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Abstract

Introduction

The fibularis longus muscle has been studied in regard to muscle fatigue, tendon injury, and tendon location in relationship to the cuboid groove (i.e. outside, overlying, and inside). However, tendon variations and the angle the tendon makes when it is wrapping around the cuboid bone have not been recorded. The goal of this research project is to describe various tendon variations along with identifying the angle the tendon makes as it wraps around the cuboid bone to determine how these variables influence lateral ankle stability. Determining who is more prone to experience lateral ankle injuries based off of their anatomical makeup can help prevent future injuries from occurring by allowing people to target specific muscles that need strengthening. This can be especially useful in athletes who have chronic ankle instability as understanding their ankle anatomy can help them focus their training on specific areas of their body.

Methods

In order to investigate the affects tendon curvature has upon ankle and foot anatomy, the angle the tendon makes behind the lateral malleolus and the angle the tendon makes around the cuboid bone were recorded. Dissections were performed on 11 formalin fixed cadavers. There were five males and six females used equaling a total of 22 ankle dissections. A midline incision was made from the middle of the patella to the midpoint of the dorsum of the foot. From there, blunt dissection was used until the lateral malleolus was exposed to obtain a full view of the fibularis longus muscle and tendon. In order to obtain accurate area measurements, the extensor digitorum longus and gastrocnemius were removed. From there the fibularis longus tendon was followed and blunt dissection was used until there was a clear view of the tendon's connection to the medial aspect of the foot. Fiji data collection was used to obtain all measurements and statistical analysis was conducted within Google Sheets. Photographs were also taken of the various tendon variations.

Results

There were four fibularis longus tendon variations from normal. The variations were as follows: tibialis posterior connection only (Figure 1), tibialis posterior connection with an adductor hallucis connection (Figure 2), adductor hallucis connection only, and a small tendon connection extending from the fibularis longus inserting between the first and second metatarsals. The average angle around the cuboid for the right foot was 171.49 with SD of +/-6.02 while the angle around the cuboid on the left foot was 165.28 with a SD +/- 9.40.

Conclusion

We hypothesize that smaller feet, a smaller cuboid angle, and larger tendon length, lateral malleolus angle, and longus-brevis gap lead to higher ankle stability. We hypothesize the tibialis posterior connection is most stable since the fibularis longus is connecting to an invertor. In order to expand upon this study immunohistochemistry could be used to evaluate the ratio of red to white fibers to determine how the strength of the fibularis longus and tibialis posterior muscles contribute to how quickly the muscles are able to position the foot back to neutral. This data can also be expanded by performing ultrasounds on the tendons of athletes along with examining their range of motion so that specific exercises can be added to their training regimes.

Tibialis Posterior connection only

Tibialis Posterior connection with Adductor Hallucis connection