

Histological characteristics of the deep fascia of the upper limb

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SUMMARY

Post-mortem specimens taken from the antebrachial and brachial fasciae of 20 upper limbs were studied by histological and immunohistochemical staining in order to evaluate collagen fibre bundle arrangement, the presence of elastic fibres, and the density of innervation in deep muscular fascia. The study demonstrated that the fasciae are formed of numerous layers of undulating collagen fibre bundles. In each layer, the bundles are parallel to each other, whereas adjacent layers show different orientations. Each layer is separated from the adjacent one by a thin layer of adipose tissue, like plywood. Many elastic fibres and a variety of both free and encapsulated nerve endings, especially Ruffini and Pacini corpuscles, are also present, suggesting a proprioceptive capacity of the deep fascia.

Thanks to the undulating collagen fibre bundles and elastic fibres, the fasciae can adapt to stretching, but this is only possible within certain limits, beyond which nerve terminations are activated by stretching. This mechanism allows a sort of "gate control" on the normal activation of intrafascial receptors. The capacity of the various collagen layers to slide over each other may be altered in cases of over-use syndrome, trauma or surgery. In such cases, the amortising mechanism of the fascia on the nervous terminations is lost, causing incorrect paradoxical activation of nerve receptors within the fascia, resulting in the propagation of a nociceptive signal even in situations of normal physiological stretch. At the same time, the layered collagen fibres allow transmission of tension according to the various lines of force. This structure of the muscular fascia guarantees perceptible and directional continuity along a particular myokinetic chain, acting like a transmission belt between two adjacent joints and also between synergic muscle groups.