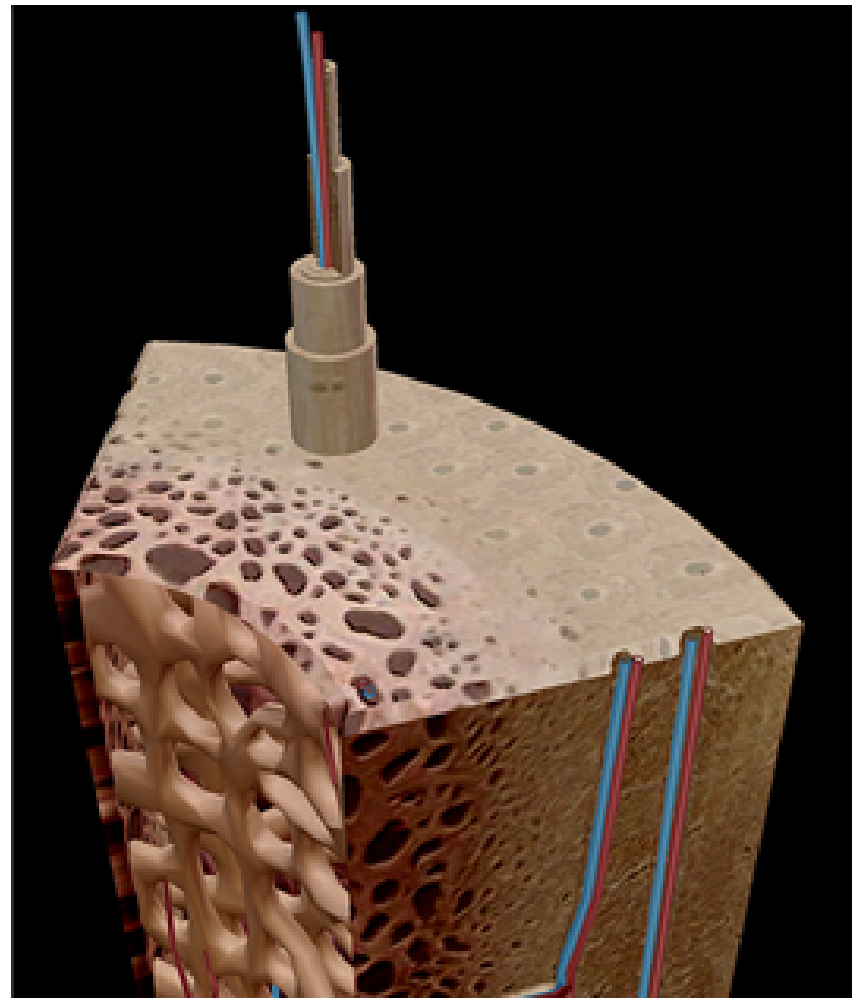


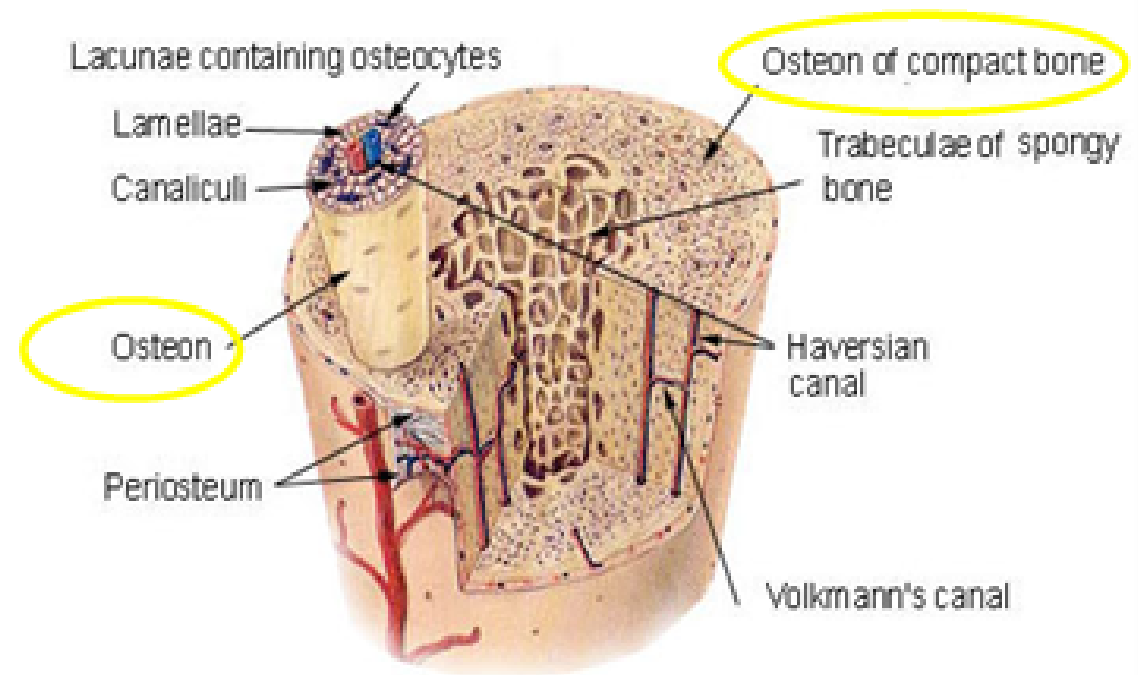
Osteons, Bone Growth and Repair



Compact Bone (anatomy of a long bone)

- also called 'dense' bone
- contains many cylinder shaped units called osteons

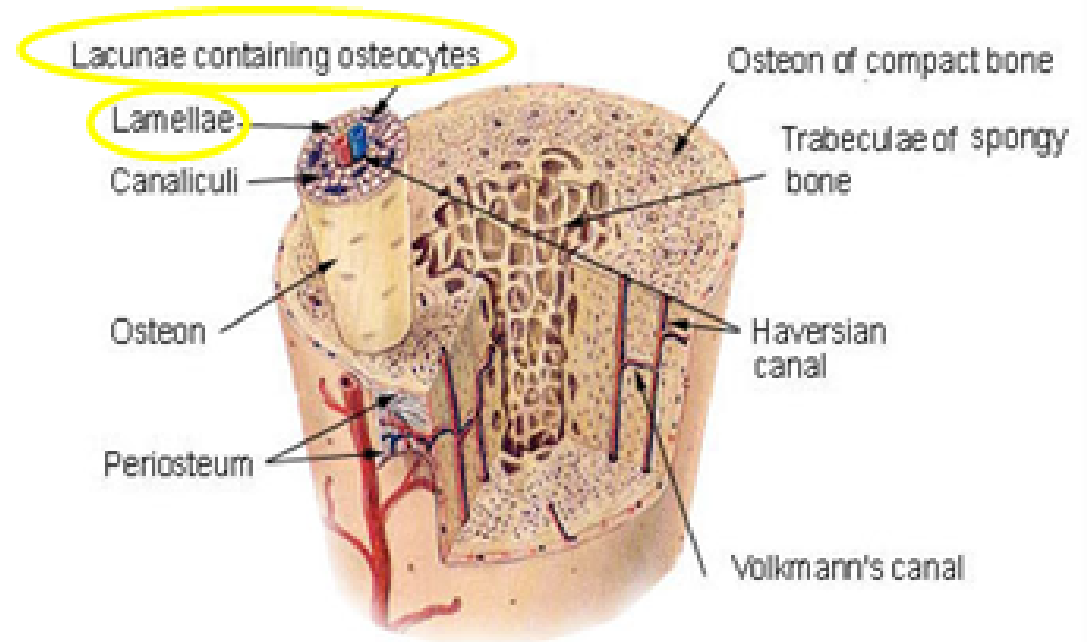
Compact Bone & Spongy (Cancellous Bone)



Compact Bone (anatomy of a long bone)

- Osteocytes (bone cells) are in tiny chambers called lacunae that occur between concentric layers of matrix called lamellae

Compact Bone & Spongy (Cancellous Bone)

