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OSTEOPOROSIS INTERNATIONAL

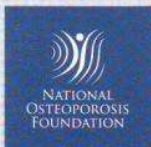
with other metabolic bone diseases

EDITORS-IN-CHIEF JOHN A. KANIS AND ROBERT LINDSAY

IOF Regionals
1st Asia-Pacific Osteoporosis Meeting
10–13 December 2010, Singapore

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How Correlation Between Micro/Nanostructure and With Atomic Configuration in Indonesian Osteoporosis Phenomenon.

Z.Noor., S.B.Sumitro



Conclusions: The results suggest that during the pathogenesis of osteoporosis the estrogen deficiency not only results in the changes in the physiological functions of osteoblasts but also is associated with alteration in the mechanical properties of the cells. The changes in mechanical properties are possibly due to the rearrangement of cytoskeletal structures of the cell. Thus, this study shows that the pathogenesis of osteoporosis affects the mechanical properties of osteoblasts and that the mechanical property of the cells possibly influences the physiological functions of the cell.

Acknowledgements: The experiments were carried out at the Nanobiomechanics laboratory of National University of Singapore.

Disclosure of Interest: None Declared

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RELATIONSHIP OF ADIPOSITY TO VOLUMETRIC BMD AND MICROSTRUCTURAL PARAMETERS IN MEN AND WOMEN ACROSS THE ADULT LIFESPAN

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Aims: Recent studies suggest that obesity might be detrimental to bone health (1,2). In this population-based, cross-sectional study, we examined the relationship between adiposity and bone, focusing on differences between various adipose depots, independent of weight, and bone mass and structure at different skeletal sites in adult men and women.

Methods: In an age-stratified population sample of 218 women (140 postmenopausal) and 291 men (age 20–97 years), we assessed their visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) areas at the L2–L3 interspace level by single slice CT and correlated these findings to volumetric BMD (vBMD) at the lumbar spine and femoral neck by central QCT, as well as vBMD and microstructural parameters at the ultradistal radius by high resolution peripheral QCT (HRpQCT). All analyses were stratified by gender, as well as by menopausal status in women and by age (< and ≥50 years) in men. We also adjusted for weight, and bioavailable testosterone and estradiol levels (measured using liquid chromatography-tandem mass spectrometry).

Results: In men below 50 years but not in men 50 years and above, VAT was negatively correlated with total and

trabecular vBMD at the lumbar spine, cortical vBMD at the femoral neck and cortical vBMD, cortical thickness and cortical area of the ultradistal radius, whereas VAT was negatively correlated with femoral neck cortical vBMD in premenopausal but not postmenopausal women. SAT was negatively correlated with trabecular femoral neck vBMD in men 50 years and older but not in men under 50 years, and negatively correlated with cortical vBMD at the femoral neck and trabecular vBMD, trabecular number, trabecular thickness and bone volume/tissue volume at the ultradistal radius in premenopausal women but not in postmenopausal women.

Conclusions: The relationship between adipose tissue and bone is complex and is confounded, as well as modified, by many factors. Our data suggest that adipose tissue has a negative relationship with bone which is age-, gender-, adipose depot- and bone compartment-specific. VAT seems to be more associated with a poorer bone phenotype.

References: 1. Zhao LJ et al., J Clin Endocrinol Metab 2007;92:1640; 2. Hsu YH et al., Am J Clin Nutr 2006;83:146

Disclosure of Interest: None Declared

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HOW CORRELATION BETWEEN MICRO/NANO-STRUCTURE AND WITH ATOMIC CONFIGURATION IN INDONESIAN OSTEOPOROSIS PHENOMENON

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Aims: Aim of this study was to know micro/nanostructure and atomic configuration from Indonesian osteoporosis women.

Methods: In this multicenter study, two groups were distinguished by BMD measurement, normal groups and osteoporosis groups. Bone was obtained from patient with fracture in Surgery room. Bone micro/nanostructure was analyzed by Scanning Electron Microscope. Bone atomic configuration was measured by X-ray fluorescence. All measurement was done in Physics Laboratory, Malang District University, Malang-Indonesia.

Results: Under SEM, there is difference in micro/nanostructure between normal groups and osteoporosis groups, such as trabecular thinning, tapering, breaking and perforating. Resorption lacunae of various shapes were seen on the surface of the trabeculum. There is difference in atomic configuration between normal groups and osteoporosis groups. Atomic configuration tend to increase in osteoporosis are S, Cr, Fe, Ni, Cu, Ti, Hf, Mo, Si, Re, and Ti.

