Diabetes and Surgical Repair Impact Early Dorsiflexion Recovery After Achilles Tendon Rupture

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INTRODUCTION: Achilles tendon rupture (ATR) is a common injury with an incidence of 7 to 40 per 100,000 person-years. Recovery requires structured rehabilitation, with many surgical and non-operative protocols recommending early immobilization in plantar flexion, followed by a gradual return to neutral dorsiflexion. Achieving neutral dorsiflexion is a key milestone that facilitates the advancement of physical therapy. However, patient-specific factors may influence recovery timelines. Prior research has identified patient factors that impair tendon healing, but risk factors that influence early dorsiflexion recovery after ATR remain unclear. This retrospective cohort study investigates patient variables associated with failing to reach neutral dorsiflexion at the six-week follow-up.

METHODS: Following Institutional Review Board approval, a retrospective review was conducted on 70 ATR patients treated between January 2014 and December 2024 by a single board-certified foot and ankle orthopedic surgeon. Patients were assessed for neutral dorsiflexion at their six-week post-injury clinic visit. The primary outcome was the presence or absence of neutral dorsiflexion, as documented in the clinical examination. Demographic and medical history data, including age, BMI, smoking status, hypertension, diabetes mellitus (DM), hyperlipidemia, history of tendinopathy, history of ATR, and treatment type (operative vs. nonoperative), were collected. A multivariate logistic regression model was used to evaluate associations between patient variables and failure to achieve neutral dorsiflexion, adjusting for potential confounders. Odds ratios (OR) and 95% confidence intervals (CI) were calculated for all variables.

RESULTS: The mean patient age was 41.6 years, with a mean BMI of 31.7. At six weeks, 76% (53/70) of patients achieved neutral dorsiflexion. Patients who underwent surgical repair were significantly more likely to reach this milestone (OR: 5.48, 95% CI 1.51, 22.0; $p = 0.004$). In contrast, patients with DM had a markedly lower likelihood of achieving neutral dorsiflexion (OR: 0.150, 95% CI 0.020, 0.888; $p = 0.017$). No other patient variables demonstrated significant associations with dorsiflexion recovery. The full regression model, including odds ratios and confidence intervals for all variables, is presented in Table 1.

CONCLUSION: Surgical treatment was associated with a higher likelihood of achieving neutral dorsiflexion at six weeks, allowing for timely rehabilitation progression. Conversely, diabetic patients were significantly less likely to reach this milestone, suggesting a delay in early functional recovery. Given the established impact of DM on tendon homeostasis, our findings highlight a potential need for modified rehabilitation protocols or closer monitoring in diabetic ATR patients. Further research is warranted to explore targeted interventions that optimize healing and functional outcomes in this population.

IMAGES AND TABLES:

Table 1: Multivariate Logistic Regression of Variables Associated with 6-week Neutral Dorsiflexion

	Number of Rupture Patients (n = 70)	Odds Ratio	95% CI	p-value
Mean Age, (±SD)	41.57 (±13.05)	0.981	0.942, 1.021	0.837
Sex (Male: Female)	55 M: 15 F	-	-	-
Mean BMI, (±SD)	31.71 (±7.38)	-	-	0.251
Met 6-week Dorsiflexion	53 (76%)	-	-	-
Categorical Variables				
Sex (F)	15 (21%)	0.500	0.120, 2.25	0.304
Operative Treatment	46 (66%)	5.48	1.51, 22.0	**0.004****
BMI Class 1 (18-25)	11 (16%)	1.53	0.270, 16.1	1.00
BMI Class 2 (25-30)	24 (34%)	0.944	0.265, 3.64	1.00
BMI Class 3 (30+)	35 (50%)	0.858	0.246, 2.94	1.00
Smoking	16 (23%)	0.952	0.232, 4.75	1.00
HTN	19 (27%)	0.470	0.128, 1.77	0.223
Diabetes	8 (11%)	0.150	0.020, 0.888	**0.017***
Hyperlipidemia	5 (7%)	0.617	0.079, 7.45	0.628
Hx of Tendinopathy	4 (6%)	0.961	0.071, 53.5	1.00
Hx of Rupture	5 (7%)	1.30	0.117, 68.3	1.00

Significance defined as p-values less than 0.05.
*p= <0.05
**p=<0.005