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Cerebellum: Silent area of brain

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Cerebellum meaning silent area of brain is located in posterior cranial fossa. It is divided into anterior, posterior and flocculonodular lobes by primary and posteriolateral fissures. Longitudinally divided into vermis, intermediate zone and lateral hemisphere, each zone has specific function in overall planning and controlling muscle movements. Inputs and outputs are via superior, middle and inferior cerebellar peduncles. The mossy fiber parallel fiber pathway (internal connection) is involved in feed forward and local feedback inhibition. Purkinje Cell (PC) and Deep Cerebellar Nuclei (DCN) form the functional unit. PC exhibit two types of action potentials, mossy fiber parallel fiber stimulation evokes simple spike while climbing fiber stimulation evokes complex spike. It has various motor functions like control of posture and balance, smoothening and coordination of skilled voluntary movements, control of ballistic movements, control of muscle tone and stretch reflex, learning and improvement of motor skills, turn on/turn off function, and has role in various vestibular functions. Extra-motor functions include, predicts movement ahead of time, cognition, emotion regulation, role in behavior, language, executive functions and decision making under uncertainty. Role is also established in music and scientific discoveries. Granule cells display surprising level of activity while learning new tasks and responds to anticipated reward. Cerebellar disorders produce ipsilateral effects like disturbance in tone (atonia), equilibrium, movements (ataxia, asynergia, asthenia, dysmetria, intentional tremors, rebound phenomenon, nystagmus, dysarthria, dysdiadochokinesia), effects deep reflexes (pendular knee jerk) and psychiatric disturbance. Cerebellum dysfunction may result from disorders (ataxia, congenital), alcohol consumption, hormonal derangement (hypothyroidism) and radiations (mobile phone usage). New horizons in cerebellum research includes improvement in ataxic gait by Cb1n 1 injection, non-invasive electrical and magnetic administration (to improve motor symptoms, cerebellar degeneration, neurological diseases), optogenetic manipulation of PC (extra-motor function study) and artificial cerebellum controlling robotic arm with human like precision.

Biography

Mohita Singh is currently pursuing her Master's degree in Physiology from Government Medical College Jammu, India. Her interest is in the field of neurophysiology/ neuroscience, in scientific discoveries for improving the health and overall well-being of mankind.

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