

Functions and Pathophysiology of the Ventricular System: Review of the Underlying Basic Physics

Authors : Mohamed Abdelrahman Abdalla

Abstract : Apart from their function in producing CSF, the brain ventricles have been recognized as the mere remnant of the embryological neural tube with no clear role. The lack of proper definition of the function of the brain ventricles and the central spinal canal has made it difficult to ascertain the pathophysiology of its different disease conditions or to treat them. This study aims to review the simple physics that could explain the basic function of the CNS ventricular system and to suggest new ways of approaching its pathology. There are probably more physical factors to consider than only the pressure. Monro-Killie hypothesis focuses on volume and subsequently pressure to direct our surgical management in different disease conditions. However, the enlarged volume of the ventricles in normal pressure hydrocephalus does not move any blood or brain outside the skull. Also, in idiopathic intracranial hypertension, the very high intracranial pressure rarely causes brain herniation. On this note, the continuum of the intracranial cavity with the spinal canal makes it a whole unit and hence the defect in the theory. In this study, adding different factors to the equation like brain and CSF density and positions of the brain in space, in addition to the volume and pressure, aims to identify how the ventricles are important in the CNS homeostasis. In addition, increasing the variables that we analyze to treat different CSF pathological conditions should increase our understanding and hence accuracy of treatment of such conditions.

Keywords : communicating hydrocephalus, functions of the ventricles, idiopathic intracranial hypertension physics of CSF

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