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Extensibility of the supraspinatus muscle is affected by intramuscular fat

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Rotator cuff tears result in muscle atrophy and fat infiltration within the rotator cuff muscles. Surgical options available and the extensibility of a torn cuff tendon and muscle are highly individualized. A decrease in the extensibility can lead to incomplete reconstruction and may require additional surgical procedures. Additionally, excessive tensile forces during surgery can lead to gap formation and failure at the repair site. An estimation of the supraspinatus (SSP) muscle extensibility is useful in selecting the most appropriate surgical procedure. The purpose of this study was to determine if non-invasive quantitative assessment of intramuscular fat using magnetic resonance imaging (MRI) could be used to predict extensibility of the SSP. Seventeen cadaveric shoulders were imaged to 1) qualitatively assess intramuscular fat using classification systems routinely used in the clinic, and 2) quantitatively assess fat infiltration (fat fraction). The SSP muscles were secured in a custom-designed set-up which allowed for extensibility (mm) and load (N) recordings. Muscles were stained with H&E for fatty evaluation. Pearson correlation coefficients and t-test were used to assess significant differences. Fat fraction positively correlated with histological findings. Fat fraction also presented a positive and high correlation with extensibility ($r=0.69$; $p=0.002$). Interestingly, extensibility was not significantly different between shoulders graded with a higher fat content vs. those with low fat when implementing clinical classification systems. A non-invasive prediction of whole-muscle extensibility can directly guide in pre-operative planning to determine if the torn edge could efficiently cover the original footprint; aid in prognosis, and postoperative evaluation of rotator cuff repair.

Biography

Hugo Giambini has completed his PhD from Mayo Clinic, Rochester MN, USA in 2013 in the area of Biomedical Engineering. He completed his Post-doctoral Fellowship in the Biomechanics Laboratory of Mayo Clinic. He is currently working in the Biomaterials and Tissue Engineering Laboratory at Mayo Clinic. He has published more than 25 papers in reputed journals and his work has been recognized by distinguished organizations including the International Society for the Study of the Lumbar Spine (ISSLS). He is currently serving as an active member of several societies including the Orthopedic Research Society, and is a reviewer for several journals.

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