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Purpose

Histology of the equine hind suspensory ligament (SL) has mainly focussed on the ligament itself.¹ In human medicine, the enthesis or tendon-to-bone insertion is generally considered a linked entity or 'enthesis-organ' and several types have been determined.² Dedicated research in equine medicine is lacking. This poster describes the preliminary results of histological evaluation of the proximal SL enthesis in the normal equine hindlimb.

Methods

The SL enthesis of a hindlimb from a 6y-old Warmblood horse, euthanized for colic and without history of lameness, has been divided in 6 sagittal compartments based on post-mortem CT examination (proximal-distal, each lateral-sagittal-medial, fig. 1). After freezing and cutting, the specimens (ca. 10mm) were decalcified, sliced (ca. 5µm) and prepared for hematoxyline-eosine (HE) and trichrome (TC) staining.

Results

The ligament-to-bone insertion was visible in 5/6 slices (fig. 2). The distosagittal slice was considered too distal. All identified entheses revealed a similarly organized 4-layered appearance (fig. 3) consisting of compact bone (MT3), calcified fibrocartilage (CF), uncalcified fibrocartilage (UF) and ligamentous collagen fibers (SL). The fibrocartilage layer varied in thickness and cellularity between and within compartments. In all, however, it consistently showed multiple aligned columns of chondrocytes (fig. 4), with a clear tidemark separating the CF and UF. The tidemark (or ossification front) was generally smooth. The plantar cortical and/or dorsal ligamentous outlines, however, were mostly irregular with several variable interdigitations.



Fig. 1 Dorsal (left) and sagittal (right) MPR reconstruction of the proximal 3rd metatarsal bone (MT3). Cutting lines for histological specimens based on CT measurements are illustrated (double arrows, left). The tarsometatarsal joint was located through needle placement for transverse sections. A tape measure on the specimen was used for sagittal cuts. The insert (right) serves as a guide for histological slice orientation in fig 2-4 below.

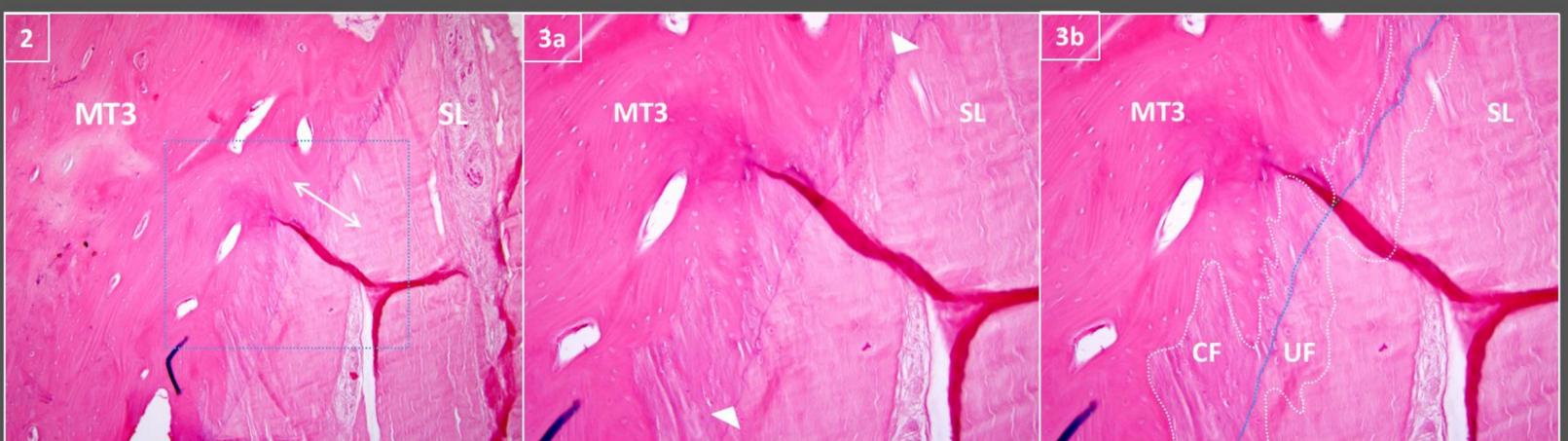


Fig. 2 Sagittal slice of the proximal suspensory enthesis at the proximolateral compartment (HE, 100x). The tendon-to-bone insertion is indicated (double-headed arrow). Insert: see fig. 3.

Fig. 3 Native (a) and illustrated (b) detail of the enthesis (HE, 200x) showing the typical 4-layered appearance of fibrocartilaginous entheses: bone (MT3), calcified fibrocartilage (CF), uncalcified fibrocartilage (UF) and ligament fibers (SL). The tidemark (a: arrowheads, b: blue line) separates the CF and UF. The cortical and/or ligamentous outline (b: white lines) show several interdigitations.

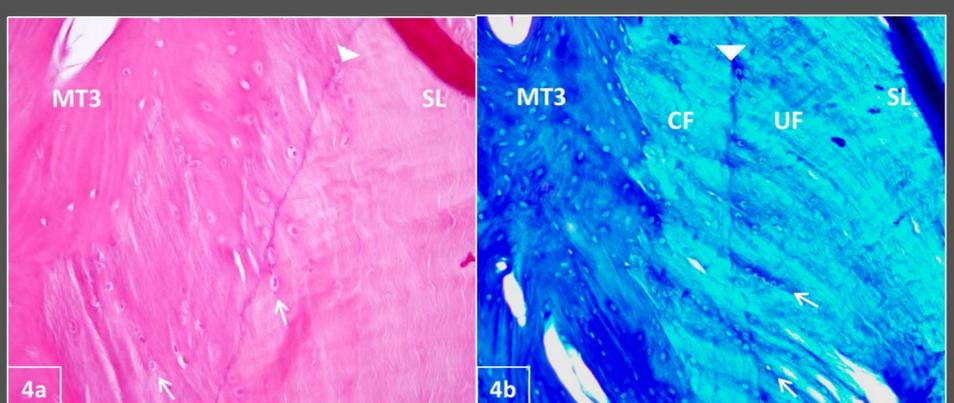


Fig. 4 Detail of the fibrocartilage layer (a: HE, 400x; b: TC, 200x) with multiple aligned columns of chondrocytes (arrows).

Conclusion

Results of this single-subject pilot study show, in agreement with human medicine, that the equine hind proximal SL enthesis is fibrocartilaginous in nature.^{2,3} Such fibrocartilaginous entheses are often found in biomechanically complex structures and their heterogeneous morphology is considered to play a key role in stress dissipation from tendon to bone.³ Whether the fibrocartilaginous nature affects imaging criteria for the diagnosis of proximal SL enthesopathy, for example 3rd metatarsal cortical outline, needs to be elucidated. Further analysis evaluating morphological or adaptive variation and its imaging presentation will be performed.