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COORDINATION OF INTERPHALANGEAL FLEXION IN THE HUMAN FINGER

K. J. van Zwieten¹, P. L. Lippens¹, J. Gelan¹, P. Adriaensens¹,
K. P. Schmidt¹, C. Thywissen², W. Duyvendak³

¹*Department of Anatomy, BioMed Institute, University of Hasselt, Diepenbeek, Belgium*

²*Department of Radiology, Virga Jesse Hospital, Hasselt, Belgium*

³*Department of Neurosurgery, Virga Jesse Hospital, Hasselt, Belgium*

Background: The extensor assembly of the finger consists of tendon fibres of extrinsic and intrinsic finger extensor muscles. Its respective fibre bundles are often depicted as single lines, although the medial bundle and lateral bundles are flattened ribbon-like structures at the proximal interphalangeal (PIP) joint level. Beyond the extended joint these bundles maintain dorsal positions.

Aims: Providing anatomically based details, to further explain the coordination of finger interphalangeal motion, with possible clinical applications.

Methods: Mathematical modelling of the finger in extension and flexion, based on measurements in anatomical specimens after microdissection and by HR-imaging techniques.

Results: Lateral bundles of the extensor assembly constitute the terminal extensor tendon of the distal interphalangeal (DIP) joint. In PIP flexion the lateral bundles shift to more volar and distal positions. The shifts are controlled by the spiral fibre apparatus, which suspends them to the medial bundle. The trajectories of the lateral bundle elements are shorter than that of the medial bundle. As a result, the terminal extensor tendon connected to the third phalanx becomes slackened and will shift distally, thus allowing distal interphalangeal flexion simultaneous with proximal interphalangeal flexion. The lateral bundles are now located in the sagittal plane.

Conclusions: Proximal interphalangeal flexion and distal interphalangeal flexion are correlated by controlled shifts of the lateral bundles of the extensor assembly. Plotting of the successive angles of DIP flexion against corresponding angles of PIP flexion results in a sigmoid curve

Discussion: In a patient with intrinsic minus fingers due to ulnar nerve compression neuropathy at his elbow, the sigmoid curve is more convex. This effect is most pronounced during the early phases of flexion. It is suggested that the slope of the sigmoid curve might be a parameter to evaluate functionality of finger flexion.