Chapter 6:
Bones and Skeletal Tissues
Bone Repair

Bone Repair!!

- Fracture = break in bone

Bone Repair!! - Classification

- Position of the bone ends after fracture
  - Nondisplaced
    - Bone ends aligned normally
  - Displaced
    - Ends of bones out of normal alignment

Bone Repair!! - Classification

- Completeness of the break
  - Complete –broken all the way through
  - Incomplete – not broken all the way through

Bone Repair!! - Classification

- Orientation of the break relative to the long axis of the bone
  - Linear – parallel break
  - Transverse – perpendicular break

Bone Repair!! - Classification

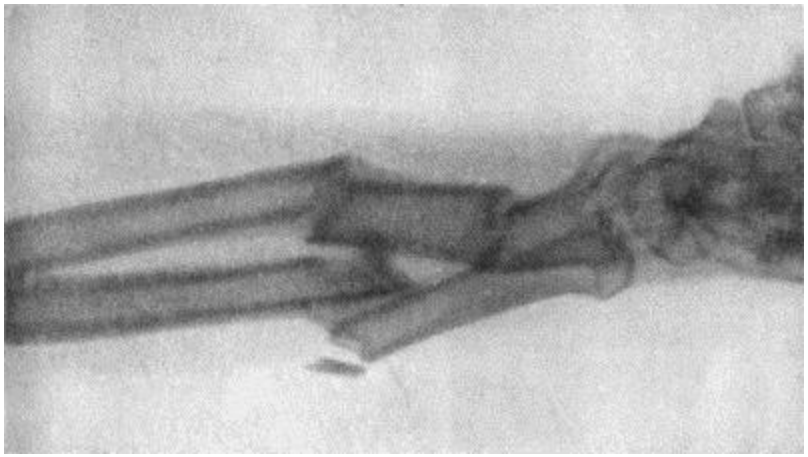
- Whether the bone ends penetrate the skin.
  - Compound (open) – bone penetrates skin
  - Simple (closed) – bone doesn't penetrate the skin

Bone Repair!! - Classification

- Fractures may also be described in terms of location, external appearance, and/or the nature of the break.

Common Types of Fractures

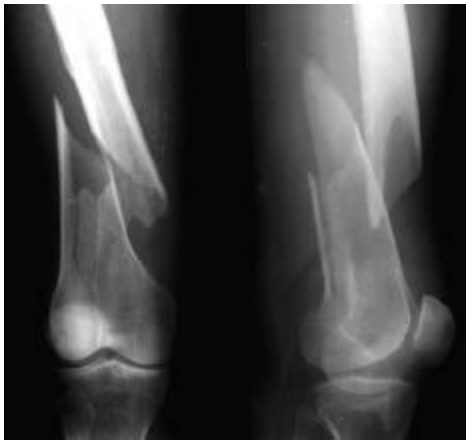
- **Comminuted**
  - Bone fragments into three or more pieces.
  - Particularly common in older people whose bones are more brittle.

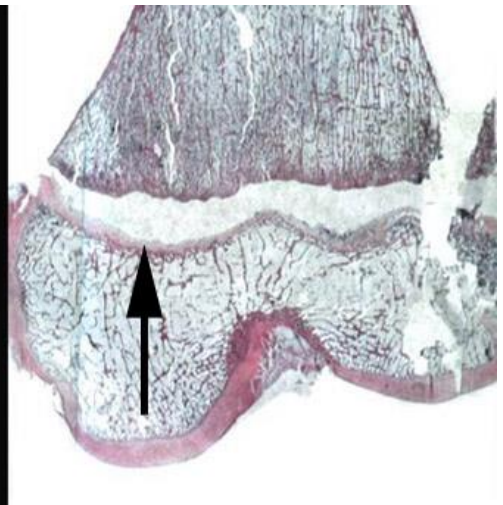


- **Compression**
  - Bone is crushed
  - Common in porous bones subjected to extreme trauma (falling)

Common Types of Fractures

- **Spiral**
  - Ragged break occurs when excessive twisting forces are applied to a bone
  - Common sports fracture





- **Epiphyseal**
  - Epiphysis separates from the diaphysis along the growth plate
  - Tends to occur where cartilage cells are dying and calcification of matrix is happening

