Diagnostic and Predictive Value of Cross-Sectional Imaging Modalities in Diagnosing Distal Biceps Tendon Ruptures

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Introduction

Advanced imaging can be obtained if there is uncertainty in the clinical diagnosis of partial vs complete distal biceps tendon (DBT) tears. Magnetic Resonance Imaging (MRI) has been thought to be the gold standard for identifying DBT ruptures, however the advancements in ultrasound (US) technology have provided improvement in resolution, decreased price and greater accessibility. While previous studies have evaluated the accuracy of diagnosing DBT injuries between MRI and US, there have been no prior studies evaluating the diagnostic consistency and positive predictive value (PPV) of advanced imaging in diagnosing partial or complete DBT rupture. PPV reflects the proportion of true positives which helps to identify the probability that a patient truly has the disease in question, as such, it may be more meaningful in clinical practice. The purpose of this study is to evaluate the diagnostic concordance and positive predictive value (PPV) of MRI and US in identifying patients with DBT injuries with confirmatory surgical findings.

Materials & Methods:

A retrospective analysis was performed on patients with pre-operative US and MRI who underwent surgical repair between January 2007 through December 2023 at a single academic institution. Concordance between imaging and intra-operative findings were evaluated. When both US and MRI findings agreed with the intraoperative findings, it was considered “concordant.” If one of the imaging studies agreed with the surgical findings, but the other imaging study disagreed, it was labeled as “discordant imaging.” If both US and MRI had the same result but the results disagreed with the surgical findings it was considered “discordant surgery.” Lastly, “complete discordance” was described when both imaging studies and the surgical findings did not agree. Statistical analysis and Fisher exact test was performed to determine the the PPV of preoperative US and MRI when compared to the surgical findings.

Results

There were 181 patients in this study, 26 patients had both pre-operative US and MRI, 63 patients had a pre-operative MRI, and 92 patients had a pre-operative US. Of the 181 patients, 156 patients were diagnosed with complete DBT tears and 25 patients were diagnosed with partial DBT tears from their intra-operative findings. MRI and US were found to have a similar PPV in diagnosing DBT tears. The overall PPV, including both complete and partial tears, was 89% for both US and MRI ($p = 0.48$). The PPV in diagnosing complete tears was 90% for US and 89% for MRI ($p = 0.389$), and the PPV for diagnosing partial tears was 82% for US and 89% for MRI ($p = 0.298$). Both imaging studies and surgical findings agreed in 65.4% of patients, discordance between imaging was seen in 26.9% of patients, discordance with surgical findings occurred in 3.8% of patients, and complete discordance between imaging and surgical findings occurred in 3.8% of patients.

Discussion

This study demonstrates there is no significant difference between the PPV of pre-operative US and MRI when evaluating complete, partial, and all DBT tears in patients with DBT injuries amenable to surgical intervention While our study found a discordance rate of approximately 35% between imaging and intraoperative findings, many of these patients had a prolonged time interval between imaging studies and surgery or had limitations in their imaging studies that may have impacted evaluation. As such, the discordance rate may not reflect clinically relevant discordances between US, MRI, and surgical findings. Given the improved accessibility and cost of US relative to MRI in combination with our findings, US may be used confidently as the first imaging modality in diagnosing DBT injuries.