cement.

Photo courtesy of Biomedtrix.



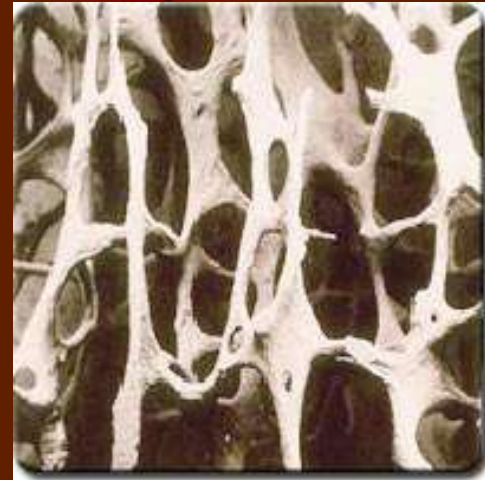
Radiographs (X-rays) of a dog with hip arthritis, secondary to hip dysplasia, before and after hip replacement.

# Protect Yourself

Normal bone



Osteoporotic bone



Osteoporosis is a bone disease where the bone mineral density is reduced. This means the bones become much more fragile. People with osteoporosis are much more likely to suffer fractures than people with normal bone density. Osteoporosis mainly effects older people, but reaching peak bone mass while you are young greatly reduces your risk of developing the disease.