

## Role of interfibrillar proteoglycans in tendon elastic recoil

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Force transmission and elastic recoil in tendon are related to fibre and fibrillar crimps. Tendon fibrils arrange in a network system in which forces are also laterally transferred between neighbouring fibrils through interfibrillar proteoglycans. The interfibrillar proteoglycan decorin with a dermatansulphate chain (DS) represents the 90% of tendon proteoglycans and seems to transfer forces between fibrils during tendon stretching. DS in decorin and biglycan may also play a role in packing fibrils forming crimps. Aim of this study was to investigate whether decorin and biglycan DS affects the microstructure/function of fibrillar crimps in tendon elastic recoil. Four relaxed Achilles tendons of 8 rats (group I) were immediately immersed for 6 hours in Chondroitinase-B solution, fixed, dehydrated and prepared for SEM. Other 4 tendons (group II) were fixed in a clamp, stretched 5 - 6 % in Chondroitinase-B solution, fixed in Karnovsky solution under stretching and processed as group I. Other 4 tendons (group III) were clamped, stretched in Chondroitinase-B solution for 6 hours, removed from the clamps to allow relaxation, fixed and processed as above. Other 4 tendons (group IV) were immersed in saline solution and mechanically disrupted to obtain isolated fibrils for TEM. Both enzymatic and mechanical removal of DS in relaxed tendons of group I and IV didn't affect the morphology of fibre and fibrillar crimps. All collagen fibrils of group I showed crimped fibres showing particular knots or fibrillar crimps at the top of each fibre crimp: fibrils twisted leftwards first, changing their plane of running, and then sharply bent, changing their course on the new plane. Stretched tendons in Chondroitinase-B solution (group II) showed flattened crimps but regular fibrillar crimps were still present. Stretched tendons immersed in Chondroitinase-B solution, relaxed and fixed (group III) showed both regular fibre and fibrillar crimps: a fibril local leftward twisting and bending in the fibrillar crimp regions was observable like in group I. These data demonstrate that structure/function of fibrillar crimps in recoiling fibrils/fibres in tendon does not depend on DS, but seems to be related to the hierarchical alternating handedness of collagen structures.

Keywords: tendon, elastic recoil, crimps, fibrillar crimps, proteoglycans.