**Effect of systemic circulatory system on cerebral blood flow regulation**

Shigehiko Ogoh
_Toyo University_

Although cerebral circulation has a specific blood flow regulatory system, e.g. cerebral autoregulation (CA), the regulation of systemic circulation also plays an important role in cerebral blood flow (CBF) homeostasis. The purpose of this presentation was to provide some important findings of our previous studies regarding the interaction between systemic circulation and CBF regulations. It is established that the arterial baroreflex does not directly control the cerebral vasculature because this reflex works via the sympathetic nervous system, which appears to have a limited effect on the cerebral vasculature of humans. Therefore, the arterial baroreflex mainly regulates arterial blood pressure such that it is maintained within the range of CA for cerebral circulation. Our previous study (Ogoh et al. Stroke 2008) using an alpha-1 adrenoreceptor blocker (prazosin) demonstrated that during recovery from acute hypotension, decreases in cerebral vascular conductance index were mediated by increases in arterial blood pressure and sympathetically mediated cerebral vasoconstriction via unloading of arterial baroreceptors. In addition, cardiac output is an important factor in the establishment of the CBF, and any regulation of cardiac output via the cardiac baroreflex would directly influence dynamic CBF regulation (Ogoh et al. JP 2005). Our previous findings clearly indicate that the systemic vasculature regulation via the arterial baroreflex is an essential circulatory mechanism for maintaining adequate CBF.

**Key words:** baroreflex, blood pressure, cardiac output

**Human redundant movements are documented from the simplification of the redundant degree of freedom**

Motoki Kouzaki
_Graduate School of Human and environmental Studies, Kyoto University_

Human achieves complex and redundant movements, such as standing and walking. Central nervous system coordinates huge degree of freedom of the musculoskeletal system. To this end, muscle activities were accounted for with low-dimensional sets of muscle synergies. Present lecture focused on the muscle synergies to comprehend human movements from the simplification of the redundant degree of freedom. The muscle synergies during human movements were extracted from the data matrix of recorded EMGs of lower limb muscles using non-negative matrix factorization. During postural maintenance with rapid perturbation, the muscle synergy and its activation distributed in various direction over horizontal plane to prevent a fall. During treadmill walking at different speed, there were no common synergies between legs, suggesting that coordination of the legs during walking is caused by CPG controlling individual muscle synergies. During walking at preferred speed, number of synergies in elderly adults was lower than young adults, indicating that this decreases QOL for elderly adults. Lastly, the muscle synergies were not fixed and flexibly were recruited depending on anatomical and/or physiological changes. Present lecture concluded that complex and redundant human activities are enabled under existence of low-dimensional sets of muscle synergies.