Temperature effects on fascia

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Summary

The use of heat is a common tool in the treatment of muscular disorders such as stiffness or myalgia. Clinical data as well as in vitro experiments demonstrate that increased temperature leads to a heat-related myofascial relaxation. The mechanisms underlying the so-called resting muscle tone are not well understood. In this study we investigated the differential effects of temperature on skeletal muscle fibers and the fascial structures.

We performed mechanographic force registrations on freshly dissected samples from rats as well as humans. The muscle strips and fascia samples were placed in a physiological organ bath. During temperature was increased from 20°C to 40°C both resting basal tension and the peak force were measured with and without electrical stimulation of the tissue.

At low temperatures, the muscle strips showed a relaxation-deficit which lead to cold-induced stiffness and mimicked a myotonic syndrome. Muscle strips lacking epi- and perimysium had a basal tension which was unchanged or even higher at increased temperature. This effect contrasts with the reported heat relaxation in collagenous connective tissues.

We showed that increased temperature leads to an enhancement in the functional properties of skeletal muscles in terms of both accelerated contraction and relaxation parameters. There is a tendency towards a heat induced increase of basal muscle tension in muscle strips lacking epi- and perimysium. Our findings on isolated muscle fibers are in contrast to the heat-induced relaxation of resting muscle stiffness. We speculate that, apart from temperature effects on peripheral nociceptors and the nervous system in vivo, there is a direct fascial relaxation that contributes to heat-induced relaxation. This supports the notion that the regulation of fascial stiffness plays a major part in resting muscle tone.