Neovascularization is Not Associated with Lower Extremity Function in Midportion Achilles Tendinopathy

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Summary

This study investigated the relationship between neovascularization and lower extremity function in individuals with midportion Achilles tendinopathy. 182 participants were assessed for neovascularization and underwent functional testing including jumping, heel rises, and gait analysis. ANCOVA models controlling for age, sex, and BMI were used to analyze group differences based on presence of neovascularization. The presence of neovascularization did not significantly influence any lower extremity function variables ($p>0.05$) after controlling for covariates. This suggests that observed functional deficits are primarily explained by demographic and anthropometric features rather than neovascularization.

Introduction

Achilles tendinopathy is a painful injury to the Achilles tendon characterized by pain with tendon loading, reduced function and tolerance for physical activity [1]. Pathological structural changes linked to Achilles tendinopathy include increased tendon thickness, larger cross-sectional area, and existence of neovascularization within the tendon [2]. Neovascularization is the presence of new blood vessels within a tissue and is a common finding in patients with Achilles tendinopathy [3]. Neovascularization has been associated with worse symptom severity, but its impact on the ability to walk, run, or jump remains unclear. Therefore, the purpose of this study was to examine differences in lower extremity function between those with and without neovascularization within the Achilles tendon.

Methods

Data from 182 participants with midportion Achilles tendinopathy were included (Table 1). Power Doppler ultrasound imaging (GE Logiq e) was used to assess the presence of neovascularization (Figure 1) and to group participants (YES = neovascularization present, NO = neovascularization absent). The Victorian Institute of Sport Assessment – Achilles (VISA-A) measured symptom severity (0-100, 100 indicates no symptoms). Lower extremity function was assessed through counter movement jump (CMJ), drop CMJ, heel rise (HR) work, self-selected gait speed and percent in stance and swing phase. A MUSCLELAB (Ergotest Technology) system including light mats, and Inertial Measurement Units were used for lower extremity functional testing. Group differences were analyzed using ANCOVA controlling for age, sex, and body mass index (BMI).

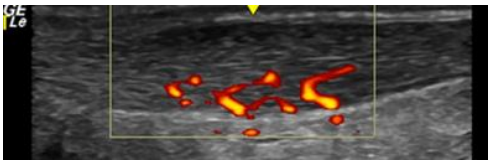

Figure 1: Neovascularization visualized using Power Doppler ultrasound imaging within the Achilles tendon.

Results and Discussion

The YES group (VISA-A, 45.5) had significantly worse ($p=0.020$) symptom severity than the NO group (VISA-A, 51.8). For all lower extremity function variables, the overall ANCOVA models were significant (all $p<0.001$), primarily due to the effects of covariates (age, sex, and BMI). After controlling for these covariates, neovascularization presence did not significantly influence any of the lower extremity function variables (all $p>0.05$), indicating that the observed variations were predominantly explained by demographic and anthropometric features. This finding suggests that while neovascularization is associated with symptom severity of Achilles tendinopathy, it may not be impacting the tendon's ability to respond to load. Further investigation is warranted to assess additional characteristics of neovascularization such as location, area, and size as these factors might provide a more comprehensive understanding of neovascularization's role in tendon health.

Conclusions

Neovascularization, while related to symptom severity, does not appear to significantly influence lower extremity function in individuals with midportion Achilles tendinopathy when controlling for age, sex, and BMI.

References

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[2] Corrigan, et al. (2020). *Orthop J Sports Med*, **30:** 8
[3] Zanetti, et al. (2003). *Radiology*, **227:2,** 556-560

Table 1: Participant baseline demographic, anthropometric and lower extremity data. Represented as means ± SD.

	Age (yrs)	BMI (kg/m^2)	CMJ height (cm)	Drop CMJ height (cm)	HR work (J)	Stance Phase (%)	Swing Phase (%)	Gait speed (m/s)
YES n = 69 (38F)	52.4 ± 10.6	31.0 ± 6.6	4.6 ± 3.0	4.0 ± 3.3	1417 ± 790	63.8 ± 2.6	36.2 ± 2.6	1.24 ± 0.2
NO n=113 (65F)	44.2 ± 12.8	27.4 ± 5.6	6.9 ± 3.9	6.4 ± 4.2	1609 ± 806	62.8 ± 2.7	37.0 ± 1.8	1.31 ± 0.2