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Is spasticity or spastic cocontraction of the elbow flexors associated with the limitation of voluntary elbow extension in adults with acquired hemiparesis?

Background: Muscle overactivity, including spasticity and spastic cocontraction, is an involuntary motor unit recruitment participating in the spastic paresis syndrome after cerebral injury. Spasticity is defined as velocity-dependent increase in tonic stretch reflexes. Spastic cocontraction refers to increased antagonist muscles recruitment triggered by the volitional command of agonist muscles. This study aimed to clarify the association between spasticity and spastic cocontraction of elbow flexors and to study their contribution to the limitation of active elbow extension in hemiparetic adults.

Methods: Ten adults with acquired hemiparesis and ten healthy participants were included. Surface EMG recorded from elbow muscles during elbow isometric extension contractions was used to compute the index of cocontraction (ICC) for each participant, while spasticity, limitation of active elbow extension, and upper extremity Fugl-Meyer Assessment (FMA-UE) score were obtained in hemiparetic participants. Non-parametric Spearman correlations were performed to investigate the relationship between ICC and i) limitation of active elbow extension, ii) elbow flexors spasticity and iii) FMA-UE.

Results: Our results showed significant ICC in three hemiparetic participants compared with

healthy participants, and significant associations between cocontraction and i) active elbow extension limitation (r_S = 0.81, p < 0.001) and iii) Fugl-Meyer Assessment score (r_S = - 0.53, p=0.017) in hemiparetic participants. No significant correlation was found between spasticity and active elbow extension limitation.

Conclusion: Our results are the first to show that spastic cocontraction directly contributes to elbow extension deficit in adults with acquired hemiparesis, and further confirm that spasticity and spastic cocontraction have different functional repercussions with regards to impaired motor function. Our findings support the conclusion that spastic cocontraction, rather than spasticity, has significant functional repercussions on impaired active motor function in hemiparetic adults. Therapeutic innovations should be directed toward reduction of spastic cocontraction to improve motor function in acquired hemiparesis.

Abstract topics : C1.7 Diagnosis and Assessment of Neurological, Musculoskeletal and Movement Related Functions (including Gait Analysis, Posturography)