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Development of an anatomic landmark-based measurement of the Achilles tendon

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Keywords

Achilles, rupture, repair, measurement

Abstract

Introduction

A greater degree of Achilles tendon lengthening during surgical correction has been correlated with worse clinical outcomes. MRI and ultrasound techniques have been validated in measurement of Achilles tendon. We sought to develop a reproducible and accurate measurement technique utilizing the manual palpation of anatomic landmarks that will be cost effective and convenient to perform, particularly intraoperatively.

Methods

The length from the medial head of the gastrocnemius to the bottom of the non-compressed heel pad was measured on both lower legs of 10 healthy subjects by three raters using the ultrasound and anatomic landmark-based techniques. The measurements were performed by three raters for inter-rater reliability and repeated one week later for intra-rater reliability. Ultrasound measurements had excellent inter-rater (0.93) and intra-rater (0.82) correlation coefficients, while good inter-rater (0.76) and intra-rater (0.86) correlation coefficients were observed among anatomic landmark-based measurements. Achilles tendon length measured with ultrasound and anatomic landmark-based techniques were compared using a paired t-test.

Results

The anatomic landmark-based technique produces longer measurements of the Achilles tendon (23.2 cm (sd 2.6 cm)) compared to measurements made using ultrasound (22.4 cm (sd 2.6)) ($p < 0.001$). On average, the anatomic landmark-based technique measures 0.8 cm (95% Confidence Interval: 0.4, 1.2) longer than the ultrasound technique. The intraclass correlation coefficient between the anatomic landmark-based and ultrasound measurements is 0.90.

Conclusions

While the anatomic landmark-based technique produces a longer measurement of the Achilles tendon, it may still be a reproducible measurement tool. If the change in tendon length is the variable of interest in Achilles tendon repair (ATR), this technique may be a valid and simple way to monitor that variable. Comparison with MRI may be warranted to confirm the accuracy of the anatomic landmark-based measurement and set the stage for evaluation of this technique in the operating room in subjects undergoing ATR repair.