OSSIFICATION

Ossification was on 21 Oct 02, 18 Oct 04, 15 Oct 08, 14 Oct 10, 17 Oct 11, 1 Feb 13, 17 Sep 15.
Martini’s 5th: 191-194, Martini’s 6th: 194-205, 10th: 189-196

Development of Bone:

Three types of bone cells associated with bone formation and maintenance:
- Osteoblasts: early bone forming cells
- Osteoclasts: remodel bone, release calcium
- Osteocytes: bone maintenance

Three types of ossification:
- Embryonic:
  - Intramembranous: form flat bones
  - Primary endochondrial: forms long bones

Growth:
- Secondary endochondrial: elongation, long bones

Endochondral Ossification:

Primary endochondral ossification:
1) Chondroblasts: form cartilage model
2) Perichondrium: converted to periosteum
3) Osteoblasts: gather inside, form collar of compact bone
4) Internal cartilage: reduced to thin partitions
5) Cartilage matrix: begins to ossify
6) Chondroblasts: starve, die
7) Osteoclasts: hollow out medullary cavity

Secondary endochondral ossification:
1) Chondroblasts: enlarge epiphyseal cartilage
2) Cartilage: towards diaphysis ossifies
3) As ossification: occurs below, new cartilage: forms above
4) Osteoclasts: remodel below
5) Epiphyseal cartilage: replaced by epiphyseal line by age 25

Intramembranous ossification:

1) Fibroblasts: lay down collagen, forming a membrane
2) Osteoblasts: form spongy bone network inside the membrane (with blood supply)
3) Periosteal membrane: forms around
4) Osteoblasts: appear in periosteum, form compact bone = diploe

Exercise affects bone physiology:
Bone grows in response to stress. No stress, salts withdrawn (astronauts can have severe bone loss)
Responds to compressional, functional and electrical forces (may stimulate alkaline phosphatase)

Bone formation: stressed bone forms a negative charge.
Phosphate released by alkaline phosphatase
Combines with Ca under influence of calciferol to form colloidal precipitates.
Converts to hydroxyapatite: $3Ca_3(PO_4)_2 \cdot Ca(OH)_2$ Rickets (p. 159)