Ecomiografia funzionale: analisi di spessori, ecostruttura, contrazione e perfusione del muscolo normale e denervato

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Abstract

Functional Echomyography: thickness, ecogenicity, contraction and perfusion of the LMN denervated human muscle before and during h-bFES

Permanent denervated muscles were evaluated by ultrasound to monitor changes in morphology, thickness, contraction-relaxation kinetics and perfusion due to the electrical stimulation program of the Rise2-Italy project. In a case of monolateral lesion, morphology and ultrasonographic structure of the denervated muscles changed during the period of stimulation from a pattern typical of complete denervation-induced muscle atrophy to a pattern which might be considered “normal” when detected in an old patient. Thickness improved significantly more in the middle third of the denervated muscle, reaching the same value as the contralateral innervated muscle. Contraction-relaxation kinetics, measured by recording the muscle movements during electrical stimulation, showed an abnormal behavior of the chronically denervated muscle during the relaxation phase, which resulted to be significantly longer than in normal muscle. The long-term denervated muscles analyzed with Echo Doppler showed at rest a low resistance arterial flow that became pulsed during and after electrical stimulation. As expected, the ultra sound measured electrical stimulation-induced hyperemia lasted longer than the stimulation period. The higher than normal energy of the delivered electrical stimuli of the Vienna home-based Functional Electrical Stimulation strategy (h-b FES) demonstrate that the explored muscles were still almost completely denervated during the one-year of training. In conclusion, this pilot study confirms the usefulness of Functional Echomyography in the follow-up and the positive effects of h-b FES of denervated muscles.

Key Words: Ultra sound, Functional Echomyography, skeletal muscle, lower motor neuron denervation, h-b FES