Atomic configuration tend to decrease in osteoporosis are P, Ca, Al and Zn.

Conclusions: Atomic configuration correlates with micro/nanostructure in Indonesian osteoporosis women.

Disclosure of Interest: None Declared

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PROLACTIN REGULATES OSTEOBLAST AND OSTEOCLAST INTERACTION IN BONE REMODELING

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Aims: Hyperprolactinemia is one of the risk factor of decrease in bone mass which has been believed to be mediated by hypogonadism. However, the presence of prolactin receptor in human osteosarcoma cell line and primary bone cell culture from mouse calvariae supported the hypothesis of a direct prolactin (PRL) action on bone cells. Recently, it was demonstrated that PRL regulates bone formation and osteoblast differentiation in vivo and in vitro. Therefore, the aim of this study was to investigate the role of PRL in the regulation of bone metabolism via osteoblast-osteoclast interaction by coculture technique.

Methods: Murine premature osteoclast (RAW 264.7) was used for coculturing at various stages of human pre-osteoblasts (SV-HFO) that differentiate in proliferating pre-osteoblasts (days 2–7) to extracellular matrix producing cells (days 7–14) which is eventually mineralized (days 14–21). Concentration of PRL mimicked a lactating period (100 ng/ml) was used to incubate in osteogenic medium.

Results: Prolactin receptor mRNA and protein was highly expressed in SV-HFO, but was absent in osteoclast (RAW 264.7). PRL significantly decreased total DNA in the osteoblast-osteoclast co-culture, which was due to a decrease in osteoblast number. Calcium measurement in PRL-treated group suggested a decrease in mineralization by PRL while having no effect on alkaline phosphatase activity. Furthermore, PRL decreased markers of osteoblast differentiation, ALP and osteocalcin, and osteoclast differentiation, CLC7 and TRAP, in the co-culture at there early stage of osteoblast differentiation (at day 10) suggesting inhibition of PRL on bone remodeling at early stage.

Conclusions: The present study shows inhibitory effects of PRL on osteoblasts and osteoclasts and provides evidence of an action of PRL on osteoclast differentiation via osteoblast.

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Disclosure of Interest: None Declared

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ASSESSMENT OF BONE LOSS IN ANKYLOSING SPONDYLITIS PATIENTS BY SERUM C-TELOPEPTIDE MEASUREMENT

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Aims: Determine the level of serum C-Telopeptide (CTX), a bone resorption marker, in AS patients and the relationship between CTX and the disease activity.

Methods: The study consisted of 36 male patients (mean age of 24.9±8.3), who fulfilled the modified New York criteria for the AS, and 15 age-matched healthy male controls. The assessments included age, disease duration, and clinical, radiology and laboratory data. Inflammatory activity of the disease was assessed using ESR, CRP and Bath Ankylosing Spondylitis Disease Activity Index (BASDAI). BMD at the lumbar spine and femoral neck was measured by DXA. Serum CTX was measured by Beta-Crosslaps method.

Results: The results showed that serum CTX level was significantly higher in the AS group (1098.8±432.5 pg/ml) compared with that of the control group ((370.5±106.7 pg/ml, $P<0.01$). There was a positive relationship between CTX level and indicators of inflammatory status, including ESR ($r=0.855$), CRP ($r=0.836$), and BASDAI ($p<0.01$).

Conclusions: Although this was a small study, our data suggest that persistent inflammation may be an etiologic factor of bone loss in AS, and thus CTX and other biochemical markers should be used to monitor disease status, beside clinical assessment, in order to have proper treatment.

Disclosure of Interest: None Declared

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VISCOELASTIC AND MECHANICAL PROPERTIES CHANGES IN OVARIECTOMIZED RAT FEMUR: PRELIMINARY RESULTS BY USING NANOINDENTATION CSM MODE

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Aims: While conventional diagnosis of osteoporosis is based on BMD from DXA, the micro-level bone quality deterioration in viscoelastic and mechanical aspects have not been thoroughly understood. The aim of this study is to evaluate the bone micro-level changes of viscoelastic and mechanical properties in ovariectomized (OVX) animal model.



IOF Regionals Singapore '10

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Raffles City Convention Centre Singapore 10-13 December 2010



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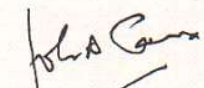
1st Asia-Pacific Osteoporosis Meeting

CERTIFICATE OF ATTENDANCE

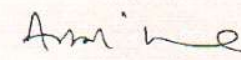
We, Professors John A. Kanis, Cyrus Cooper and Ambrish Mithal, certify that:

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attended the
IOF Regionals - 1st Asia-Pacific Osteoporosis Meeting
held at the Raffles City Convention Centre
in Singapore on 10-13 December 2010.


