Changes in the Cerebral Blood Flow after Electrical Stimulation of the Cervical Sympathetic Nerve and Head-down Postural Rotation

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Abstract

Introduction: It has been shown in our previous study that head-down rotation (HDR) induced a suppression of the renal sympathetic nerve activity (RSNA) which was followed by a transient fall of arterial blood pressure (ABP). HDR induces head-ward fluid shift, which may elicit a transient increase of the cerebral blood flow (CBF) if the cervical sympathetic nerve activity (CSNA) is suppressed during HDR. However, changes in CBF and CSNA during HDR are not investigated previously. This study was undertaken to elucidate neural mechanisms controlling CBF during HDR using anesthetized rats and rabbits.

Methods & Results: We first recorded CBF during and after electrical stimulation of the cervical sympathetic nerve (CSN). Stimulation at 30 Hz of the CSN for 20-30 seconds induced a transient increase of CBF which was followed by a decrease of the flow, and the CBF recovered to the baseline level. The decrease was eliminated by intravenous administration of phenoxybenzamine. The result suggests that it probably elicited by vasoconstrictive response of arteries to noradrenaline. Next, we recorded CBF and CSNA during HDR. The animal was mounted on a table, tilted to a 45 degree head-down rotation in 5 seconds and kept at the posture for 1-2 minutes. HDR induced a transient decrease of CBF which was followed by an increase in the flow. CSNA did not change during HDR, although RSNA was suppressed during HDR.

Conclusion: These results suggest that CSNA might be associated with controlling CBF transiently during HDR.

Keywords: Head-down rotation, Cervical sympathetic nerve activity, Cerebral blood flow