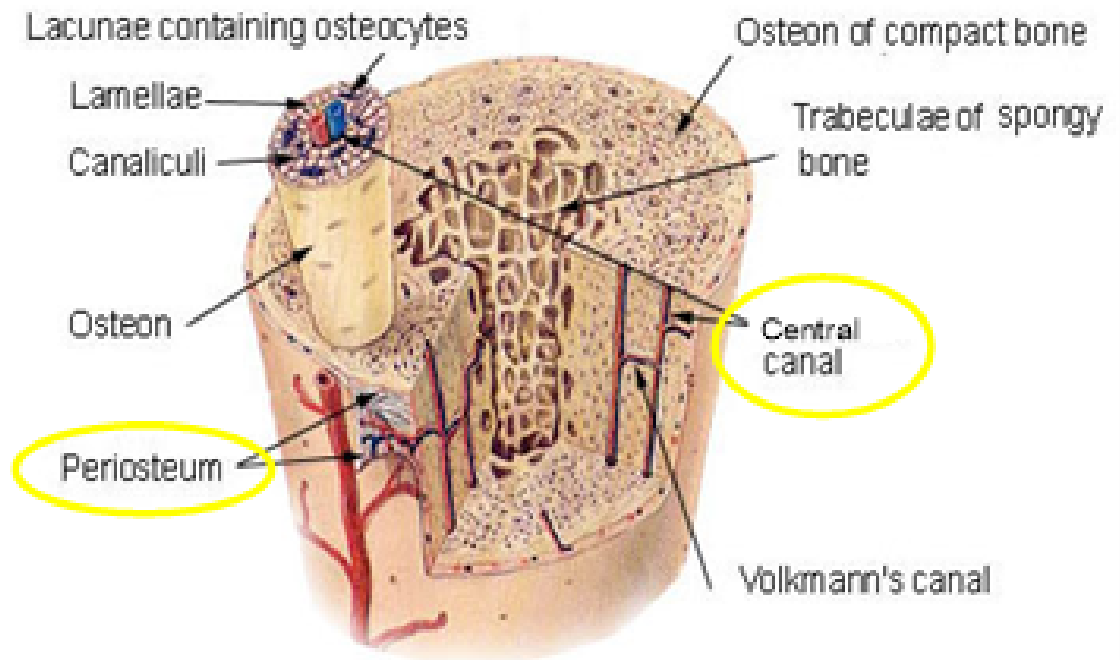


- The matrix contains collagenous fibers and mineral deposits (calcium and phosphorus salts)

Compact Bone Cont. (anatomy of a long bone)

- each osteon, lamellae and lacunae surround a single central canal
- blood vessels and nerves from the periosteum enter the central canal

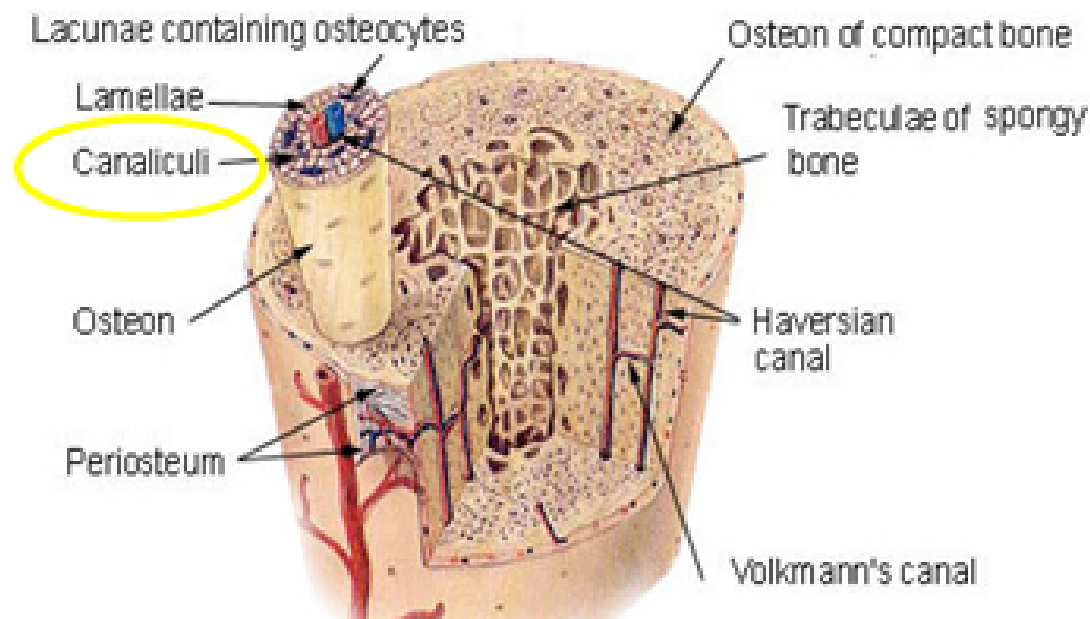
Compact Bone & Spongy (Cancellous Bone)



