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Ultrastructural modifications of myotendinous junction with disuse

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The skeletal muscle contraction is transmitted to the tendon through the myotendinous junction (MTJ), where the proximal extremity of tendon forms characteristic finger-like processes, penetrating into the muscle mass (Ciena et al., 2010). MTJ represents an intriguing and complex structure from both biological and functional point of view. We recently demonstrated that changes at MTJ level occur as an adaptation to exercise-induced tension increase. In particular, branching of finger-like processes increases, so enlarging the whole tendon-muscle surface area and, consequently, allowing a better tension resistance (Curzi et al., 2012). The aim of this study is to analyse MTJ behavior in disuse condition, furtherly investigating the strict morpho-functional correlation. Therefore, 4 hind-limb suspended and 4 control rats were studied. After sacrifice, MTJs of plantaris muscle were withdrawn, fixed in 1.4% glutaraldehyde in 0.2M sodium cacodylate and processed as previously described (Tidball et al., 1992; D'Emilio et al., 2010). After 5 days of suspension, skeletal muscle highlights signs of atrophy in response to decreased mechanical loading (Linderman et al., 1994). In fact, close to muscle-tendon interface, irregular misaligned sarcomeres, with absent Z-lines, were observed. Muscle intermyofibrillar component spreads, especially between terminal filaments and tendon finger-like processes. A lower number of muscle-tendon interdigitations, characteristically not bifurcated, also appears. In conclusion, along with muscle atrophy features, ultrastructural changes occur at the MTJ organization level, as an adaptation to muscle unloading.

References

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