Joao Manuel D A Rollo et al., Orthop Muscular Syst 2017, 6:2 (Suppl)
DOI: 10.4172/2161-0533-C1-032

Nanoindentation of human vertebrae trabecular bone classified as normal, osteopenic and osteoporotic by ultrasonometry of the calcaneus

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Osteoporosis is an osteometabolic disease characterized by the loss of bone mass and an increase in fracture risk. The evaluation of microarchitecture resistance of the trabecular bone may contribute in determining the risk and preventing fractures associated to osteoporosis. A total of 90 human trabecular vertebrae were dried (dehydrated), distributed proportionally by the regions T12, L1 and L4 in a total of 30 vertebrae segments extracted from individuals (human cadavers of Brazilian nationality) and classified through a bone quality index (BQI) as normal, osteopenic and osteoporotic bones through the ultrasonometry of the calcaneous bone. The nanoindentation technique allowed the evaluation of the elastic module (E) and nanohardness (H) in one single trabecula in the respective groups. The results obtained from the groups do not show any meaningful differences when analyzed by the ANOVA Test (p=0.682 for E and H) or in multiple comparisons by Turkey Kramer HSD (p=0.915 between normal/osteopenic, p=0.932 between normal/osteoporotic and p=0.999 between osteopenic / osteoporotic for E, and p=0.939 between normal/ osteopenic, p=0.690 between normal/ osteoporotic and p=0.878 between osteopenic/osteoporotic for H) and the Spearman Test did not show any correlation between the BQI and E and H. Therefore, it was not possible to classify the quality of the microarchitechture in the trabeculae of human vertebrae through the mechanical properties of the bone matrix in one single trabecula in order to evaluate the bone quality and fracture risk associated to osteoporosis.

Biography

Joao Manuel D A Rollo has a degree in Materials Engineering, Master's degree and PhD in Sciences and is currently a Professor at University of Sao Paulo (USP) in Brazil.

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