

# Abnormal ocular motility in cerebellar dysfunction



**Jeong-Yoon Choi, MD**

Department of Neurology, Seoul National University Bundang Hospital

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Several parts of cerebellum are engaged in normal ocular motilities including vestibulo-ocular reflexes (VOR), smooth pursuit, and saccades. And diverse abnormal ocular motilities in cerebellar disorders can be summarized by three anatomically categorized cerebellar syndromes; floccular and parafloccular disorders, nodulus and ventral uvular disorders, and dorsal vermis, fastigial nucleus, and uncinate fascicular syndrome. Floccular and parafloccular regions have abundant neuronal connections related to visual and vestibular information and function in gaze holding and VOR adaptation. Spontaneous downbeat nystagmus, VOR adaptation failure, impaired smooth pursuit and VOR cancellation, gaze-evoked nystagmus and pulse-step mismatch are well-known findings of floccular and parafloccular dysfunction. Dissociated VOR response (normal or elevated response to low-frequency and low-velocity stimulation and decreased response to high-frequency and high-speed stimulation) is a newly discovered finding in floccular and parafloccular dysfunction. Nodulus and ventral uvular regions play a crucial role maintaining a spatial orientation of VOR. Periodic alternating nystagmus, head-shaking nystagmus, and several type of positional nystagmus have been reported in nodulus and uvular dysfunction. Central paroxysmal positional nystagmus is highlighted in recent regarding its' characteristics and mechanism. Finally, dorsal vermis, fastigial nucleus, and uncinate fasciculus comprise a local circuit controlling saccadic and pursuit eye movements. Thus lesion in dorsal vermis, fastigial nucleus, and uncinate fasciculus cause saccadic lateropulsion, directional saccadic preponderance, and pursuit asymmetry.

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