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P41: Quantification Technique for Analysing Juvenile Sacral Trabecular Microarchitecture: A Micro-CT Scan and Skyscan Analysis Method

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Introduction: The study of trabecular bone provides information relating to bone strength. A number of imaging modalities are used to investigate the internal structure of human trabecular bone, including X-ray macroradiograph, high resolution-CT (HRCT) and micro-computed tomography (micro-CT), with many studies focusing on adult bone analysis, including fracture management and osteoporotic-related bone density. However, only a limited number are investigating trabecular microarchitecture in juvenile bones. The purpose of the current study is to introduce a technique of quantifying trabecular bone parameters in the human juvenile sacrum.

Materials and Methods: Twenty-six individual human S1 sacra spanning the infancy period until eight years of age were examined using micro-CT. The images were then analysed using Skyscan CTAnalyser version 1.11, which provides detailed 3-D quantification of trabecular architecture in a targeted region for specific parameters: (i) bone volume fraction (BV/TV (%)), (ii) trabecular thickness (Tb.Th), (iii) trabecular separation (Tb.Sp), (iv) trabecular number (Tb.N), (v) structural model index (SMI) and (vi) degree of anisotropy (DA).

Result and Discussion: Areas with high-density, plate-like trabecular structure were commonly found in high stress regions of the bone, suggesting that trabecular pattern highly correlates with its mechanical properties. The results demonstrated that in S1, the areas of high stress are located at the medial part of the vertebra, while the lateral part (the auricular areas) exhibited sparse bone density.

Conclusion: The study shows that the sacrum exhibits an early pattern of trabecular bone morphology which is maintained into childhood.

Keywords: Sacrum, trabecular, juvenile, micro-CT scan, skyscan