THE INFLUENCE OF THE LESION OF NORADRENERGIC CEREBELLAR INNERVATION ON CEREBRAL SEROTONERGIC SYSTEMS: A POTENTIAL ROLE IN THE HARMALINE-INDUCED TREMOR

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Introduction: Abnormal synchronous activation of the glutamatergic olivo-cerebellar pathway has been suggested to be crucial for the harmaline-induced tremor. However, the mechanisms underlying this symptom seem to be complex and involve also other brain structures and neurotransmitter systems. Our recent studies have indicated that 6-OHDA injected into the cerebellar vermis in rats destroys its noradrenergic innervation and increases the tremor induced by harmaline.

Aims: The aim of the present study was to examine whether a lesion of the cerebellar noradrenergic transmission may secondarily influence noradrenergic and serotonergic transmissions in some distant brain structures.

Methods: Rats were injected into the cerebellar vermis with 6-hydroxydopamine (6-OHDA) (8 µg/0.5 µl). Harmaline was administered in doses of 7.5 or 15 mg/kg ip. Rats were killed by decapitation and the levels of monoamines and their metabolites in different brain structures were measured by HPLC.

Results: Harmaline increased serotonin and noradrenaline levels in the frontal cortex and decreased the 5-HIAA level and/or 5-HIAA-serotonin ratio in the caudate-putamen, substantia nigra and frontal cortex. 6-OHDA increased levels of serotonin, 5-HIAA in the substantia nigra and noradrenaline in the caudate-putamen. Moreover, this lesion increased the serotonin and 5-HIAA levels in the caudate-putamen and frontal cortex in the harmaline-treated rats.

Conclusions: The present study indicates that the lesion of noradrenergic cerebellar innervation secondarily influences serotonergic transmission in the substantia nigra, caudate-putamen and frontal cortex which may contribute to the harmaline-induced tremor.

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