PO0151

Structural and physiological muscle changes after post-stroke hemiplegia: A systematic review

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Objective  Corticospinal tract damage is responsible for motor function impairment after stroke. However, many processes seem to induce muscle damage, which may limit rehabilitation achievement.

To achieve a systematic literature review of human muscular modifications due to post-stroke hemiplegia. This review considers structural (histological, biochemical) and physiological modifications and their functional consequences over 1 year after stroke.

Material/Patients and methods  Literature search on PubMed, Embase and Cochrane databases for papers published before February 2016 combining the following keywords: cerebral stroke, hemiplegic, atrophy, muscle structure, paresis, skeletal muscle fiber type, motor unit, oxidative stress, strength, motor control led to select forty articles.

Results  Literature reports atrophy (20–25%), fatty replacement (17–30,6%), and decrease in fibers size and type (43% of type I fibers) as well as capillary density (38%) in spastic-paretic muscle. Enzymatic activity reduction was observed (decrease in citrate synthase and 3-hydroxyacyl-coenzymeA-deshydrogenase concentrations).

A physiological reduction in the motor unit number estimate occurs very early (starting from 4 h post-stoke). At a chronic stage, an increase of motor unit firing rate and motor unit activity at “rest” were reported. These global changes have an additional effect on motor command impairments and increase the motor deficiency, even at a chronic stage.

Discussion - Conclusion  The initial dysfunction of motor command in post-stroke hemiplegia induces structural and physiological muscular changes. These changes are hardly reversible, and plead for an improvement in muscular training in these patients.

Disclosure of interest  The authors declare that they have no competing interest.

http://dx.doi.org/10.1016/j.rehab.2016.07.241