

## **Abstract**

This paper focuses on the observation of the effects of resistance training application in the treatment of Achilles tendinopathy (AT). Specifically, it focuses on the observation of the effect of resistance training on the morphological structure of the AT and the subjective perception of symptoms of AT tendinopathy.

The theoretical part discusses the current knowledge of anatomy, kinesiology, histology and biomechanics of the AT, pathological processes associated with the development of AT tendinopathy, differential diagnosis of painful conditions in the AT and therapeutic options. Specifically, the biological effects of resistance training in the treatment of AT tendinopathy are discussed.

The main objective of this research was to evaluate the effect of resistance training for the treatment of AT tendinopathy on the morphology of the AT using ultrasonography (US) examination along with spatial frequency analysis parameters in correlation with clinical manifestations.

**METHODS:** 12 patients with doctor-diagnosed unilateral symptomatic mid-portion tendinopathy of the Achilles tendon were included in the study. 11 patients completed the entire study and their results were statistically processed. This group of patients underwent a 12-week resistance training program for the treatment of Achilles tendinopathy as part of the intervention. Patients underwent clinical and ultrasound examinations at the start of the intervention, during the intervention after 6 weeks of exercise, and at the end of the intervention, 12 weeks after the start of the intervention. The clinical examination focused on subjective pain perception and AT function, where maximum pain (NRS) and VISA-A score were assessed. The anteroposterior width (TD) [mm] and cross-sectional area (CSA) [mm<sup>2</sup>] of the tendon at the anteroposterior widest site were recorded numerically during US examination. In addition, the AT was imaged with a special US setup for subsequent evaluation of the intratendinous structure and organization of the tendon using spatial frequency analysis (SFA). All examinations were performed on the symptomatic and asymptomatic lower limb (LL).

**RESULTS:** After the intervention, we observed statistically significant improvements in patient's maximum tendon pain and subjective perception of the disease. In contrast, we did not observe a statistically significant difference in US parameters between symptomatic and asymptomatic LL at baseline examination, nor a reduction in these parameters in symptomatic LL after intervention. We observed a statistically significant change in intratendinous tendon organization in three of the four SFA parameters examined in symptomatic LL and a higher

organization of the asymptomatic tendon compared with the symptomatic tendon in all SFA parameters.

**CONCLUSION:** Our results confirmed the effectiveness of resistance training for the treatment of AT tendinopathy on reducing maximal pain and improving subjective perception of disease over 12 weeks of exercise. Furthermore, the intervention was shown to improve intratendinous tendon organization in three of the four SFA parameters studied. Conversely, the results did not support a statistically significant difference in width between symptomatic and asymptomatic LL at baseline examination or a reduction in the width of the symptomatic tendon during the intervention in the US parameters studied. Through these results, we can conclude that there is a correlation between improvement in subjective disease perception parameters and improvement in intratendinous organization, but we cannot confirm the same correlation with tendon width according to TD [mm] and CSA [mm<sup>2</sup>] parameters.

## **Keywords**

Achilles tendon, Achilles micromorphology, Achilles tendinopathy, resistance exercise, ultrasonography