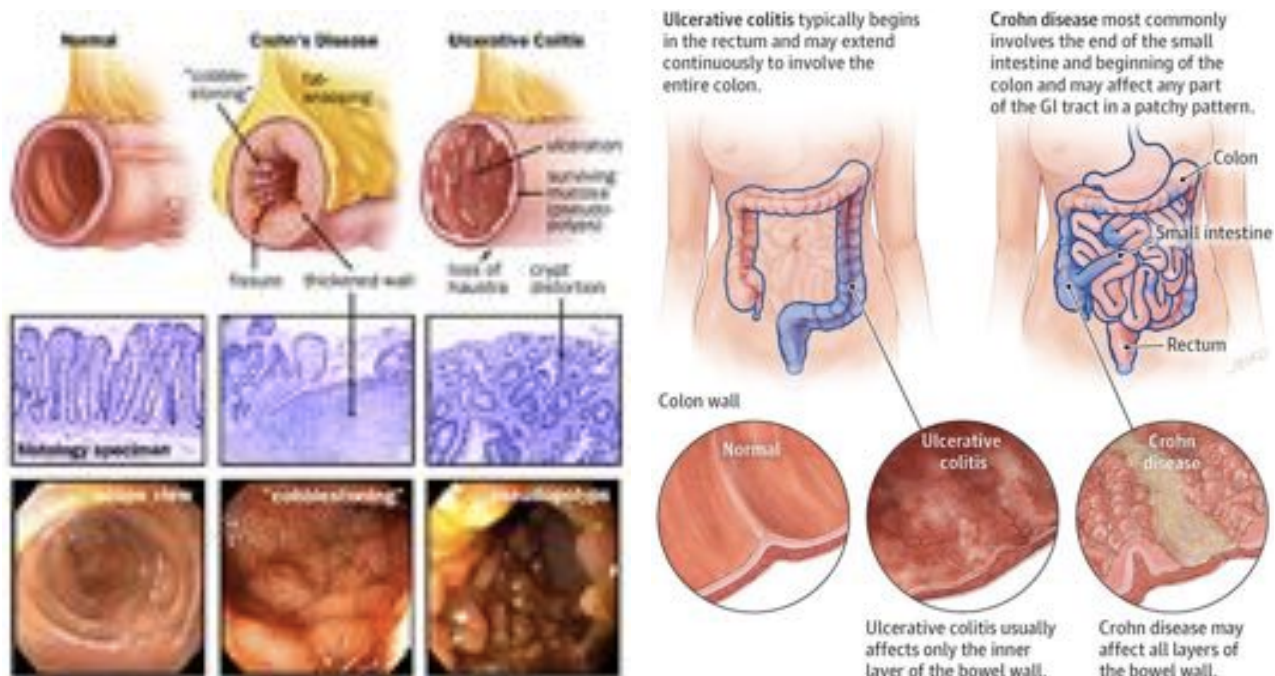


summary of Ulcerative Colitis

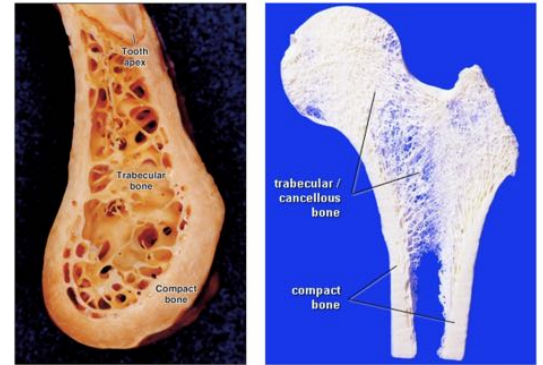
- Limited to the colon and rectum
- Always involves the rectum and expands proximally in a continuous fashion to involve part or all of the colon
- Disease of the entire colon = pancolitis
- Left sided disease extends no farther than the transverse colon
- Small intestine is normal, although mild inflammation of the distal ileum may be present in severe cases of pancolitis
- Ulcers are aligned along the long axis of the colon but do not typically replicate the serpentine ulcers of Crohn Disease
- Isolated islands of regenerating mucosa often buldge into the lumen to create pseudopolyps and the tips of these polyps may fuse to create mucosal bridges
- Chronic disease may lead to mucosal atrophy with a flat and smooth mucosal surface that lacks normal folds
- Serosal surface is normal (outer layer)
- The inflammatory process is diffuse and generally limited to the mucosa and superficial submucosa
- Extensive mucosal destruction may be accompanied by ulcers that extend more deeply into the submucosa, but the Muscularis propria is rarely involved
- Granulomas are NOT present in ulcerative colitis



Lecture 16: Acquired disorders of Bone: Osteoporosis and Paget Disease

Basic structure and function of bone

- The adult human skeleton is composed of 206 bones
 - o In a child this is close to 300, as you mature your bones fuse
- Functions of bone;
 - o Mechanical support
 - o Provides an anchor point for muscles – allowing movement
 - o Protection of viscera
 - o Niche for production of blood cells – through the bone marrow
 - o Mineral homeostasis
- Long bones are generally used for the best example;
 - o Dense bone material
 - o Solid part of the bone
 - o A lot of the disease – start to manifest in the trabecular parts of the bone
 - Trabecular bone – has specific arrangements of bone material (cross sections) this develops over time and is different in different individuals dependent on what they do
 - Depends on where the mechanical stress is
- Osteoid/ woven bone: more biological/organic component, it is in amongst the cavities
- Lamellar bone: more dense, consists of rows or regular layers
- A lot of vascularization of the bone



