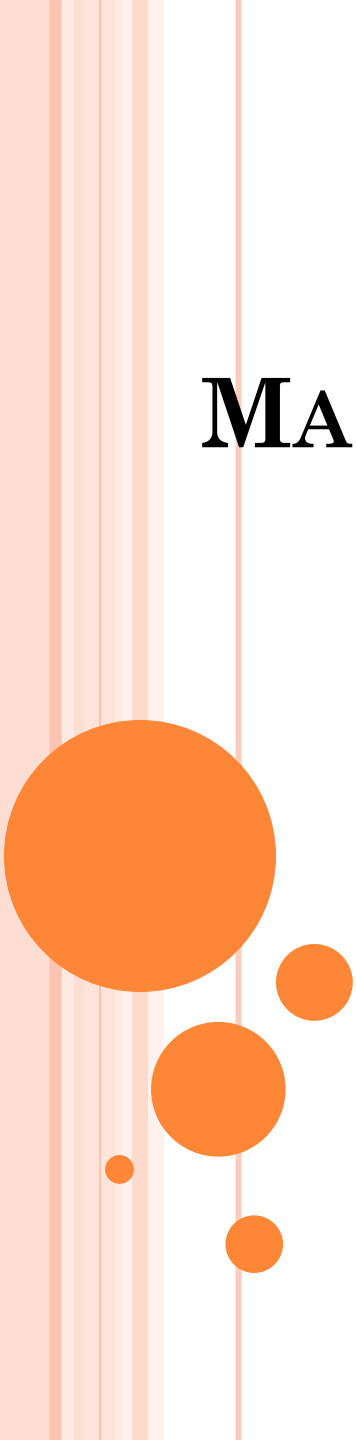


MARKERS OF BONE METABOLISM



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BONE STRUCTURE

- Cellular components
 - Osteoblasts
 - Osteoclasts
 - Osteocytes
- Calcified matrix
 - Collagen
 - Glycosaminoglycans
 - Noncollagen calcium binding proteins-Osteocalcin, sialoprotein , osteoprotein



DEPOSITION OF COLLAGEN

- Pyridinolines crosslinks
- GAGS
- Proline and hydroxyprolines
- Minerals



BONE MASS AND BONE FUNCTION

- Peak bone mass
- Factors determining peak bone mass
- Assessment of bone strength- BMD
- Coupling of bone formation and resorption i.e. modelling and remodelling.



BONE CHANGES

- Modeling
- Remodelling
 - Resorption
 - Reversal
 - Formation

Remodeling is carried out by BSU

- Normal and abnormal coupling



BIOCHEMICAL MARKERS OF BONE TURNOVER

- Bone resorption markers
 - Urine hydroxyproline
 - Urine deoxypyridinoline
 - Urine pyridinoline
 - Type I peptide collagen telopeptides-
 - N terminal telopeptides to helix in urine (NTX-I)
 - C terminal telopeptides – I to helix in serum(ICTP)
 - C terminal telopeptides- II in urine and serum (CTX)
 - Serum tartarate resistant acid phosphatase, hydroxylysine and its glycosides



BIOCHEMICAL MARKERS OF BONE TURNOVER

- Bone formation
 - Serum osteocalcin
 - Serum alkaline phosphatase(ALP), bone specific ALP
 - Serum procollagen I extension peptides
- Mineral status- serum calcium, magnesium, phosphorous



APPLICATIONS OF BIOCHEMICAL MARKERS

- Monitoring the effects of therapy
- Adjust dosage when appropriate
- Determine consequences of discontinuing therapy
- Identifying fast and slow losers of bone mass.
- Measurement of biochemical markers in conjunction with BMD can identify individuals at risk of osteoporosis.



BIOCHEMICAL MARKERS OF DISEASE ACTIVITY USED IN OSTEOPOROSIS

Bone Formation :

Markers	Source	Osteoporosis
Alkaline phosphatase	Liver/bone/gut	Increased
Skeletal ALP	Bone, osteoblasts	Increased
Osteocalcin	Bone, osteoblasts	Increased
Procollagen peptides	Bone, osteoblasts	Increased
Decarboxylated osteocalcin	Bone, osteoblasts	Increased

BIOCHEMICAL MARKERS OF DISEASE ACTIVITY USED IN OSTEOPOROSIS

○ Bone Resorption

Markers	Source	Osteoporosis
Tartarate resistant acid phosphatase	Osteoclasts	Increased
Deoxypyridinoline and pyridinoline	Collagen crosslinks	Increased
NTX	Collagen	Increased
CTX	Collagen	Increased

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Thank you

