

Influence of the contraction mode on the tendon structure: Rat model.

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Introduction:

Tendinopathies are common in sport and affect both upper and lower limbs. Eccentric rehabilitation is a successful way of treating them and now is becoming the "gold treatment". Although clinical results are very favorable, beneficial morphological and histological effects have not yet been elucidated. The aim of our experiment was to determine if there exist any intrinsic modifications in a tendon trained in concentric or eccentric modes, in a rat model.

Methods:

18 rats were divided into 3 groups: 6 for the control group, without physical restraint; 12 for a training of 1 hour, 3 times a week, for 5 weeks, at a speed of 17m/min (1km/h), on a inclined treadmill: 6 rats running uphill at +15° for the concentric effort (group C) and 6 rats running downhill at -15° for the eccentric effort (group E). After this training period, the Achilles, patellar and tricipital tendons of both limbs were surgically removed in all 18 rats. Tendons taken from five rats of each group were subjected to a tensile test up to rupture using a "cryo" jaw. Tendons of the remaining rat of each group were subjected to a histological study.

Results:

The results showed significant changes in group E only: (1) an increase of the force required to rupture the patellar and tricipital tendons; (2) an improvement of the ratio between the force necessary to rupture the tricipital tendon and the body mass of the rats; (3) an increase of the surface area of the section of the tricipital tendon. No significant change was observed as far as constraint was concerned between groups. Histologically, we saw, in the group E, more peripheral blood vessels and a greater proportion of collagen.

Conclusion:

This study showed that the mechanical properties of tendon tissue are enhanced by eccentric training. Tendons become stronger, the amount of collagen increases and there is probably more interaction between collagen fibers (mechanotransduction).

Keywords:

Tendinopathy, eccentric rehabilitation, mechanotransduction.