Common Types of Fractures

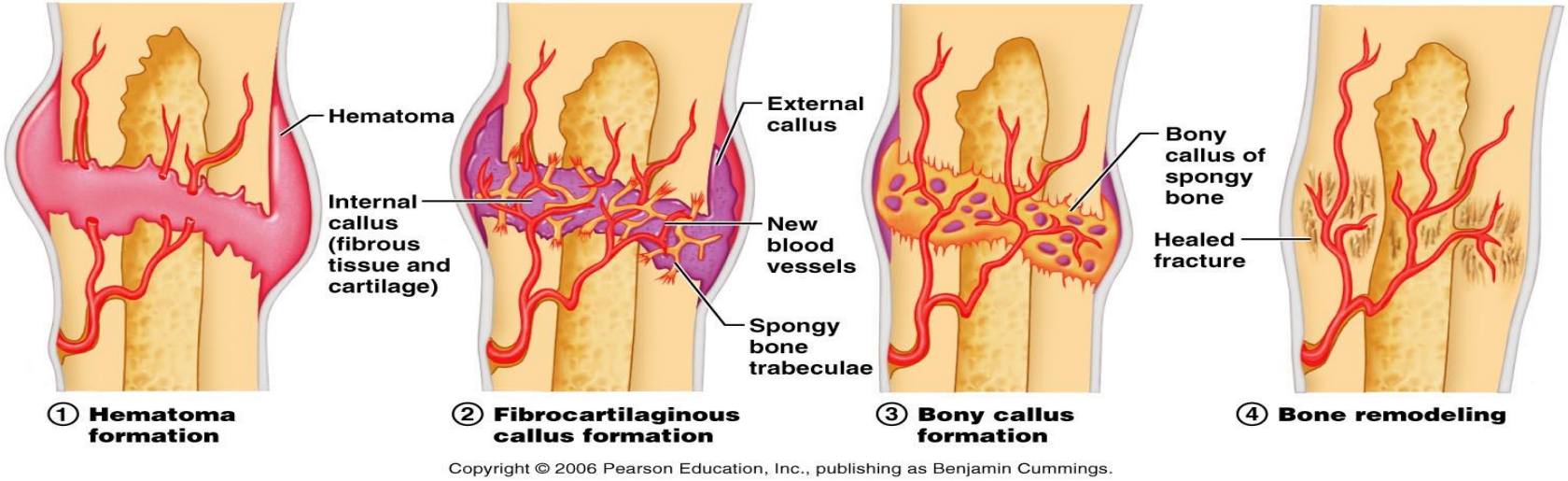
- **Depressed**
  - Broken bone portion is pressed inward.
  - Typical of a skull fracture.

- **Greenstick Fracture**
  - Bone breaks incompletely, much in the way a green twig breaks; the other side bends.
  - Common in children, whose bones are more flexible than those of adults

Bone Repair!!

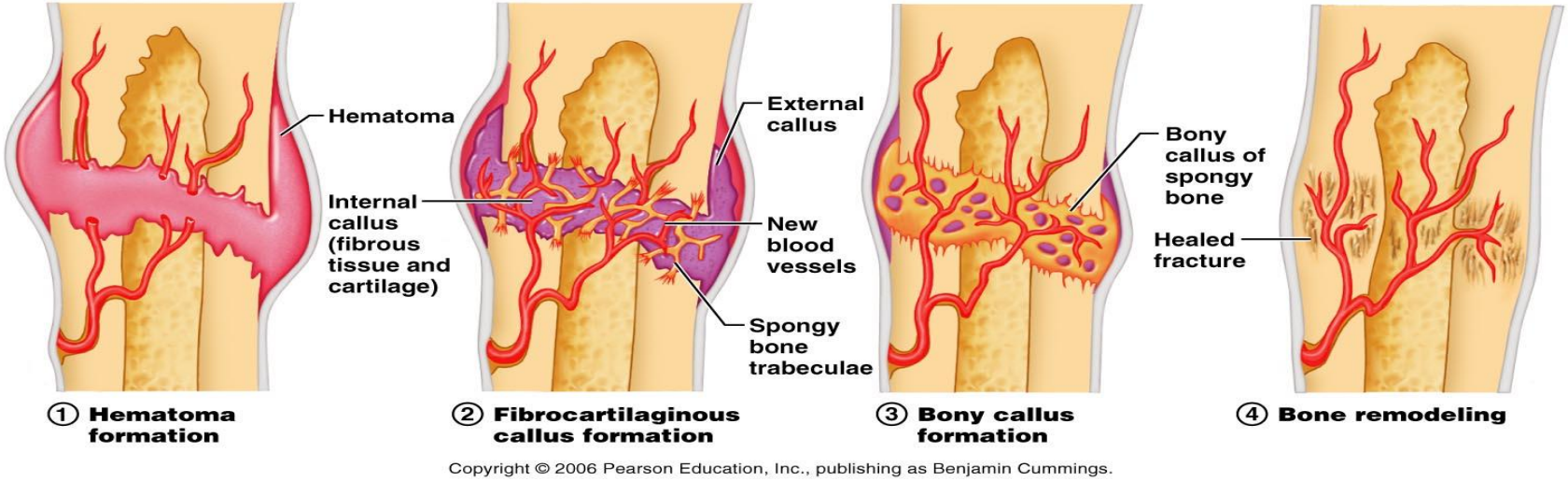
- Treated by reduction
  - Closed (external) reduction
    - Coaxed into position by physician's hands
  - Open (internal) reduction
    - Secured together by pins or wires.
- Immobilized by a cast or traction to allow healing process to begin