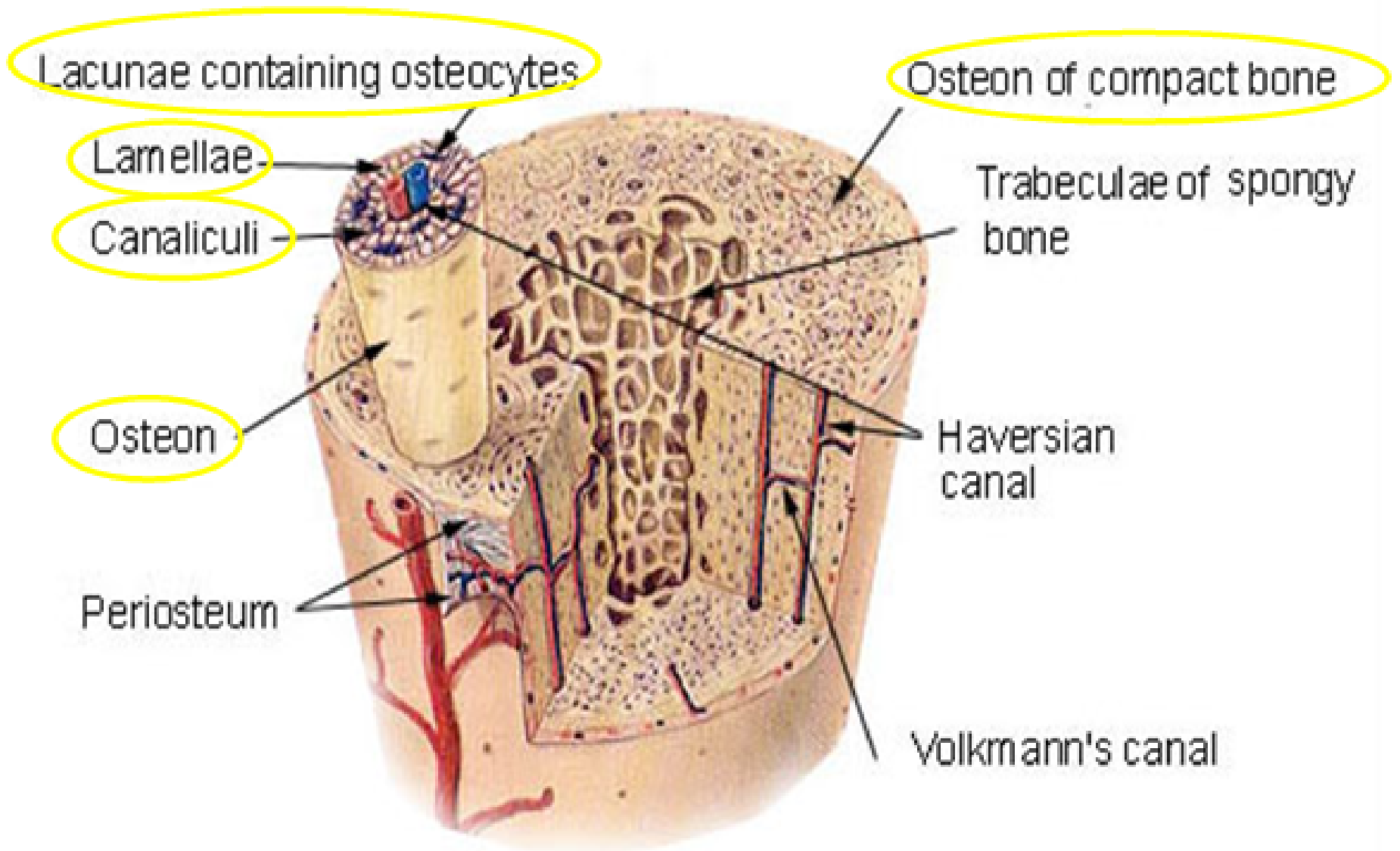
Compact Bone Cont. (anatomy of a long bone)

- osteocytes have extensions that extend into passageways call canaliculi and thereby the osteocytes are connected to each other to the central canal

Compact Bone & Spongy (Cancellous Bone)



Compact Bone & Spongy (Cancellous Bone)



Anatomy of Compact Bone



Spongy Bone (anatomy of a long bone)

- also called 'cancellous' bone
- contains numerous bony bars and plates called trabeculae
- lighter than compact bone
- designed for strength because it follows lines of stress

Compact Bone & Spongy (Cancellous Bone)

