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IMPLEMENTATION OF VARIOUS DEGREES OF HEAD DOWN TILT TO STUDY THE ETIOLOGY
OF THE VIIP SYNDROME

Abstract

Head down tilt (HDT) bed rest has been used for decades as a ground-based analog for spaceflight. Majority of bed rest studies are performed at a -6 HDT angle, however long duration bed rest studies have failed to produce similar ocular findings as seen during spaceflight, including structural and functional ophthalmic changes associated with the Visual impairment and Intracranial Pressure (VIIP) syndrome in astronauts. It is hypothesized that the underlying cause of the VIIP syndrome is a cerebral venous congestion induced increase in intracranial pressure (ICP). Furthermore, increased levels of carbon dioxide (CO₂) on the ISS may exacerbate this increase in ICP by increasing the cerebral blood volume. In the present paper we describe a new study paradigm to parametrically investigate HDT (-6, -12 and -18 HDT) to evaluate the effects of hydrostatic pressure gradients on ocular and cerebral anatomy and physiology. In addition, a 1% CO₂ was also investigated during HDT. Finally, lower body negative pressure (LBNP) was implemented during HDT to alleviate cerebral venous congestion as a potential countermeasure. A number of cerebral, ophthalmic and cardiovascular measurements were implemented to study changes the etiology of the VIIP syndrome.