Immediate Effects of Compressive Myofascial Release and Joint Mobilization on Passive Mechanical Properties After Achilles Tendon Repair

Fırat Tan[*1], Zilan Bazancir Apaydin PT, PhD,[2] Ahmet Gurler, MD[3], Mehmet Orçun Akkurt, MD,[3] Hande Guney-Deniz PT, PhD.[4]

[1]Atatürk University Faculty of Health Science, Department of Physical Therapy and Rehabilitation, Erzurum, Türkiye
[2]Ankara Medipol University Faculty of Health Science, Department of Physiotherapy and Rehabilitation, , Ankara, Türkiye.
[3]Ankara Bilkent City Hospital, Department of Orthopedics and Traumatology, Ankara, Türkiye.
[4]Hacettepe University Faculty of Physical Therapy and Rehabilitation, Department of Musculoskeletal Physiotherapy and Rehabilitation, Ankara, Türkiye.

Email: fztfirattan@gmail.com

Summary

Achilles tendon repair alters muscle-tendon mechanical properties, affecting mobility and function. This study compared the acute effects of Compressive Myofascial Release (CMR) and Talocrural Joint Mobilization (TJM) on muscle stiffness, tone, and ankle mobility. Twenty post-surgical individuals were randomized into two intervention groups. Passive mechanical properties were assessed using Myoton-3, while ankle mobility and functional strength were measured via Achilles Tendon Resting Angle (ATRA), Weight-Bearing Lunge Test (WBLT), and Heel Rise Test.

Results showed that CMR significantly reduced gastrocnemius and Achilles tendon stiffness, while TJM had no notable effect on muscle-tendon stiffness but improved ankle mobility. Both techniques led to functional improvements. These findings suggest that CMR may be beneficial for modifying muscle stiffness, whereas TJM primarily enhances mobility. However, the long-term effects remain unclear. Further research is needed to optimize post-operative rehabilitation strategies for individuals recovering from Achilles tendon repair.

Introduction

Achilles tendon rupture is a common lower limb injury, often requiring surgical repair. Postoperatively, alterations in passive mechanical properties of the muscle-tendon unit, such as increased stiffness and reduced elasticity, may impact joint mobility and functional recovery [1-3]. While these changes contribute to movement restrictions and compensatory patterns, their acute response to rehabilitation interventions remains unclear.

Compressive Myofascial Release (CMR) and Talocrural Joint Mobilization (TJM) are manual therapy techniques commonly used to modulate muscle and tendon mechanical properties [4,5]. While TJM primarily targets joint mobility, CMR is suggested to directly influence muscle tone, stiffness, and elasticity. Despite their frequent use, comparative evidence on their immediate effects is limited.

This study aims to compare the acute effects of CMR and TJM on muscle stiffness, elasticity, tone, and functional performance following Achilles tendon repair, providing insights for optimizing rehabilitation strategies.

Methods

This single-session, crossover study included 20 participants with a history of Achilles tendon repair. Participants were randomly assigned to one of two intervention groups: Compressive Myofascial Release (CMR) or Talocrural Joint Mobilization (TJM) (n=10 per group). No additional physiotherapy interventions were applied prior to the manual therapy session. Passive mechanical properties of the Medial Gastrocnemius (MG), Lateral Gastrocnemius (LG), and Achilles tendon were assessed using Myoton-3, measuring muscle tone, elasticity, and stiffness . Ankle mobility was assessed using the Achilles Tendon Resting Angle (ATRA) with a universal goniometer, the Weight-Bearing Lunge Test (WBLT) for dorsiflexion range of motion, and the Heel Rise Test for functional plantar flexion strength. Within-group comparisons (pre- and post-intervention) were conducted using the Wilcoxon Signed-Rank Test, while between-group comparisons were performed using the Mann-Whitney U Test, with a significance level set at $p < 0.05$.

Results and Discussion

Following a single session of manual therapy, CMR resulted in an immediate reduction in MG, LG, and Achilles tendon stiffness, whereas TJM did not induce significant changes in muscle passive mechanical properties ($p < 0.05$) (Table 1). MG muscle tone significantly decreased in the CMR group ($p < 0.05$). Both groups showed significant post-intervention increases in Achilles tendon resting angle, WBLT scores, and Heel Rise Test performance ($p < 0.05$) (Table 1).

These findings suggest that CMR may be effective for acutely reducing gastrocnemius and Achilles tendon stiffness, while both CMR and TJM contribute to improvements in ankle mobility and functional measures. However, as this study only evaluated immediate post-treatment effects, the duration and sustainability of these changes remain unknown. Therefore, while CMR and TJM may be useful in temporarily alleviating movement restrictions and preparing individuals for exercise-based rehabilitation, further research is needed to determine

their long-term impact on recovery and functional progression.

Conclusions

This study compared the acute effects of Compressive Myofascial Release (CMR) and Talocrural Joint Mobilization (TJM) on muscle-tendon mechanical properties and functional outcomes following Achilles tendon repair. The findings indicate that CMR effectively reduces gastrocnemius and Achilles tendon stiffness, while TJM primarily enhances ankle mobility. Both techniques contributed to short-term improvements in functional measures, yet their long-term impact remains unclear. Future research should explore the sustained effects of these interventions to optimize post-operative rehabilitation strategies.

References

[1] Agres AN et al. (2015). *Scand J Med Sci Sport.*, **25**(6):860-7.
[2] Bravo-Sánchez A et al. (2017). *Clin Biomech.* 2021;**85**.
[3] Schneebeli A et al. (2023). *Foot Ankle Int.* **44**(12):1295-304.
[4] Stanek J et al. (2018). *J Athl Train.* **53**(2):160-7. Stanek J et al. (2018). *J Athl Train.* **53**(2):160-7.
[5] McKeon PO et al. (2018). *Med Sci Sports Exer,* **48**(5):776-84.
[6] Chang TT et al. (2021). *Front Physiol.,* **12**:718827.

i. Schneebeli A et al. (2023). *Foo*