Lacunae containing osteocytes

Lamellae

Canaliculi

Osteon

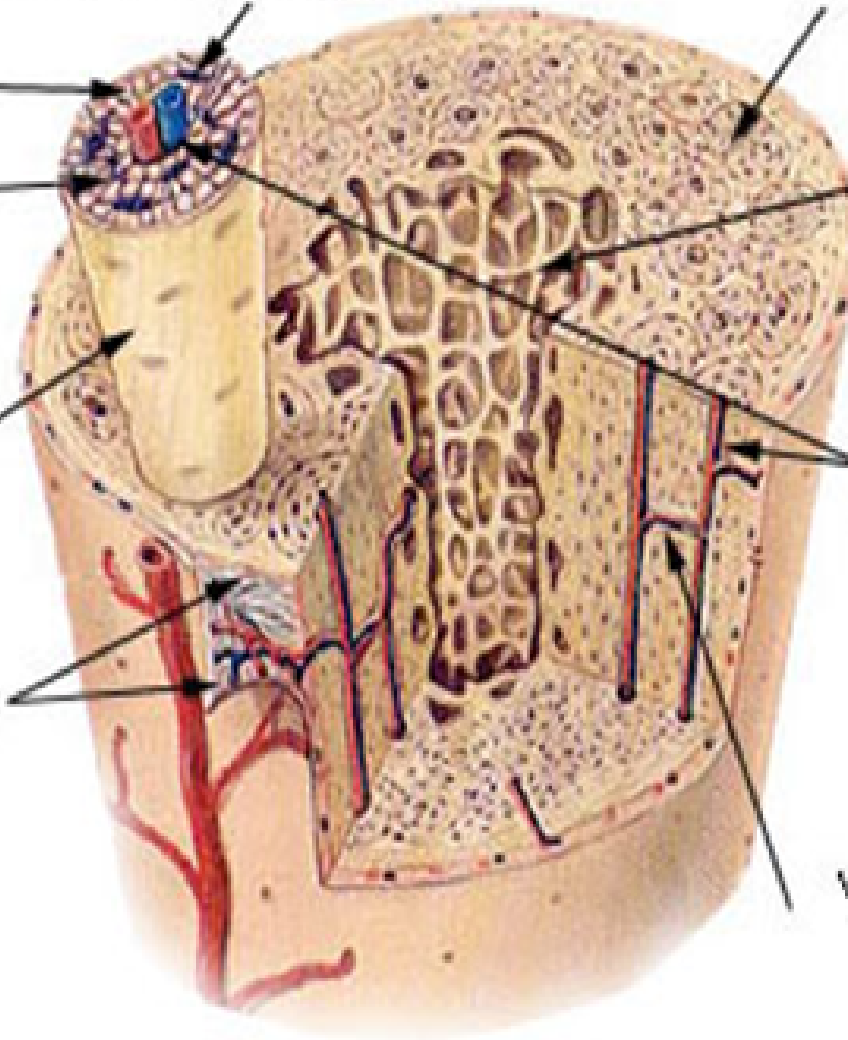
Periosteum

Osteon of compact bone

Trabeculae of spongy bone

Haversian canal

Volkman's canal



Bone Growth and Repair



Cells Involved in Bone Growth and Repair

- .Osteoprogenitor Cells - specialized cells present in the inner portion of the periosteum, in the endosteum, and in the central canal of compact bone
- .Osteoblasts - bone forming cells derived from osteoprogenitor cells. Responsible for secreting matrix characteristic of bone

Cells Involved in Bone Growth and Repair Cont.

- Osteocytes - mature bone cells derived from osteoblasts. Once osteoblasts are surrounded by matrix they become osteocytes in bone
- Osteoclasts - thought to be derived from monocytes (white blood cells in red marrow). Perform bone resorption (break down bone and assist in depositing calcium and phosphate in blood. VERY important in growth and repair of bone

Bone Development and Growth



Bone Development and Growth

- .Ossification - the formation of bone

Bones form during embryonic development in two ways:

1. intramembranous ossification - broad flat skull bones, bone develops between sheets of fibrous connective tissue

Bone Development and Growth

2. endochondral ossification - most bones are formed this way, hyaline cartilage models which appear during fetal development are replaced by bone as development continues

** After birth, the epiphysis of a long bone continues to grow. A band of cartilage called the epiphyseal plate remains between the primary ossification center and the secondary center. The limbs keep increasing in length and width as long as the epiphyseal plates are still present. The rate of growth is controlled by hormones. When the epiphyseal plate becomes ossified, the bone stops growing in length. Even though long bones may not grow in length due to the closing of the growth plate, it is possible for bones to increase in diameter. This is called appositional growth.

Bone Development and Growth Cont.



REVIEW

- Mature bone cells _____
- Cells that perform bone resorption (break down bone and assist in depositing calcium and phosphate in blood).
VERY important in growth and repair of bone _____
- Generic cells present in the inner portion of the periosteum, in the endosteum, and in the central canal of compact bone _____
- Responsible for secreting matrix characteristic of bone

Osteocytes

Osteoprogenitor Cells

Osteoblasts

Osteoclasts

REVIEW

 the process when broad flat skull bones, bone develops between sheets of fibrous connective tissue

 most bones are formed this way, hyaline cartilage models which appear during fetal development are replaced by bone as development continues

intramembranous
ossification

endochondral
ossification

Remodeling of the Bones

In adults, bones are constantly being broken down and built up again.

Both adults and children need calcium to promote the work of osteoblasts. Children need it for growth and adults need it for prevention of osteoporosis.

