Kinesiophobia-related Changes in Joint Moments but not Joint Mobility after Achilles Tendon Rupture

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Summary

Reduced moments on the ATR-operated ankle and knee correlate to kinesiophobia, or fear of movement or re-injury, in mid-term follow-ups. Only joint mobility at the hip, and not the ankle, correlated to kinesiophobia. Collectively, these results indicate that patient-specific anxiety can lead to reduced joint use and loading on the injured limb. This underinvestigated cofactor may underlie heterogenous functional outcomes post-ATR, regardless of rehabilitation.

Introduction

Rehabilitation after Achilles tendon rupture (ATR) aims to gradually introduce load to provide an ideal biomechanical environment for tissue healing. Yet, various rehabilitation protocols that aim to augment tissue loading lead to similar outcomes [1]. A cofactor underlying these results is kinesiophobia, or fear of movement and re-injury. Patient-specific anxiety to mobilize the ATR limb can greatly impede recovery and healing, regardless of prescribed rehabilitation. Limited work in ATR cohorts are inconclusive [2]. It remains unclear if measures of kinesiophobia could aid in understanding the wide heterogeneity of functional outcomes. Thus, this work investigated the association of lower-limb function with kinesiophobia after ATR surgery. We hypothesized that increased kinesiophobia would negatively correlate with self-reported function, and ipsilateral joint moments and mobility during gait after ATR. We further hypothesized that kinesiophobia would positively correlate to joint asymmetries.

Methods

11 males and 1 female (41 ± 9.6 years old, 84.8 ± 8.9 kg, 1.82 ± 0.05 m, BMI: 23.4 ± 7.8 kg/m³) that received primary unilateral ATR repair were recruited after acquiring written informed consent. All protocols were approved by the local ethics committee. Patients were assessed at 20.8 ± 7.4 weeks and 33.1 ± 4.7 weeks post ATR surgery. 3D ground reaction forces (f=1000 Hz) and kinematics from 26 markers (f=100 Hz, Human Body Model, HBM2) were collected during gait on an instrumented dual-belt treadmill (Motek, Amsterdam, Netherlands). Bilateral angles and reaction moments of the ankle, knee, and hip were calculated in Visual3D, from which peak values and range of motion (ROM) during stance were extracted in MATLAB. Relative asymmetry was determined using the weighted Universal Symmetry Index (wUSI) [3]. The shortened Tampa Scale of Kinesiophobia (TSK-11) assessed kinesiophobia and the Achilles tendon rupture score (ATRS) assessed self-reported function. Statistical analysis was performed using SPSS (IBM, Armonk, NY). After testing for normality using Shapiro-Wilk, Spearman-rho or Pearson's correlations (1-tail) assessed relationships between kinesiophobia and joint biomechanics or ATRS, with p=0.05.

Results and Discussion

After dropouts, 19 measurements were included. TSK-11 scores (24.2 ± 6.5, max. kinesiophobia=44) did not correlate to ATRS (62.7 ± 24.1, best function=100; r=-0.15, p=0.27). Regarding joint mobility, TSK-11 scores did not correlate to ankle or knee parameters, but negatively correlated to max hip extension (r=-0.42, p=0.038) and frontal ROM (r=-0.451, p=0.026). Considering moments (Figure 1), TSK-11 scores negatively correlated to max ankle plantarflexion (r=-0.45, p=0.027), ankle external rotation (r=-0.515, p=0.012), and knee external rotation (r=-0.525, p=0.011). For asymmetry, TSK-11 scores correlated positively to wUSI scores for ankle external rotation (r=-0.453, p=0.026) and hip extension angles (r=-0.462, p=0.023).

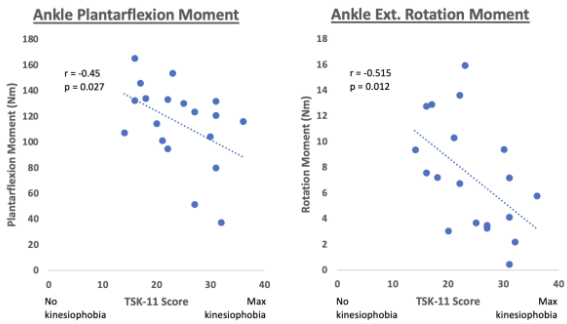

Figure 1: Correlations of TSK-11 scores for kinesiophobia to peak ankle moments during stance.

Kinematic metrics alone are unable to distinguish patients with increased kinesiophobia, and joint moment analyses should be prioritized when assessing patient-specific functional recovery following ATR.

Conclusions

Post-ATR kinesiophobia is primarily associated with reduced moments in the ankle and knee, but unrelated to self-reported function and most joint mobility measures (other than hip extension). Kinesiophobic patients mobilize their injured ankle similarly to their peers during gait, but rather opt to exert a reduced effort on the joint and tissues in a similar ROM. Identifying kinesiophobic patients during ATR rehabilitation could enable interventions to improve functional outcomes.

References

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