

The Innervation of the Fascia Thoracolumbalis

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BACKGROUND: Data about the neuroanatomy of the thoracolumbar fascia (TLF) are scarce, and the existing findings are partly contradictory. Therefore, the question as to the role of the thoracolumbar fascia as a potential source of low back pain is relevant.

METHODS: Tissue sections (N = 66) of TLF in adult male Sprague-Dawley rats (N = 5) were studied by the avidin biotin peroxidase method for the presence of nerve fibres. Antisera to the protein gene product 9.5 (PGP 9.5), a global marker of nerve fibres, were used to obtain an overview of the density of the innervation. Neuropeptide-containing fibres are generally assumed to be sensory; they were investigated by using antisera to substance P (SP) and calcitonin gene-related peptide. In addition, microelectrode recordings of spinal dorsal horn neurons (N = 25) both in intact animals and in animals with inflamed low back muscle were made in the segments L2 and L3 to find dorsal horn neurons having input from the TLF.

RESULTS: Fig. 1 shows the dense innervations of the TLF. We can demonstrate that the TLF is a highly innervated tissue, but there are significant differences within the different fascial layers. (1. external layer: dense connective tissue adjacent to the subcutaneous tissue, 2. middle layer: massive collagen fibre bundles, 3. inner layer: loose connective tissues overlying the muscle). The presence of SP containing free nerve endings (identified by the presence of at least 3 varicosities) was largely restricted to the external layer (94.9 % of all SP fibers in this layer) and the subcutaneous connective tissue (69.4 % of all SP containing fibers in this layer). There were no SP fibers or free nerve endings in the middle layer. The electrophysiological data show that in intact animals, there exist a relevant proportion of dorsal horn neurons having input from TLF (12 %), however an experimentally induced chronic inflammation of lumbar back muscles increased this proportion of neurons significantly (26%).

CONCLUSION: This study, by showing a tight neural innervation of the TLF, has important implications on the current concepts of lower back pain and opens a new avenue of therapeutic strategies. Particularly interesting are the substance P containing free nerve endings, because they are considered to be nociceptive. These endings were most abundant in the subcutaneous tissue and the external layer of the fascia. The data demonstrate that the TLF of the rat is a potential source of low back pain. Future studies on human tissue will have to show if the present findings can be transferred to low back pain patients.

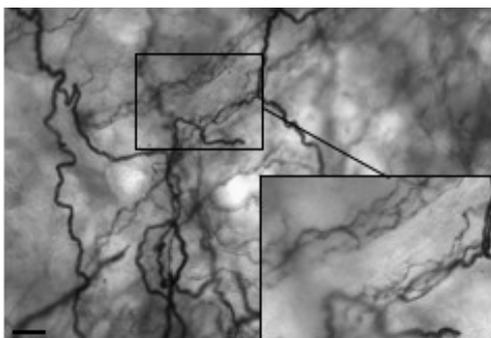


Fig.1: Whole mount preparation of the rat thoracolumbar fascia showing a dense network of PGP 9.5-positive fibres. The inset shows thin nerve fibres accompanying small blood vessels at a higher magnification (TFL tissue from the L4/L5 level, black bar = 100 μ m).