Osteoporosis - a condition where the bones are weakened due to a decrease in the bone mass that makes up the skeleton



Bone Repair

Repair of a bone is required after it breaks (fractures). Bone repair occurs in a series of 4 steps:

1. Hematoma - Within six to eight hours after a fracture, blood escapes from ruptured blood vessels and forms a hematoma (blood clot) in the space between broken bones

Bone Repair

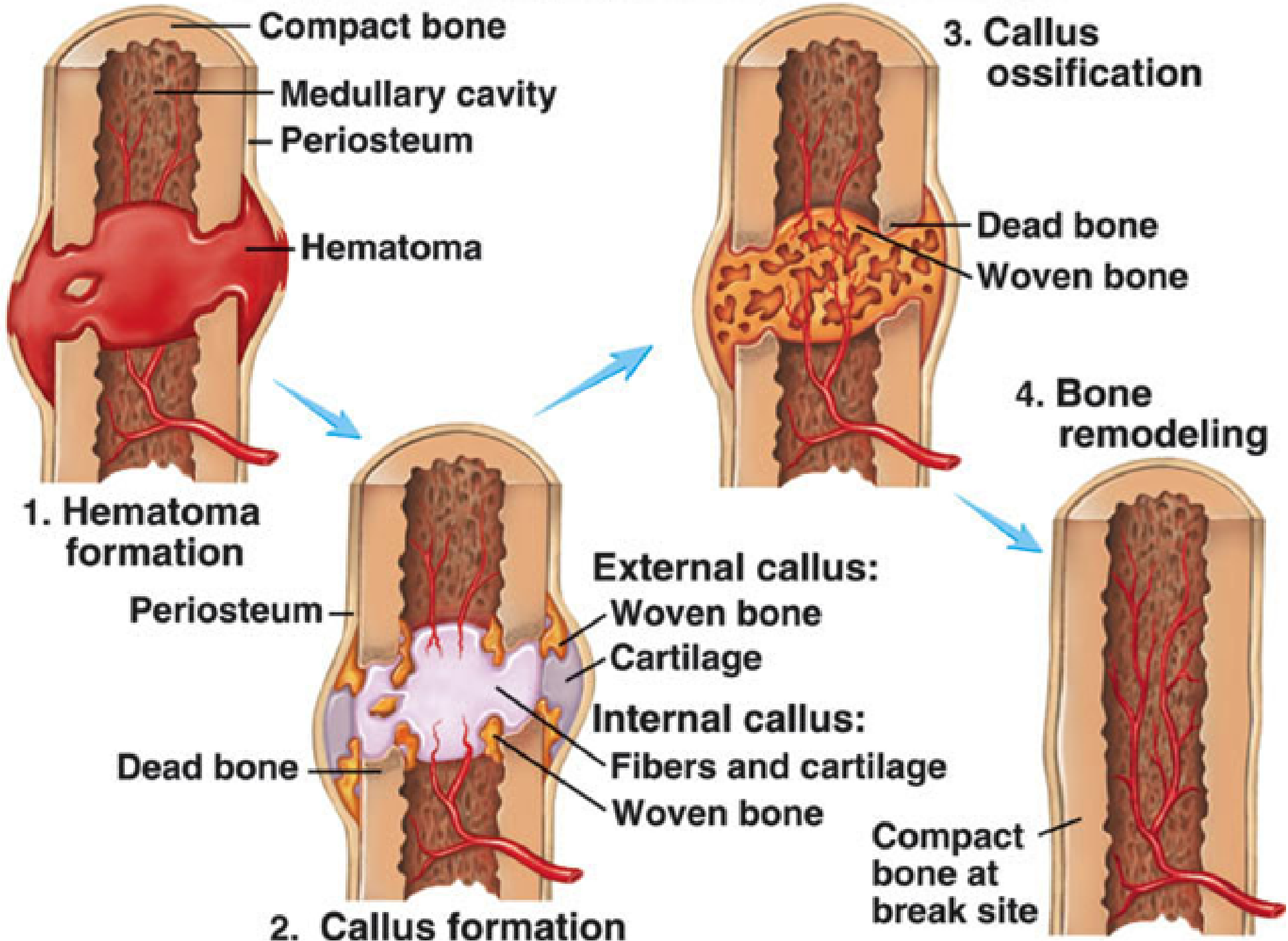
2. Fibrocartilaginous Callus - Tissue repair begins, and fibrocartilage fills the spaces between the ends of the broken bone for about three weeks.

Bone Repair

3. Bony Callus - Osteoblasts produce trabeculae of spongy bone and convert the fibrocartilaginous callus to a bony callus that joins the broken bones together and lasts about three to four months.

Bone Repair

4. Remodeling - Osteoblasts build new compact bone at the periphery, and osteoclasts reabsorb the spongy bone, creating a new medullary cavity.