Structure of Bone

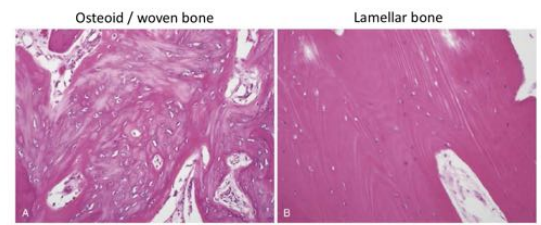
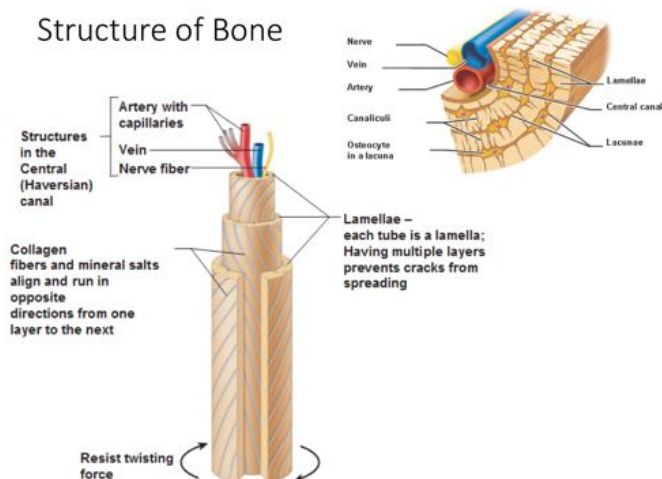


Figure 26-1 Woven bone (A) is more cellular and disorganized than lamellar bone (B).
Young bone – abnormal in adult

Structure of Bone



- Osteocytes throughout the bone, not just solid mineralized material
- There is a lot of nerve innervation of the bone = allows bone remodeling, has a role in the progression of bone disease

Composition of bone

- Bone matrix (extracellular component)
 - o 35% organic osteoid component (osteoid component)
 - Mainly type 1 collagen

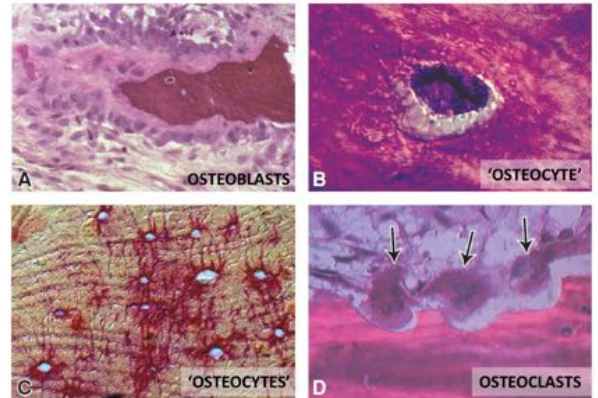
Table 26-1 Proteins of Bone Matrix

Osteoblast-Derived Proteins
Type I collagen
Calcium-binding proteins
Osteonectin, bone sialoprotein
Cell adhesion proteins
Osteopontin, fibronectin, thrombospondin
Cytokines
IL-1, IL-6, RANKL
Enzymes
Collagenase, alkaline phosphatase
Growth factors
IGF-1, TGF- β , PDGF
Proteins involved in mineralization
Osteocalcin
Proteins Concentrated from Serum
Albumin
β_2 -microglobulin

IGF, insulin-like growth factor; TGF, transforming growth factor; PDGF, platelet-derived growth factor; IL, interleukin; RANKL, receptor activator of nuclear factor- κ B ligand.

- Cytokines
- 65% mineral component – **extremely hard hydroxyapatite = $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$** = repository for 99% calcium and 85% phosphate
 - This can be mobilized and absorbed if necessary

- Major cells of the bone;
 - Osteoblasts
 - Osteoclasts
 - Osteocytes
- They both have different niches (topographical regions) in which the reside but they are neighboring cells both undergoing paracrine signaling



- **Osteoprogenitor cells:** contribute to maintain the osteoblast population and bone mass. Develop from Mesenchymal stem cells and are located in the endosteum, differentiate into osteoblasts
 - **Osteoblasts:** Synthesize bone matrix on bone forming surfaces
 - Cluster around a particular area of mineralized bone, they produce the bone material
 - Located on the surface of the matrix
 - **Osteocytes:** >90% of bone cells, osteoblasts that enter the mineralized bone matrix, dendrites, long lived, mineral homeostasis, activate osteoclasts, mechanosensors
 - Osteocytes are essentially osteoblasts that have travelled into the bone matrix and reside there
 - Perform a sentinel function, know and sense any problem of the bone – help to control calcium and phosphate levels in the microenvironment and detect mechanical forces and translate them into biological activity
 - Looks like they communicate within one another, have extensions that allow communication – therefore disruption is sensed, allowing mobilization of osteoclasts
 - **Osteoclasts:** Large multinucleated cells derived from HSCs, circulating myeloid cells and resorb bone
 - Osteoclasts are multi-nucleated
 - Tend to be much bigger
 - Derived from monocytes
 - Responsible for bone resorption through secretion of acid and proteases into the resorption pit results in dissolution of the inorganic and organic components of the bone