Bone Repair!! - Stages



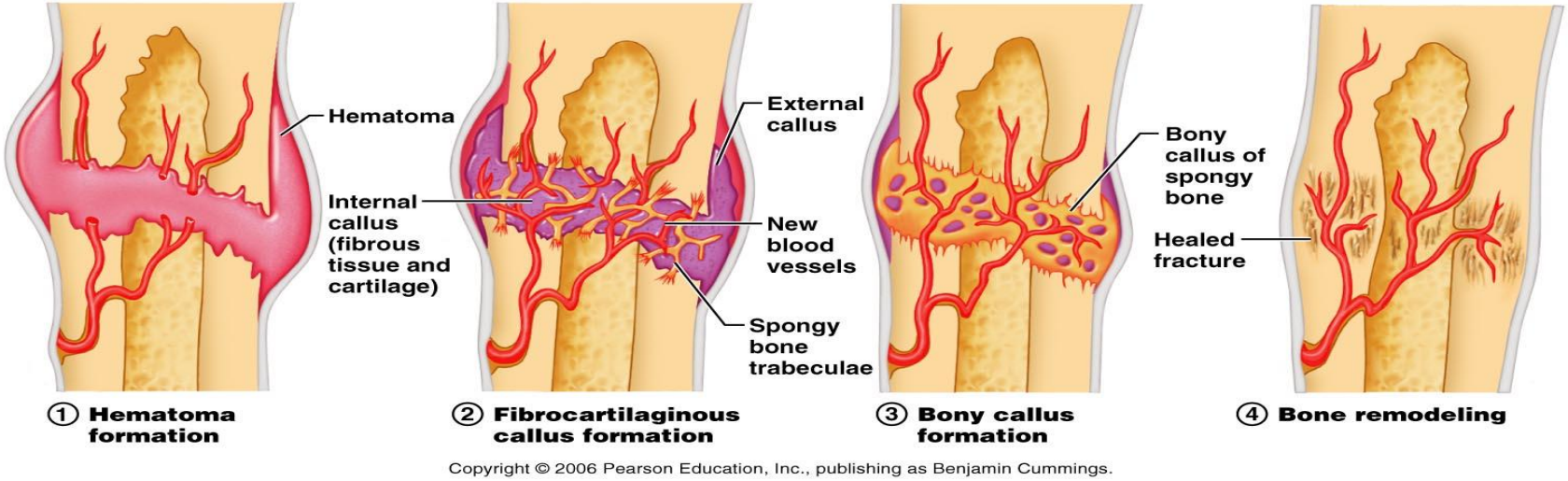
- **Hematoma formation**
  - Blood vessels broken in the bone and periosteum (possibly surrounding tissue) and bleeding occurs.
  - Hematoma forms → mass of clotted blood
  - Because of reduced blood supply, bone cells around the fracture start to die
  - Surrounding tissue becomes swollen and painful

Bone Repair!! - Stages



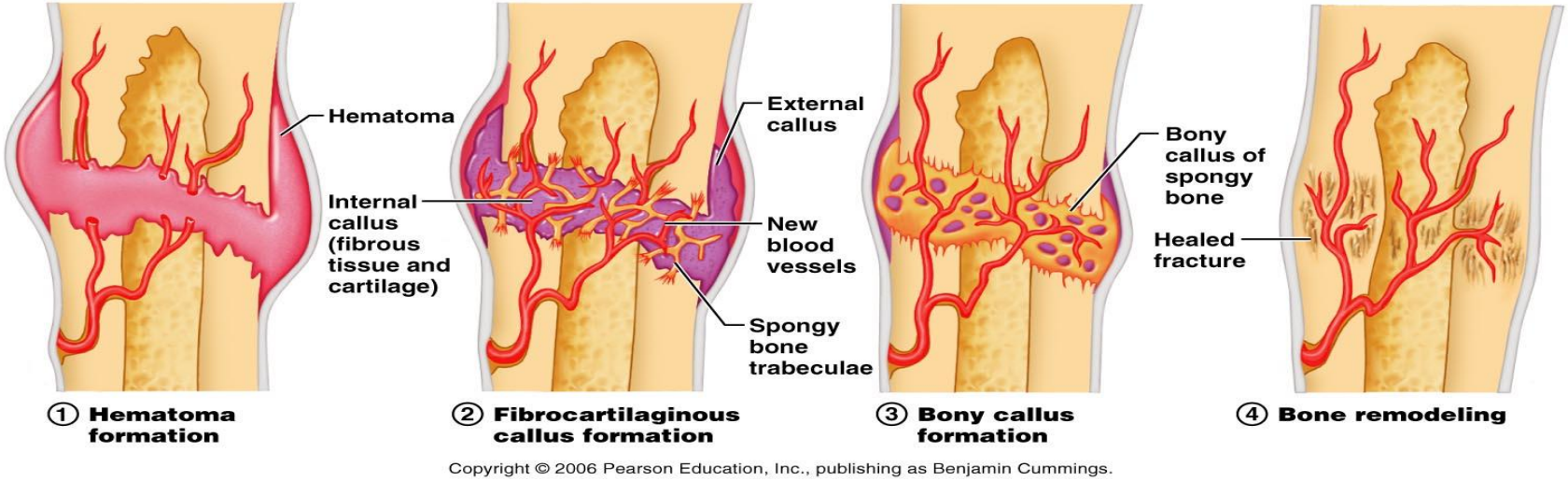
- **Fibrocartilaginous callus formation**
  - Within a few days
  - Capillaries grow into the hematoma and phagocytic cells invade the area → debris is cleaned up
  - Fibroblasts (collagen makers) and osteoblasts (bone makers) are invade the area from the surrounding area and begin reconstructing bone

