Corticomuscular and intermuscular coherences become correlated after stroke.

Célia Delcamp[1], David Gasq[1,2], Camille Cormier[1,2], David Amarantini[1]

[1]ToNIC, Toulouse NeuroImaging Center, Université de Toulouse, Inserm, UPS, France

[2]Department of Functional Physiological Explorations, University Hospital of Toulouse, 31400 Toulouse, France

Introduction: Oscillatory coupling can be calculated between electroencephalographic and electromyographic signals of stroke patients to quantify the corticomuscular coherence (CMC), which reflects the central-peripheral communication during motor control. Oscillatory coupling can also be calculated between two electromyographic signals to quantify the intermuscular coherence (IMC), which reflects the common central drive sent to muscles. Because CMC and IMC are altered by stroke, the aim of this study was to explore the relationship between these variables in stroke and control subjects to better understand the involvement of central drive in motor control.

Method: 24 chronic stroke and 24 control healthy subjects performed 20 self-paced active elbow extensions of the paretic limb for stroke subjects and the non-dominant one for control subjects. Electroencephalographic and electromyographic activity of the triceps-brachii, biceps-brachii, and brachioradialis were recorded. CMC was calculated between the sensori-motor cortex contralateral to the movement and each of the three recorded muscles, while IMC was calculated for the triceps-brachii – brachioradialis and biceps-brachii - brachioradialis muscle pairs.

Results: Spearman correlations revealed linear relationships between IMC and CMC for both muscles pair in stroke subjects (Rho>0.50; $p<0.022$) but not in control subjects (Rho>0.35; $p>0.100$).

Discussion: These results show that in stroke subjects, the greater the central-peripheral communication, the higher the common central drive shared between synergistic muscles. This correlation only for stroke subjects could suggest that the regulatory mechanisms in the neuromuscular communication network - where CMC and IMC are proportionally regulated - can be qualified as simplified after stroke with a more global motor control.