Abstract

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Changes in muscle spindle firing in response to length changes of neighboring muscles.

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Abstract

Skeletal muscle force can be transmitted to the skeleton not only via its tendons of origin and insertion, but also through connective tissues linking the muscle belly to surrounding structures. Through such epimuscular myofascial connections, length changes of a muscle may cause length changes within an adjacent muscle and, hence, affect muscle spindles. The aim of the present study was to investigate the effects of epimuscular myofascial forces on feedback from muscle spindles in triceps surae muscles of the rat. We hypothesized that, within an intact muscle compartment, muscle spindles not only signal length changes of the muscle they are located in, but can also sense length changes that occur as a result of changing the length of synergistic muscles. Action potentials from single afferents were measured intra-axonally in response to ramp-hold-release (RHR) stretches of an agonistic muscle at different lengths of its synergist, as well as in response to synergist RHRs. A decrease in force threshold was found for both soleus and lateral gastrocnemius afferents along with an increase in length threshold for soleus afferents. In addition, muscle spindle firing could be evoked by RHRs of the synergistic muscle. We conclude that muscle spindles not only signal length changes of the muscle they are located in, but also local length changes that occur as a result of changing the length and relative position of synergistic muscles.

KEYWORDS: muscle spindle; myofascial force transmission; proprioception; rat; triceps surae

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