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Predicting Skeletal Side Dominance From Functional Dominance: DXA, pQCT And QUS Findings

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(No relationships reported)

PURPOSE: Bone densitometry is typically performed on the “non-dominant” limb. While upper extremity functional dominance (writing hand) reliably predicts upper limb skeletal dominance, our experience suggested the same did not apply to the lower limb. In fact, the determination of lower extremity functional dominance is not straight forward. Consequently, the upper extremity dominance assumption is routinely extrapolated to the lower limb and densitometers are designed primarily for left hip scanning to accommodate the preponderance of right-handed individuals in the population. The aim of the current work was to determine the true nature of the association between functional and skeletal dominance of the lower limb. The ultimate goal is to establish a simple and reliable determinant of lower extremity skeletal dominance.

METHODS: 77 men (35.4±16.4 yrs) and 100 women (42.7±16.0 yrs) were recruited for bilateral femoral neck bone mineral density (FNBMD; XR-800, Norland), calcaneal broadband ultrasound attenuation (BUA; QUS-2, Quidel), tibial peripheral quantitative computed tomography (XCT3000 Stratec) and limb anthropometry. Side dominance questionnaires and physical tasks were completed including the Waterloo Footedness Questionnaire, hop distance test, Pastor Day Marsden Test, handedness and footedness questions, and side preference for common postures (e.g. folding arms). Chi-square tests with crosstabs were run on all parameters using SPSS Version 19.

RESULTS: No significant association was observed between writing hand and any measure of lower limb skeletal dominance. Significant negative associations were found for strongest arm ($p=0.01$) and kicking foot ($p=0.04$) with FNBMD dominance, and racquet hand with tibial cortical area at the 38% site ($p=0.05$). Strongest arm was positively associated with dominant BUA ($p=0.04$). A trend for lower limb skeletal dominance in the functionally non-dominant limb was observed for 85% of all bone parameters, excluding BUA.

CONCLUSIONS: Contrary to conventional thinking, skeletal dominance exists more commonly in the functionally non-dominant lower extremity. Findings bring into question the standard practice of densitometric scanning of the left lower extremity of right-dominant individuals when detection of minimum bone mass is desired.
