

Lumbodorsal Fascia Does Not Affect Passive Signaling Properties of Lumbar Paraspinal Muscle Spindles

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BACKGROUND: Muscle spindles are proprioceptors that respond to muscle lengthening and shortening. They also respond to transverse forces experienced by muscle [1]. In the lumbar spine, the lumbodorsal fascia creates a compartment enclosing the longissimus and multifidus muscles. Tension in this fascia may load the enclosed muscles and affect proprioceptive signaling. We tested the null hypothesis that the responsiveness of lumbar paraspinal muscle spindles is not different in the presence and absence of the lumbodorsal fascia.

METHODS: We used a previously described approach in the anesthetized cat [2, 3] and compared the history-dependent responsiveness of paraspinal muscle spindles in the presence and absence of the lumbodorsal fascia. Single unit activity from 12 afferents was recorded in the L₆ dorsal root from multifidus and longissimus muscle. To create muscle history, a feedback controlled motor attached to the L₆ spinous process actuated (range 1.0 – 1.5mm) and held (conditioned) the L₆ vertebra in directions that lengthened or shortened the paraspinal muscles. Conditioning was applied in both caudal-cranial (C-C) and left-right (L-R) directions. Following 4s of conditioning the L₆ vertebra was returned to a reference position for 0.5s (STATIC TEST) and then slowly actuated (0.2mm/s) to its long conditioning position (DYNAMIC TEST).

RESULTS: Resting muscle spindle discharge was similar with the fascia intact vs. removed [30.7 (11.8) vs. 31.5 (9.8) imps/s, mean (SD), $p=0.49$]. STATIC TEST: Long conditioning decreased muscle spindle discharge but the decrease was not significantly different with the fascia intact vs. removed in either the C-C [-18.2 (8.3) vs. -18.8 (7.3) imp/s, $p=0.64$] or the L-R (-9.4 (8.4) vs. -8.6 (7.3) imp/s, $p=0.77$) direction. Short conditioning increased spindle discharge but the increase was not different with the fascia intact vs. removed in either the C-C [6.2 (2.6) vs. 5.7 (3.6) imps/s, $p=0.89$] or the L-R (3.8 (2.2) vs. 4.4 (2.8) imp/s, $p=0.36$) direction.

DYNAMIC TEST: Similarly, long conditioning decreased spindle responsiveness to movement. The decrease was not different with the fascia intact vs. removed in either the C-C ($p=0.53$) or the L-R ($p=0.26$) direction. Short condition slightly increased dynamic spindle responsiveness, but again the increase was not different with and without the fascia for either the C-C ($p=0.71$) or L-R ($p=0.86$) direction.

CONCLUSIONS: The lumbodorsal fascia does not affect proprioceptive signaling of lumbar paraspinal muscles spindles to small passive vertebral movements in the lumbar spine.

REFERENCES:

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