

ABSTRACTS

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Microarchitectural contribution in the assessment of biomechanical properties in human os calcis

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The aim of this study was to determine the contribution of microarchitecture in the assessment of the mechanical strength of os calcis cancellous bone. In 37 subjects aged 52 to 95 yrs, after necropsy, two adjacent cubic samples of cancellous bone were removed along the medio-lateral direction from the posterior tuberosity of os calcis. The medial cubic samples were submitted to biomechanical compressive tests and to the measurement of apparent density. The lateral cubic samples were used for histomorphometry : bone volume/tissue volume, trabecular thickness (Tb.Th), separation and number (Tb.N), nodes, trabecular bone pattern factor, Euler number, marrow star volume (Ma.St.V.) and interconnectivity index (ICI). All these parameters were significantly correlated with Young modulus (E) and maximum compressive stress (σ). After adjustment for density, all microarchitectural parameters correlated with E and σ except Tb.Th, ICI, Ma.St.V. and Euler number. Multiple regressions demonstrated that E and σ were mainly explained by density (respectively : $R=0.75$, $p<0.0001$ and $R=0.85$, $p<0.0002$). These correlations were significantly improved by adding Tb.N for E ($R=0.82$) and node to node length/total strut length for σ ($R=0.89$). In conclusion, 2D microarchitecture bring additional informations on density in the explanation of biomechanical properties.