

Chapter 7 Skeletal Tissues

I. Types of Bones

a. 4 types

- i. long bones ex. femur
- ii. short bones ex. carpals
- iii. Flat bones ex. skull
- iv. irregular bones ex. patella

b. Parts of a long bone

- i. Diaphysis – main shaft like portion; hollow, cylindrical shape; provides strong support
- ii. Epiphyses – bulbous shape; red marrow fills spaces in spongy bone
- iii. Articular cartilage – hyaline cartilage that covers articular surface
- iv. Periosteum – fibrous membrane that covers bone; tendons interlace with its fibers, anchoring muscle to bone; area with osteoblasts, osteoclasts and blood vessels
- v. Medullary (marrow) cavity – hollow spaces in a diaphysis

vi. Endosteum – thin epithelial membrane lining the medullary cavity

II. Microscopic Structure of Bone

a. Compact Bone – contains many cylinder shaped structural units – osteons (Haversian Systems); each surrounds a canal that runs lengthwise

i. 4 structures make up each osteon

1. lamellae – cylinder shaped layers of calcified matrix

2. lacunae – small spaces with tissue fluid, with bone cells embedded between hard layers of lamellae

3. canaliculi – canals radiating in all directions from lacunae and connecting them to each other and into a larger canal – Haversian canal

4. Haversian Canal – extends lengthwise; contains blood vessels, lymphatic vessels and nerves

i. Haversian Canals are connected to each other by transverse Volkmann's canals – contain nerves, blood & lymph vessels

b. Cancellous Bone

- i. Spongy bone
- ii. Trabeculae – needle-like bony spicules; contains osteocytes; diffusion brings nutrients & takes wastes through tiny canaliculi; arranged along stress lines; embedded within compact bone
- iii. Arteries supply bone marrow in the internal medullary cavity

III. Bone Marrow

- a. Myeloid Tissue – soft, connective tissue
- b. Site of blood cell production
- c. Red Marrow – in infant or child, throughout the body all bones make rbc in the medullary cavity; It is in the epiphyses only in the adult
- d. Yellow marrow – cells have become saturated with fat and become inactive in rbc production; replaces red marrow as individual ages in diaphysis of bone

IV. Functions of Bones

- a. Support – framework of body
- b. Protection – surrounds organs
- c. Movement – bones with joints are levers
- d. Mineral Storage – Calcium, phosphorous; calcium stored in matrix (set by age 18); Vitamin D is needed for calcium absorption; Vitamins A & C also needed for bone formation
- e. Hematopoiesis – blood cell formation; myeloid tissue primarily in epiphyses

V. Development of Bone

- a. Intramembranous Ossification
 - i. Within a connective tissue

- ii. Centers of ossification are where clusters of osteoblasts are located
 - 1. Golgi and Endoplasmic Reticulum play an important role
- iii. Ground substance accumulates around osteoblasts and collagenous fibers become embedded – calcification of this matrix occurs when calcium salts are deposited
- iv. Trabeculae appear and join in a network to form spongy bone, which is covered by plates of compact bone
- v. Increase in size occurs by the addition of osseous tissue on outer surface = appositional growth

b. Endochondral Ossification

- i. Formed from cartilage model with bone formation from the center to the end
- ii. Bone collar forms
- iii. Primary ossification center forms with entrance of blood vessels
- iv. Bone collar lengthens and thickens

- v. Secondary ossification centers form and enlarge
- vi. Bone growth proceeds toward diaphysis from each end
- vii. Lower, then upper epiphyseal plates disappear as bone growth stops

VI. Cartilage

a. connective tissue

b. three specialized types

i. hyaline cartilage

1. most common type

2. covers articular surfaces of bones, costal cartilage, rings in trachea and bronchi, tip of nose

ii. elastic cartilage

1. forms external ear, epiglottis, auditory tubes

iii. fibrocartilage

1. strong and rigid

2. symphysis pubis, intervertebral disks