IJAE
Vol. 119, n. 1 (Supplement): 161, 2014
ITALIAN JOURNAL OF ANATOMY AND EMBRYOLOGY

Ultrastructural aspects of mineralization-induced modifications in turkey tendon

Mario Raspanti, Marcella Reguzzoni, Marina Protasoni, Terenzio Congiu

Department of Surgical and Morphological Sciences, Insubria University, 21100 Varese, Italy

In all tendons the collagen fascicles follow a wavy course (actually a flattened left-handed helix) forming visible crimps. Each crimp corresponds to a sharp bend and/or an axial twisting of individual collagen fibrils (Raspanti et al., 2005; Franchi et al., 2010), and even once the fibril are straightened out a permanent local deformation remains visible, still revealing the original crimp location (Raspanti et al., 2005).

The tendons of some birds represent a special case as they undergo a physiological process of gradual mineralization involving heavy modifications of the tissue architecture. In the present research, turkey tendons appeared to be more finely subdivided into thinner fascicles than most tendons; they contained a greater amount of cell-rich endotenon tissue as well as occasional nodules of cartilage-like matrix. The most striking finding, however, was the complete disappearance of the crimps in the calcified portions of the tendon, while they were present with the usual morphology in the non-mineralized portion. The mineralized fibrils ran perfectly straight, but the electron microscopy revealed traces of pre-existing crimps locked in the extended position by the mineralization process. The inorganic phase itself appeared composed of two different types of fine particles, respectively growing inside or around the collagen fibrils and looking as tightly packed fine needles or as larger platelets regularly arranged in relation with the D-period.

The perifibrillar mineral could play a critical role in the mechanical coupling of adjoining fascicles and in the transmission of tensile loads along the tendon itself.

References

[1] Raspanti et al. (2005) The 3D structure of crimps in the rat Achilles tendon. Matrix Biol 24: 503-507.
[2] Franchi et al. (2010) Tendon and ligament fibrillar crimps give rise to left-handed helices of collagen fibrils in both planar and helical crimps. J Anat. 216: 301-319.

Keywords

Extracellular Matrix, Tendon, Crimps, SEM, Mineralization.