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Pain sensitivity of human fascia and muscle Sensory findings after chemical and electrical stimulation

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In many patients, chronic low back pain cannot be explained by abnormalities in the bony structures of the vertebral column. Due to their dense innervation, fascia and muscles of the lower back are potential alternative sources of nociceptive input in these patients with "non-specific low-back pain". The present work aimed at investigating differences between fascia *(thoracolumbar fascia)* and muscle *(erector spinae muscles/multifidus muscle*) of healthy human volunteers regarding pain intensity, pain quality, and pain radiation in response to brief chemical and electrical stimuli, and the short-term and long-term changes in pain sensitivity induced by these stimuli.

In two separate series of experiments, fascia and muscle were stimulated with injections of hypertonic saline and electrical stimuli applied through bipolar concentric needle electrodes. In both experiments, needle placement inside the fascia was verified by ultrasound. For comparison, the skin was also stimulated.

Chemical Stimulation of fascia with hypertonic saline caused higher pain intensity with a higher magnitude of affective pain descriptors, and wider pain radiation compared to muscle stimulation. Furthermore, chemical stimulation of the muscle, not of the fascia, led to a sensitization to blunt pressure. Stimulation of the fascia with electrical high-frequency pulses (HFS) revealed higher pain intensity than muscle stimulation, but pain radiation was similar. Only HFS of the fascia, not of the muscle, induced a long-term potentiation of pain at the site of stimulation. HFS of the muscle, however, reduced pain sensitivity of the overlying fascia. Neither HFS of the fascia nor of the muscle changed the somatosensory profile of the skin or the sensitivity to blunt pressure. Sensory descriptors for fascia pain were similar to those for cutaneous pain, while descriptors for muscle pain were those usually associated with deep tissues.

These studies suggest that the fascia of the lower back might be a key structure in the genesis of nonspecific low-back pain, because of its high innervation density, its high pain sensitivity to several stimuli, and substantial pain amplification after its stimulation. Effects of muscle nerve stimulation in previous studies may have been at least partly due activation of afferents from the fascia that run through these nerves. Therefore, treatment of input from the fascia may be an important target for prevention and treatment of back pain. However, contributions of muscle input cannot be excluded based on these findings, since due to its much larger volume the muscle may generate more spatial summation than fascia or skin.