Complete Fracture: bone is broken all the way through

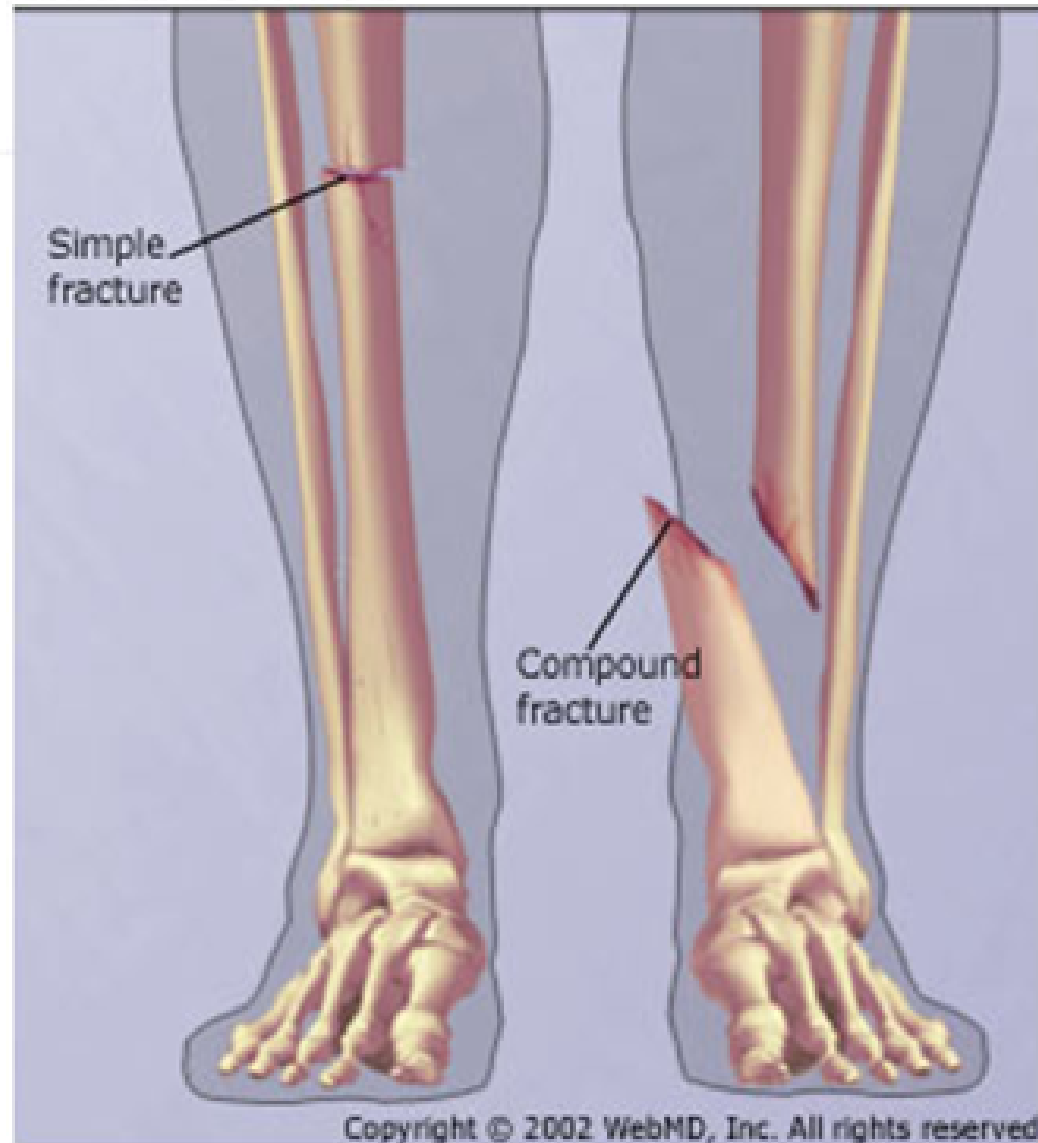
Complete Fracture



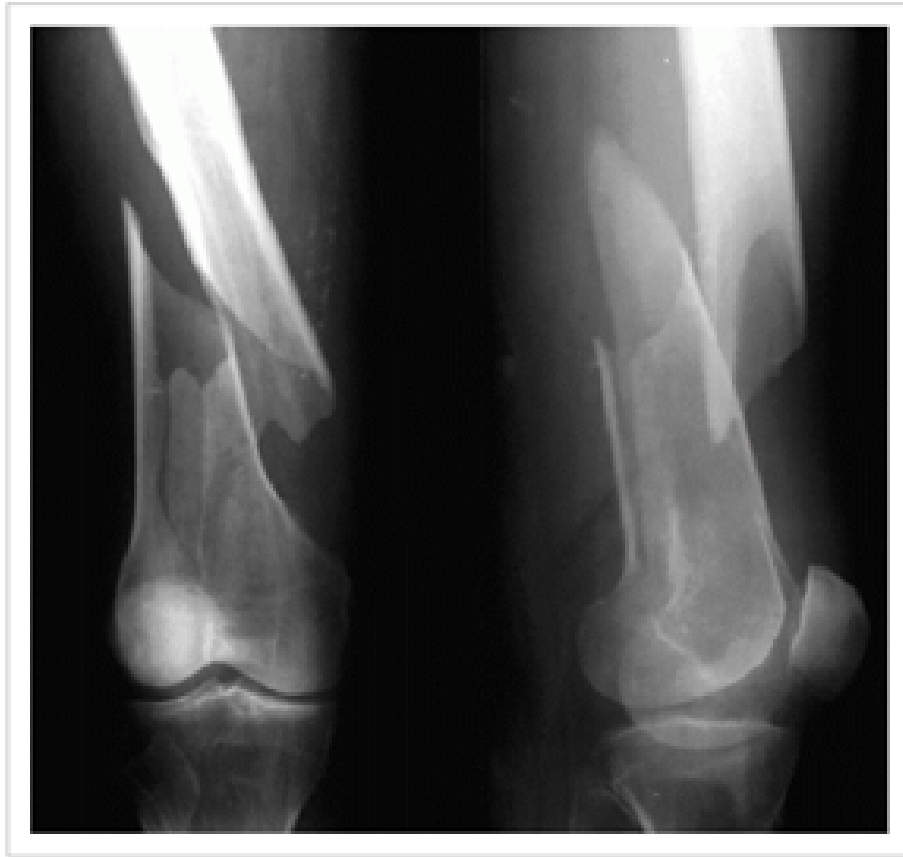
Incomplete/Greenstick: bone is not broken all the way through. One side of the bone breaks and the other side bends.

Incomplete Fracture

Bone Fractures



Simple Vs Compound Fracture



