Back


# 8th World Congress of Biomechanics

O1418

## Biomechanical and histopathological investigation of the effects of high-dose vitamin C and hyaluronic acid on tendon healing

Yasar Mahsut Dincel[1], Oktay Adanir[2], Yavuz Arıkan[1], Aysel Kara Caglar[3], Suzan Cansel Dogru[4], Yunus Ziya Arslan[4]
[1]Department of Orthopaedics and Traumatology, Metin Sabanci Baltalimani Bone Diseases Training and Research Hospital, Istanbul, Turkey. [2]Department of Orthopaedics and Traumatology, Istanbul Bagcilar Training and Research Hospital, Istanbul, Turkey. [3]Department of Medical Pathology, Istanbul Bagcilar Training and Research Hospital, Istanbul, Turkey. [4]Department of Mechanical Engineering, Faculty of Engineering, Istanbul University, Istanbul, Turkey

## Abstract

### Introduction

Researchers have examined many factors to better understand the mechanisms of, and to speed up, tendon healing [1]. Among these factors are growth factors, mesenchymal stem cells, cytokines, gene therapy approaches, sodium hyaluronate, platelet concentrates, anticoagulants, and hyperbaric oxygen [2]. However, there exists no gold-standard treatment to improve tendon healing with the application of exogenous agents. The effects of hyaluronic acid (HA), which is known to have a preventive effect on adhesions, on the biomechanics of tendon are not fully known. Although HA has been used in humans after tendon repair, a consensus on its benefits is lacking. On the other hand, vitamin C (VC) has been shown to have beneficial effects on tendon healing, such as increased collagen fibril diameter, promotion of angiogenesis, and an increase in the number of fibroblasts in the healing period [3]. However, the number of studies regarding the effects of VC on tendon healing is limited. In this study, we aimed to investigate the histopathologic and biomechanical results of HA and VC administration in Achilles tendon ruptures treated with primary repair.

### Methods

Forty-eight Sprague-Dawley rats were randomized to HA and VC and control groups, equal in number. Each group was further divided into two subgroups to be sacrificed on Day 15 (*n*=8) and Day 30 (*n*=8). The Achilles tendons were cut and repaired. While the control rats remained untreated, HA and VC were administered after repair. The repaired tendons were removed for biomechanical and histopathologic analyses. On biomechanical tests, the tendons were stretched to failure and maximum forces were measured. For histopathologic examination, the specimens were interpreted semiquantitatively using the Movin's grading scale and Bonar's scores. Histopathologic

findings were analyzed using the Kruskal-Wallis and Mann-Whitney U tests, and biomechanical findings were analyzed using one-way ANOVA.

## Results

The highest mean tensile forces were obtained in the HA group on Day 15 and in the VC group on Day 30, with significant difference between HA and VC on Day 15 and between control and VC on Day 30 ($p<0.05$). On histologic examination, in all the groups, both Movin and Bonar scores decreased on Day 30, with significant improvements in the HA and VC groups ($p<0.05$).

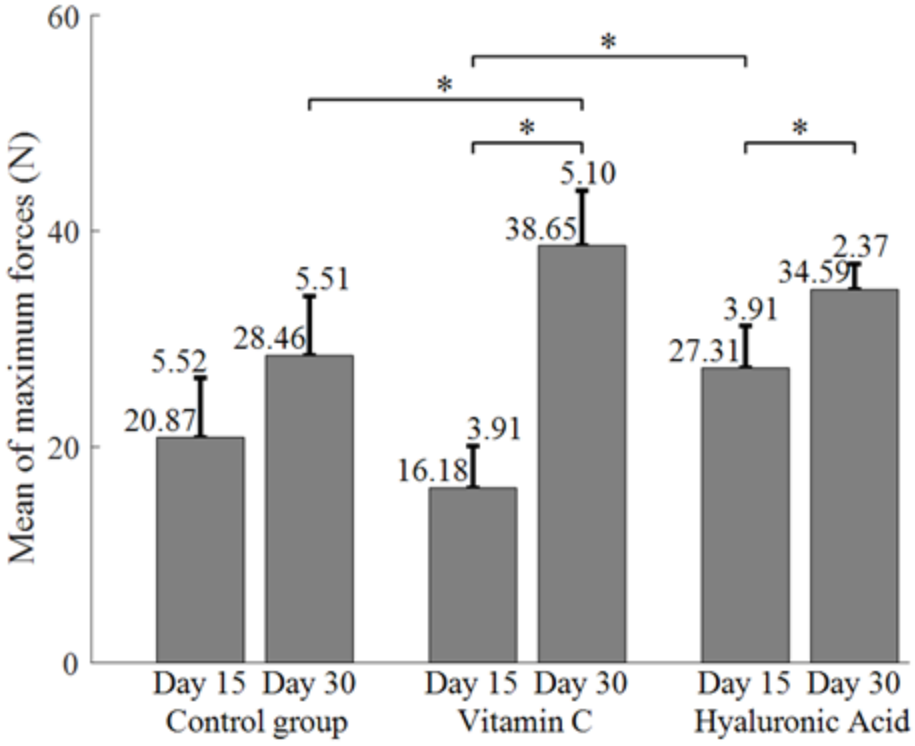


**Figure:** Mean of the maximum tensile force values of the tendons on Day 15 and Day 30 (*$p<0.05$).

## Discussion

This study demonstrated that both VC and HA had therapeutic effects on tendon healing, especially in the late phase of tendon repair. Further experimental studies may provide more conclusive data for the use of VC and HA in Achilles tendon injuries.

## Acknowledgements

This research was funded by Istanbul Bagcilar Training and Research Hospital, Turkey.

## References

1. Hess GW., (2010). Foot Ankle Spec 3(1):29-32.

2. Derelioglu N., et al., (2004). Acta Orthop Traumatol Turc. 33:221-224.

3. Omeroglu S., et al., (2009). Arch Orthop Trauma Surg. 29:281-286.