

Osteoporosis

Friday, December 5, 2014
7:45 PM

Learning Objectives:

- OP
- pathophysiology of Normal Bone Remodeling vs. OP
- risk factors & their impact on OP
- clinical manifestations of OP

OSTEOPENIA - precursor to OP

OSTEOPOROSIS (OP) - poor density, architecture, strength

Frequency	Spine > Wrist > Hip > Pelvis
Cost \$	Hip > Spine > Pelvis > Wrist

Types of Bone

	TRABECULAR	CORTICAL
% skeleton	20	80
% replaced	25	3
quality	- spongy (lattice/honeycomb) - light, strong	- compact
examples	- spine	- forearm, wrist, femoral neck of hip - outer shell of bones

Components of Bone

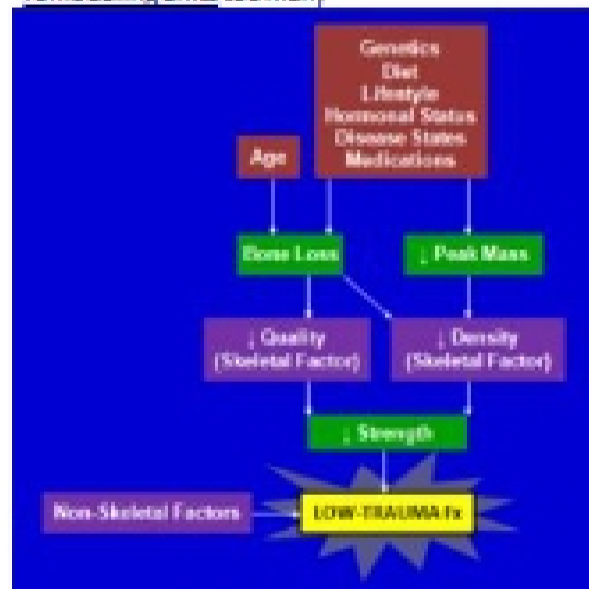
- **COLLAGEN** - flexibility, energy absorption
- **MINERALS** (Ca^{2+}/PO_4^{3-}) - stiffness, strength

Hormonal Impact

Vit D	Ca ²⁺ absorption						
PTH	↓ Ca ²⁺ , ↑ PTH, ↑ Ca ²⁺						
	<table border="1"> <tr> <td>Bone</td> <td>↑ Ca²⁺ release from bone resorption</td> </tr> <tr> <td>Kidney</td> <td>↓ Ca²⁺ excretion</td> </tr> <tr> <td>Intestine</td> <td>↑ VitD (calcitriol)</td> </tr> </table>	Bone	↑ Ca ²⁺ release from bone resorption	Kidney	↓ Ca ²⁺ excretion	Intestine	↑ VitD (calcitriol)
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Intestine	↑ VitD (calcitriol)						
Estrogen	↓ Clasts: - ↑ OPG - ↓ RANK-L - ↓ cytokines (IL1, IL6, TNFα)						

OP Pathogenesis

- cavity too big
- new bone too small
- remodeling units too many

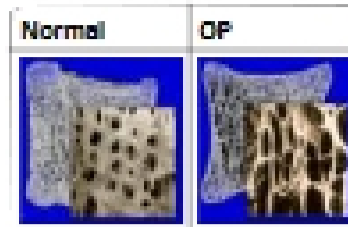


Risk Factors

- women
- age
- smoking
- alcohol (3+/day)
- ↓ BMI
- Glucocorticoids
- ↓ BMD
- Secondary Osteoporosis (RA)
- Fx history
- Hip Fx parental history