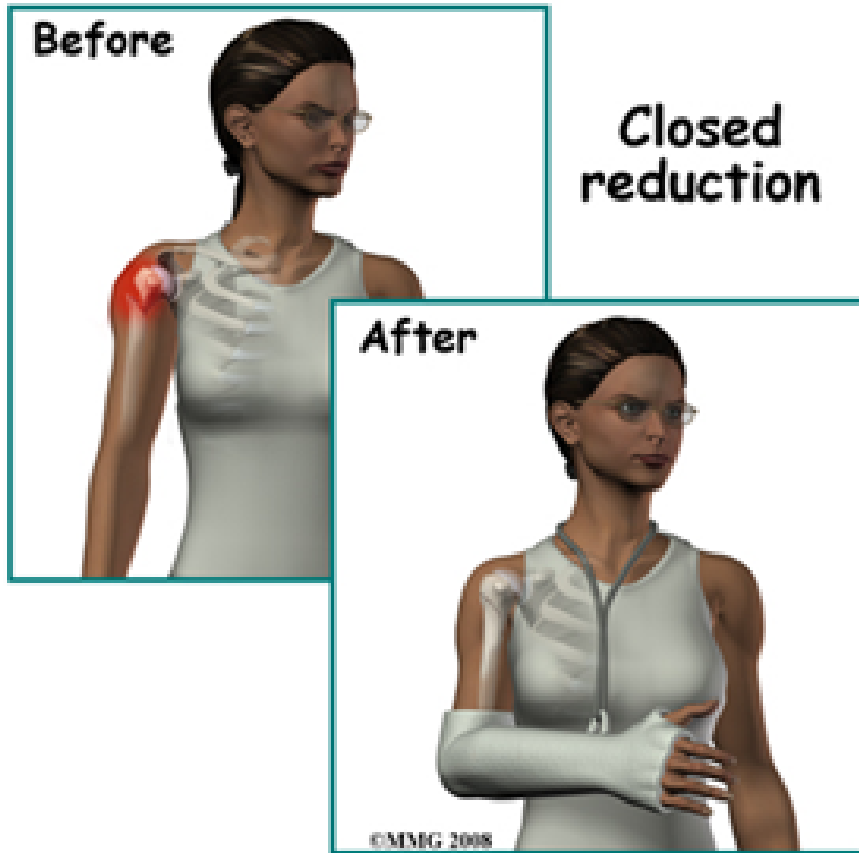
Spiral Fracture a jagged fracture from a bone being twisted

**Spiral
Fracture**



**Impacted
Fracture**

Repair of a Fracture



Closed Reduction

(Realigning the bone into their normal position without surgery)



Open Reduction

(Using surgical repair of the bone using plates, screws, or pins)