TORQUE-ANGLE PROPERTIES OF THE SPASTIC ANKLE PLANTARFLEXOR IN STROKE SURVIVORS

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INTRODUCTION: Spasticity, a neurological disorder secondary to upper motor neuron lesion, affects skeletal muscle function (Lieber et al., 2004). Among post-stroke alterations in skeletal muscle, a velocity-dependent joint stiffness has been known to influence the stroke survivors' movement and mobility. Taking the suggestion that the increased joint stiffness is attributed to by three origins (passive muscle stiffness, neurally medicated reflex stiffness, and active muscle stiffness), this study aimed to gain better understanding of the contribution of non-neural factors to the increased joint stiffness by measuring torque-angle relationship of the ankle plantarflexion muscle at rest and during twitch contraction.

METHOD: For adult stroke survivors (n=11), we recorded ankle plantarflexion torque of paretic and non-paretic legs at systematically varying ankle joint angles using a dynamometer while the ankle plantarflexor was at rest and during twitch contractions (doublet stimulation; 0.5 ms pulse duration, 10 ms inter-pulse delay; voltage set to supramaximal). A repeated measure two-way ANOVA was used for the statistical analysis.

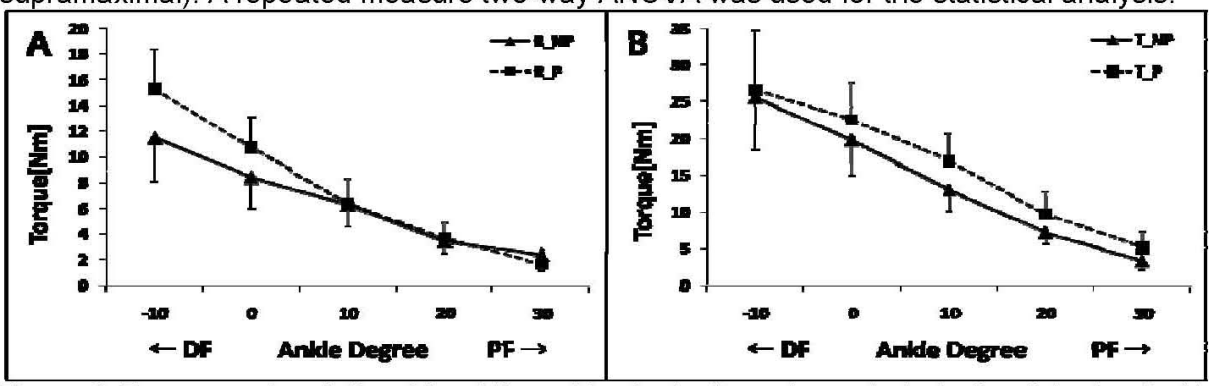

Figure 1. Torque-angle relationship of the ankle plantarflexor in post-stroke hemiplegia. A: At rest, B: Twitch contraction. NP: Non-paretic, P: Paretic. DF: Dorsiflexion, PF: Plantarflexion.

RESULTS: For twitch contractions, ankle plantarflexion torques of the paretic side were greater than those of the non-paretic side (p=.030). Ankle plantarflexion torque increased as ankle went into dorsiflexed positions. For the resting condition, the similar pattern was observed as was for the twitch contractions.

DISCUSSION: Joint stiffness has been explained in terms of underlying neural and mechanical properties. Different from the expectation that the prolonged inactivity due to post-stroke neural impairment would degrade the contractile properties of the paretic side muscle, this study showed that was not the case. In conclusion, non-neural factors has significant contribution to the increased joint stiffness along with neurally mediated reflex stiffness. These torque-angle data could be used to develop training program for the rehabilitation of muscle function after stroke.

REFERENCES:

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