John A. Kanis
IOF President


Cyrus Cooper
Scientific Programme
Co-chair


Ambrish Mithal
Scientific Programme
Co-chair



BONE MICRO-NANOSTRUCTURE AND THE ATOMIC CONFIGURATION

(STUDY OF OSTEOPOROSIS IN INDONESIAN POPULATION)

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Background



Königsberger & Königsberger, 2006



- White paper from Perhimpunan Osteoporosis Indonesia (PEROSI) show prevalence osteoporosis at 2009 was 26.95% for men and 32.3% for women (PEROSI, 2009).
- Clinical research indicates that negative calcium balance often occurs in aged men and postmenopausal women due to low dietary calcium intake and decreased intestinal calcium absorption that contributing to low bone mass, rapid bone loss and high fracture rates (Zhang, 2009).
- Prentice et al (1995) show in Gambia population who calcium daily intake is low level was rarely found osteoporosis.
- Western population who calcium daily intake is high level was higher in fracture incidence (Cummings & Melton, 2002).
- Conversely in Asian population who low calcium was lower in fracture incidence (Cummings & Melton, 2002).
- This phenomenon indicates that not only calcium is involved in bone strengthened as risk factor of osteoporosis.

Results

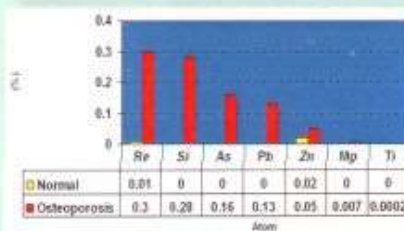
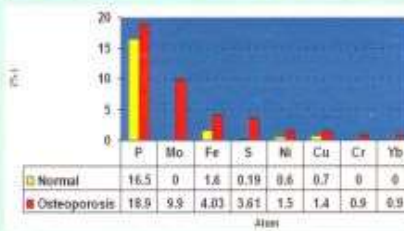


Figure 1. Scanning electron microscope in normal trabecular bone

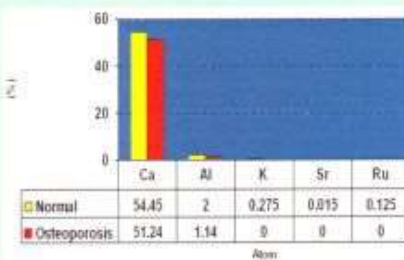


Figure 2. Scanning electron microscope in osteoporosis trabecular bone

Increasing of atomic mineral in osteoporosis



Decreasing of atomic mineral in osteoporosis

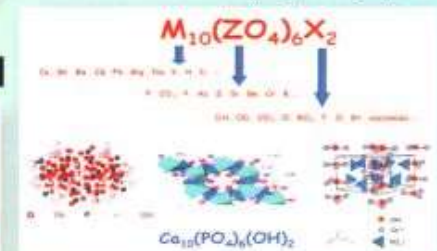


Discussion

- Microstructure osteoporosis trabecular bone is different than normal bone.
- Changes such as thinning, tapering, breakage, and perforation made the arch structure lose its integrity.
- Some of them became round due to continuous resorption to obtain knob-like structure.
- These changes contributed to an obviously increasing separation of inter-trabeculae.
- Geometrics pattern of bone atomic mineral based on its properties of atomic in periodic tables of Mendeleev for substitution or incorporation.
- Substitution is change one atomic to another caused by similarity of atomic radius and atomic charge.
- Incorporation is joining of atomic to composite then change integrity its molecule.
- This process would build dissipative structure of bone crystal.

Shen et al, 2009

Königsberger & Königsberger, 2006



Substitution or incorporation atomic mineral (Vallet-Regi & Arcos, 2008)

Aims

Aim of this study was to seek any information relating with bone micro/nanostructure and atomic configuration of Indonesian osteoporotic bone in regard to bone quality.

Methods

- Multicenter study.
- Inclusion criteria:
 - postmenopausal woman,
 - trabecular bone fracture,
 - normal and osteoporosis BMD value, and
 - no history of previous disease.
- Bone was obtained in surgery room then analysed for:
 - micro/nanostructure by Scanning Electron Microscope,
 - atomic mineral configuration by X-Ray Fluorescence

Conclusion

- The different of mineral composition is in accordance with the different pattern of bone micro-nanostructure.
- The composition of minerals should be considered to important factor for bone quality in Indonesian osteoporosis women.

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