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Effect of Arm Dominance on Quantitative Transmission Ultrasound at the Forearm

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The long-term objective of this research is to establish ultrasound as a safe, effective, and non-invasive method for assessing osteoporotic fracture risk. The purpose of this study was to determine the effect of arm dominance on ultrasound measurements. A new ultrasound device (*UltraScan 650*, CyberLogic, shown below) that is designed to assess the forearm at the 1/3rd location was used in this study. The device emits an ultrasound signal from a single element rectangular source that propagates through the radius and soft tissue to a 64-element linear array rectangular receiver. Twenty-one people were evaluated with the *UltraScan 650*, each being measured 3 times on both the left and right arms and arm dominance recorded. Ambidextrous individuals were excluded from this analysis. The array signals for each acquisition were used to compute two net time delay (NTD) parameters. The product of the two NTD parameters for each of the three measurements made on each arm and subject was computed and averaged. The product of the NTDs has been shown to be proportional to the cortical cross-sectional area (CCSA) *in vitro*¹ and in simulation². A paired one-sided *t*-test was used to evaluate the statistical difference between dominant and non-dominant arms. Short term precision (%RMS-CV) was also computed³. The precision of the CCSA estimate was found to be 2.7%. The data showed that the dominant arms had 5.8% more CCSA, although there was a relatively high degree of variability (in 7 of the 21 subjects the non-dominant arm had a larger CCSA) and the *P*-value was equal to 0.17. These results are consistent with prior studies with DXA that showed a 6-9% increase in bone mineral content (BMC) in the dominant vs. non-dominant arms³. This suggests that the ultrasound estimate of CCSA and x-ray determined BMC may be closely related. Further studies are on-going, including direct comparisons of ultrasound with DXA at the same anatomical site, in order to determine directly the correlation of ultrasonic parameters with BMD and BMC. The *UltraScan 650* has the potential to become a simple, safe and effective screening tool for bone loss and fracture risk assessment.

1. Le Floch V et al. (2008) *Ultrasound in Med & Biol* 34:1972-1979, 2008. 2. Kaufman JJ et al. (2008) *IEEE Trans Ultrason Ferroelectr Freq Control* 55:1205-18. 3. Bonnick SLB (2004) *Bone Densitometry in Clinical Practice* Totowa, NJ: Humana Press.

