# Dorsomedial/Perifornical hypothalamic stimulation increases intraocular pressure, intracranial pressure, and the translaminar pressure gradient

Samuels BC, Hammes NM, Johnson PL, Shekhar A, McKinnon SJ, Allingham RR

Eugene and Marilyn Glick Eye Institute, the.

PURPOSE: Intraocular pressure (IOP) fluctuation has recently been identified as a risk factor for glaucoma progression. Further, decreases in intracranial pressure (ICP) , with postulated increases in the translaminar pressure gradient across the lamina cribrosa, has been reported in glaucoma patients. We hypothesized that circadian fluctuations in IOP and the translaminar pressure gradient are influenced, at least in part, by central autonomic regulatory neurons within the dorsomedial and perifornical hypothalamus (DMH/PeF) . This study examined whether site-directed chemical stimulation of DMH/PeF neurons evoked changes in IOP, ICP, and the translaminar pressure gradient.

METHODS: The GABA(A) receptor antagonist bicuculline methiodide (BMI) was stereotaxically microinjected into the DMH/PeF region of isoflurane-anesthetized male Sprague-Dawley rats (n = 19) . The resulting peripheral cardiovascular (heart rate http://HR and mean arterial pressure http://MAP) , IOP, and ICP effects were recorded and alterations in the translaminar pressure gradient calculated.

RESULTS: Chemical stimulation of DMH/PeF neurons evoked significant increases in HR (+69.3 ± 8.5 beats per minute) ; MAP (+22.9 ± 1.6 mm Hg) ; IOP (+7.1 ± 1.9 mm Hg) ; and ICP (+3.6 ± 0.7 mm Hg) compared with baseline values. However, the peak IOP increase was significantly delayed compared with ICP (28 vs. 4 minutes postinjection) , resulting in a dramatic translaminar pressure gradient fluctuation.

CONCLUSIONS: Chemical stimulation of DMH/PeF neurons evokes substantial increases in IOP, ICP, and the translaminar pressure gradient in the rat model. Given that the DMH/PeF neurons may be a key effector pathway for circadian regulation of autonomic tone by the suprachiasmatic nucleus, these findings will help elucidate novel mechanisms modulating circadian fluctuations in IOP and the translaminar pressure gradient.

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