Extensor retinacula of the ankle and foot: do they exist as illustrated in textbooks?

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BACKGROUND
A review of literature and anatomical textbooks/atlases revealed similar descriptions of the extensor retinacula in the ankle region. Particularly striking is their uniform delineation showing typically a broad transverse superior retinaculum (SER) and a distinctive Y-shaped inferior retinaculum (IER). This study was undertaken to re-visit the anatomy of the deep fascia over the distal leg, ankle, and dorsum of the foot.

METHODS
The arrangement of the deep fascia in the three regions was recorded in 14 lower limbs of adult cadavers (5 male and 2 female of Caucasian origin and with a mean age of 79) using photographs and drawings. The fascial layer from all three sites was subsequently removed in total, and serial thickness measurements were made along its entire length. In addition, fiber disposition was studied under polarized light, and histological sections were stained to demonstrate collagen.

RESULTS
Thickened bands of deep fascia were complex with variations of major retinacula and the presence of additional bands. Their width and thickness ranged from 5-123mm and 40-550µm, respectively. The SER was identified as a 3.5-cm long and 270µm thick band of deep fascia located 3 cm proximal to level of lateral malleolus. The IER often resembled the shape of a cruciate (7 out of 12) rather than the described Y-shaped appearance. Less commonly (5 out of 7), the IER was identified as a thickened band (node) located 1-2 cm distal to the level of lateral malleolus over the common tendon of extensor digitorum longus and with smaller bands running from its ends to the malleoli. This node represented the thickest part (mean=430µm) of the whole deep fascia. A distinctive "criss-cross" pattern of thickened bands and orientation of fibers was often observed and confirmed by histology and polarizing light. A characteristic symmetry or "mirror-image" arrangement of thickened bands, retinacula, and "anchoring" extensions from deep fascia was also observed.

CONCLUSIONS
The findings suggest the presence of a special architecture of deep fascia designed to enhance stability and support of ankle and foot regions, and may have implications in mechanisms of injury and surgical repair. In considering the sites of thickening of deep fascia, the question is raised as to what physical forces may act over the dorsum of the ankle and foot regions.