Bones and bone tissue

Chapter 6

Cartilages

Skeletal Cartilages have solid matrix
with holes = lacunae
cells in lacunae = Chondrocyte
lot of water in matrix and covered with fibrous Perichondrium.
Fig 6.1

Cartilages

Structure of bones

Bone and cartilage are supportive C.T.
Bone has 2 % of cells in a flexible, solid matrix
Matrix is formed of Calcium Phosphate crystals and Collagen fibers

	Hyaline C.	Elastic C.	Fibrocartilage
1. Characteristic	Glassy, most abundant	Very elastic, branched fibers visible	resist Compression
2. Fibers	Invisible thin collagen	Elastic	Thick collagen
3. Location	Ribs, articular caps	External ear	Vertebral discs

Shapes of Bones

There are 4 kinds of bones on the basis of shape. Long, short, flat and irregular. Fig 6-1. Classification of Bones is done on the basis of their shape and proportion of compact versus spongy bone in them.
Long bones (longer than wide) = femur, tibia, humerus
Short bones (cube like) – tarsal or carpals
Flat (2 sheets of compact bone with thin spongy bone = diploe, in between) = frontal, parietal skull bones
Irregular bone (cannot be classified in above 3 categories) = vertebrae.

Bone Structure and Bone Cells

Bone Structure - Gross Anatomy: Bones have solid but flexible matrix with collagen fibers and minerals. Periosteum = outer tough fibrous membrane; inner cellular layer with blood vessels. Endosteum = delicate inner membrane lining the medullary cavity. Fig 4.11, fig. 6.2 and **Fig 6.3**
Bone Cells: **Osteocytes** are cells of mature bones and lie in lacunae. **Osteoblasts** make new bone tissue = **Osteogenesis**, during bone growth. **Osteoclasts** are giant cells with numerous nuclei that break down bone tissue by dissolving it and release minerals.

Microscopic Anatomy

Compact bone– Osteon is the structural unit of compact bone Fig 6.3. A Central Canal is surrounded by concentric rings of bone material = lamellae; inside lamellae open spaces = lacunae; adjacent

lacunae are joined with branched channels = canaliculi; inside lacunae are present Osteocytes. **Spongy bone** has bar or arch like Trabeculae of bone material with lot of air spaces. Trabeculae make a meshwork and this bone is strong but light weight.

Chemical Composition of bone

Organic contents include a) Living cells are Osteogenic, Osteoblasts, Osteocytes and Osteoclasts. Osteoblasts secrete both matix and fibers. The matrix has organic substances called Osteoid which gives the bone tensile strength but the inorganic hydroxyapetites make the bone Strong.

Appositional Bone Growth

Osteoblasts deposit bone material just below Periosteum but at the same time osteoclasts dissolve bone material lining the marrow cavity. This way, bones of infants grow into bones of children and adults.

Bone Repair and Homeostasis

Bone Repair- Bone breaks = bone fractures; Complete fracture is when bone is completely broken or incomplete when not. Simple fracture has bone ends inside the skin. Comminuted when bone end is exposed through skin. Bone repair takes place by making hematoma, cartilage callus formation, bone callus formation followed by remodeling of bone.

Homeostatic Imbalances

Osteomalacia and Rickets is a disorder caused due to deficiency of Vitamin D or deficiency of Calcium in diet. Bones have less inorganic deposits and bones become soft and weak. Osteomalacia occurs in adults and Rickets in children and is more severe and causes bow-legs. Osteoporosis mainly occurs in elderly people and is due to faster bone absorption than bone deposition. Bones get easily fractured.

Recap 1 Chapter 6

1. Bones and cartilages form ---------- connective tissue.
2. Phalanges the bones in fingers are ----------bones (short, long, small)
3. ---------- cells form new bone; process is called ----------.
4. ---------- cells are present in holes (lacunae) in a mature bone.
5. ----------cells break-up bone tissue and send Ca^{2+} to blood.
6. Bone is covered by ---------- and cartilage is covered by ----------
7. --------- bone has structural units called ---------- having a central canal and concentric rings of osteocytes and matrix around it.
8. ----------bone has arch like bone material called trabeculae.
9. Ends of a long/short bone are ---------- and are covered by ---------cartilage.
10. Most bones in body are formed by ---------- ossification.
11. Most Bones of the skull, mandible and clavicle are formed by -------- ossification.
12. After a fracture a large blood clot fracture -------is formed followed by --------formation to heal the bone injury.