

**Validity of Ultrasound Imaging of Abductor Hallucis Volume Demonstrated by Strong Agreement with MRI**

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**ABSTRACT**

Intrinsic foot muscles such as abductor hallucis (ABDH) are crucial for function and mobility while influencing quality of life. Thus, being able to accurately measure foot muscle volume is important. While magnetic resonance imaging (MRI) is often considered to be the reference standard of medical imaging, ultrasound (US) provides a cost effective, rapid and dynamic way of assessing muscle size and function. **PURPOSE:** To investigate the validity and intratester reliability of US imaging in assessing ABDH volume compared to MRI. **METHODS:** US and MRI were employed to measure the right and left ABDH muscle volume involving 9 participants (females = 3; males = 6). Muscle volume of the ABDH was calculated across the muscle belly every 0.5 cm both manually by utilizing a truncated cone (TC) formula and with a semi-automation tool in the Osirix (OX) software. Pearson product correlation ( $r$ ), intraclass correlation coefficients (ICC), standard error of the measurement (SEm) and minimal detectable difference (MDD) were calculated. **RESULTS:** High correlations were detected between the US and MRI volume ( $\text{cm}^3$ ) measurements ( $r = 0.887$ ) and between MRI TC and MRI OX ( $r = 0.986$ ). Test reliability was excellent for both MRI and US measurements (ICC = 0.947 to 0.989). SEm value for the US was  $0.409 \text{ cm}^3$  with the percent SEm equal to 0.028%, while the SEm for MRI OX was  $1.145 \text{ cm}^3$  with a percent SEm of 0.072% and finally the SEm for MRI TC was  $1.142 \text{ cm}^3$  with a percent SEm of 0.071%. MDD value for the US was  $1.135 \text{ cm}^3$ , while MRI OX MDD value was  $3.174 \text{ cm}^3$  and MRI TC MDD value was  $3.166 \text{ cm}^3$ . **CONCLUSIONS:** US appears to be a valid and reliable alternative to MRI when measuring volume of the ABDH muscle. This method of US and MRI measurement can likely be used for assessing any of the deep small muscles of the foot.