Corticosteroids reduce tensile strength of isolated collagen fascicles

Haraldsson B.T., Langberg H., Aagaard P., Kjaer M., Magnusson S.P.
Institute of Sports Medicine, Copenhagen, Denmark

Introduction
Tendinopathies are frequently sustained in both recreational sports and in the work place, and corticosteroid injections are commonly used to treat these overload injuries. However, the direct effects of the corticosteroids on tendon material properties are poorly understood. The present study examined the influence of corticosteroids on the tensile strength of isolated collagen fascicles.

Methods
Single strands (ø 0.3-0.5 mm) of rat-tail collagen fascicles were incubated in either high (1mL of 40 mgmL⁻¹ mixed with 0.5 mL saline 9% - HC) or low concentration (1mL of 40 mgmL⁻¹ mixed with 2 mL saline 9% - LC) of methylprednisolone acetate (Depo-metrol) for 3 or 7 days while the control segment from the same fascicle was kept in saline. Thereafter the fascicles underwent displacement to failure in a mechanical test rig at 0.13 mm/s. The samples were divided into four intervention groups (3 days HC & LC, 7 days HC & LC) consisting of eight strands with accompanying control specimens for a total of 64 strands. The data for each concentration was analysed with a 2-way ANOVA (time x treatment) for peak stress (MPa)(mean±SD).

Results
There was a significant reduction in tensile strength as a result of the HC corticosteroid treatment, P<0.001. The strength was reduced by 45 % after 3 days and 67 % after 7 days compared to the controls. There was also a significant reduction in tensile strength as a result of the LC corticosteroid treatment, P<0.001. The strength was reduced by 62 % after 3 days and 66 % after 7 days compared to the controls.

Fig. 1 – Peak stress values for isolated collagen fascicles incubated in corticosteroids and corresponding controls. A) Peak stress values for fascicles incubated in the higher concentration of corticosteroids for 3 and 7 days (n=8). B) Peak stress values for fascicles incubated in the lower concentration of corticosteroids for 3 and 7 days (n=8). * indicates significantly different from control, P<0.05.

Discussion/Conclusion
To our knowledge, this is the first study to examine the effect of corticosteroid treatment on isolated collagen fascicle strength. The results clearly demonstrate that the tensile strength of isolated collagen fascicles is markedly reduced after 3 and 7 days incubation in high or low concentration of corticosteroids. Although the magnitude of the observed effect on whole tendon remains unknown, it is likely that corticosteroid treatment will weaken the tendon, thus making it more prone to rupture.