4 Major OP Fractures

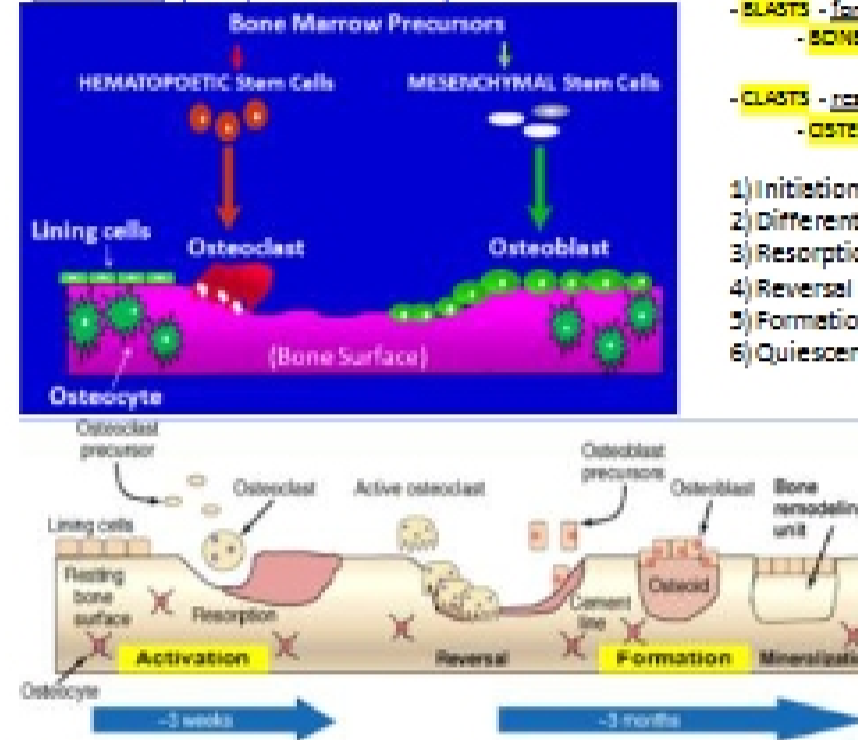
Spine	vertebral
Wrist	distal radius
Shoulder	proximal humerus
Hip	proximal femur/femoral neck of hip



$$\text{Strength} = \text{Quality} + \text{Mass}$$

Bone Remodeling

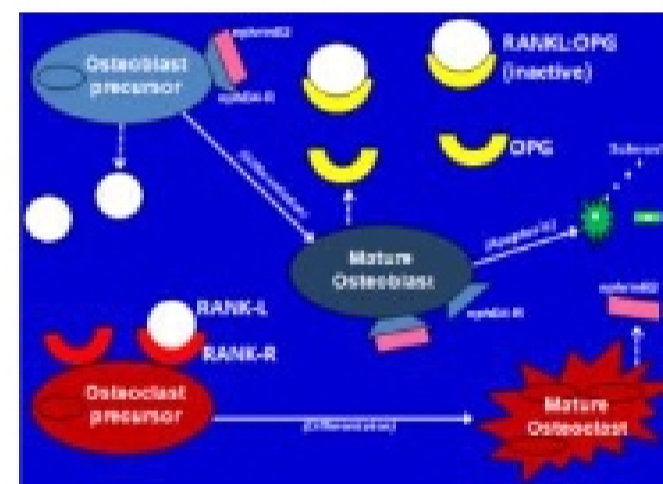
*Mature: destruction (resorption) & remodeling (formation)
*Ca²⁺ balance: (resorption releases Ca²⁺)



- **BLASTS** - [some] secrete osteoids, which turn into bone
- **BONE-LINEING CELLS** - retired Blasts

- **CLASTS** - resorption
- **OSTEOCYTES** - retired Clasts

- 1) Initiation
- 2) Differentiation/Activation (Clasts)
- 3) Resorption
- 4) Reversal (Blasts)
- 5) Formation (Osteoids)
- 6) Quiescence/Rest



	Function	Expressed by...	Clast Maturation
OPG	receptor	Blast	(-)
RANK-R	receptor (activates NF-κB)	Pre-Clast	(+)
RANK-L	ligand	Pre-Clast	

Signs/Symptoms

Symptoms	Signs
- pain	- height loss
- immobility	- KYPHOSIS (convex)/ LORDOSIS (concave)
- depression	- fracture
	- ↓ BMD (radiography)

Ca ²⁺	VitD
into new bone	Ca ²⁺ absorption
- Ca ²⁺ carbonate	- UV
- Ca ²⁺ citrate	- food
- Ca ²⁺ gluconate	
diet encouraged	supplement encouraged