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  Saccadic orientation of gaze: contribution of the medio-posterior cerebellum in the primate

  The sudden appearance of an object in the visual field often triggers an orienting gaze shift toward this visual target. The medio-posterior cerebellum is an important structure for generating accurate saccadic gaze shifts. Electrical microstimulation of the caudal fastigial nucleus elicits saccadic eye movements in the head-restrained monkey and lesions severely impair the accuracy of visually guided saccades. In the head-unrestrained cat, unilateral inactivation of cFN leads to a dysmetria of gaze (eye in space) that is associated with dysmetric movements of the eyes in the orbit and of the head without any noticeable change in the head contribution to the gaze shifts. The question remains whether the saccade dysmetria after cFN inactivation in the head-restrained monkey corresponds to a central perturbation in issuing a gaze- related command or whether it is a peripheral impairment in generating saccadic oculomotor commands. To test this hypothesis, we studied the effects of the muscimol inactivation and electrical microstimulation of the caudal fastigial nucleus in the head- unrestrained monkey. After muscimol injections, when viewing the fixation LED, the starting position of the head was changed. Ipsilesional gaze shifts directed toward a 40° eccentric target LED were hypermetric and contralesional movements were hypometric. For both ipsilesional and contralesional gaze shifts, the changes in eye saccade amplitude were strongly correlated with the changes in gaze amplitude and largely accounted for the gaze dysmetria. The stimulation of the fastigial nucleus showed that the direction of evoked movement can be ipsilateral or contralateral depending on the site of the stimulation. The microstimulation elicited gaze shifts which could be accompanied by a movement of the head when a staircase of saccade was evoked. The latency of saccades was reduced with increasing frequency for both ipsilateral and contralateral movements. In conclusion, the pharmacological and microstimulation data collected in the head-unrestrained monkey suggest that the cFN is involved in the generation of oculomotor (rather than gaze- related) commands during tasks involving foveal capture of a visual target.

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