

[171] LATERAL OR MYO-FASCIAL FORCE TRANSMISSION IN SKELETAL MUSCLE

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PURPOSE--Experiments on single myofibers and small bundles of myofibers indicate that lateral force transmission can take place. On the basis of morphological studies of 'in-series fibered muscle' and biomechanical modeling, it has been argued that force could also be transmitted laterally from the tapered ends of myofibers onto paired myofibers via the intramuscular connective tissue component. Shearing of the interfaces between myofibers is hypothesized to be the mechanisms of transmission. The interfaces are made up of basal membranes of both myofibers and their common endomysium.

The purpose of this project is to study the functional importance of such effects in fully activated whole muscle.

METHODOLOGY--Gastrocnemius medialis and EDL muscle of Wistar rats were studied: length force characteristics and muscle geometry were determined. The morphology of EDL muscle allows interference with myotendinous force transmission for selected parts of the muscle by performing distal tenotomy. Aponeurotomy allows interference with the inter fiber interfaces.

PRELIMINARY RESULTS--It is estimated that by tenotomy of head II, III, and IV, up to 55 percent of the physiological cross-sectional area is prevented from using myotendinous force transfer.

The decrease in force is always considerably less than 55 percent. For example, optimum force decreased to 84 percent of whole muscle optimum force, as optimum length shifted by 1.6 mm to higher muscle length. The shift of optimum length is compatible with changes of estimates of active fiber length. Interference with interfiber interfaces decreased lateral force transmission in proportion to the magnitude of interference, but did not fully eliminate it.

IMPLICATIONS--These results show the importance of lateral force transfer from myofibers in whole muscle to the intramuscular connective tissue. So, in fact, two parallel paths for force transfer are available: myo-tendinous and myo-fascial

transfer. Regarding myo-fascial force transfer, the possibility has to be considered that force will be transmitted from the muscle by other than myotendinous paths.

RECENT PUBLICATIONS FROM THIS RESEARCH

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