Effect of oral contraceptives on patellar tendon collagen synthesis at rest and in response to exercise

Hansen M, Langberg H., Koskinen S., Petersen SG, Døssing S, Magnusson, P., Kjaer M. Institute of Sports Medicine, Bispebjerg Hospital, Copenhagen, Denmark

Introduction: Women are in a higher risk of sustaining curtain kind of injuries and diseases related to the collagen-rich tissue of the skeletal muscle system compared to men. This study was design to exam whether use of oral contraceptives (OC) and thereby enhanced level of ethinyl-estradiol affect tendon collagen metabolism, in vivo, at rest, and in response to strenuous exercise. Based on animal and in vitro studies we hypothesis that OC would have an inhibiting effect on tendon collagen synthesis.

Material and Method: Healthy, young women; oral contraceptive users (OC)(n=8) and never-OC-users (n=8) in the follicular phase of the menstrual cycle, when the level of estradiol is low, were studied the day after 1 h of 1-legged kicking exercise at 67% of Watt max. Microdialysis catheters were placed in the peritendinous space in front of the patellar tendon. The collected dialysate was analyzed for aminoterminal propeptide of type I collagen (PINP), a marker of collagen formation. Cross-Sectional Area (CSA) of the patellar tendon was measured by magnetic resonance imaging. Besides, fractional protein synthesis rates (connective tissue, myofibrillar protein and tendon tissue), whole body protein synthesis, protein oxidation and protein degradation were measured by infusion of stabile isotope labeled amino acids ([1-13C]leucine, [13C]proline) followed by biopsies (rest and 24h post ex) from mm. vastus lateralis and patellar tendon.

Results: At rest no differences between OC-users and never-OC-users in PINP in the dialysate were observed. However, the never-OC-users experienced an exercise-induced increase in collagen synthesis (PINP (ng/ml) Mean +/- SD, Rest 7.9 +/- 2.9 vs Exercise; 11.3 +/- 5.6, p < 0.05), whereas no significant change was observed in the OC-group (Rest 5.9 +/- 3.5 vs. Exercise; 6.6 +/- 3.4, p = 0.49). No differences in the patellar tendon CSA was observed between OC-users and never-OC-users. Discussion/Conclusion: A stimulating effect of exercise on tendon collagen synthesis has earlier been shown in young men. For the first time in vivo an inhibiting effect of OC was observed on the exercise-induced increase in tendon collagen synthesis. However, in the situation with naturally low level of estradiol we were able to detect a stimulating effect of exercise on tendon collagen synthesis. No difference in tendon CSA was detected, but the change in collagen turnover may influence collagen density and biomechanical properties of the tendon. Forthcoming results will hopefully shed light on additionally aspects of the effects of OC on protein metabolism.