Bone Repair!! - Stages



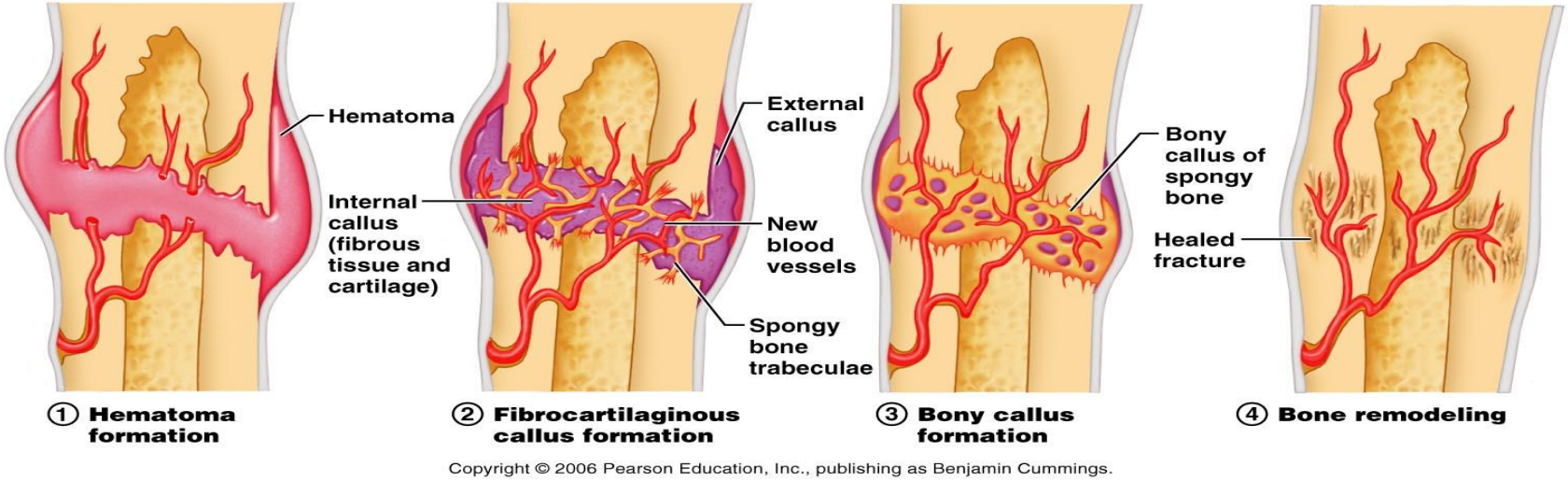
- **Fibrocartilaginous callus formation**
  - Collagen fibers start to span the break and connect the broken bone ends and a cartilage matrix is secreted
  - Osteoblasts begin forming spongy bone
  - External bulge is formed (later calcified)
  - Fibrocartilaginous callus is the body's natural splint

Bone Repair!! - Stages



- **Bony callus formation**
  - Within a week
  - trabeculae begin to appear in the callus → gradually converted to a bony (hard) callus of spongy bone
  - Continues for about 2 months

Bone Repair!! - Stages



- **Bone remodeling**
  - Begins during the bony callus and continues for several months afterwards
  - The bony callus is remodeled
  - Excess material on sides and insides is removed
  - Compact bone is laid down
  - Final structure resembles original bone!