Morphological matching of proximal interphalangeal (PIP) joint arthritis-related entheses

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Phylogenetically, hands in lower primates gradually loose the rectangular convex articular surfaces of the proximal interphalangeal (PIP) joints of their fingers (Franzen, 1993; van Zwieten et al., 2013). Higher primates, humans included, therefore display a trapezoidal contour of the so-called trochlea of their fingers' PIP joints at transverse section. The slant lateral sides of these heads of the human proximal phalanges thus offer ample spaces for bony attachments of the PIP collateral ligaments, the so-called entheses. Enthesitis as a key-mechanism in human arthritis has been investigated by various authors (e.g., McGonagle et al., 2003). Such analyses however, often rely upon diagrammatic or cartoonesque sketches of PIP joints at coronal section, meanwhile hypothesizing that mechanical factors e.g., the bending of tensional forces within fibrocartilaginous entheses during joint movements may play important roles in developing arthritis. A meticulous reappraisal was therefore carried out, based on coronal HR-MRI slices of a normal anatomical specimen of an extended PIP joint (Lippens et al. , 1997) to match with these and similar sketches in current literature. As a result, we can confirm the bending of collagen fibers in PIP collateral ligaments. However, additional coronal histological sections (Masson Trichrome & Weigert Orcein staining) of a PIP collateral ligament from a normal finger anatomical specimen, observed under low power magnification, reveal crisscrossing of collagen fiber bundles with virtually no elasticity. This contrasts with the simple parallelism of collagen fibers as sketched in the diagrams from literature. Crisscrossing is also confirmed by interpreting HR-MRI slices. Remarkably, this arrangement had been noted in hand-surgery decades ago (Hintringer and Leixnering, 1991).

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