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SPACEFLIGHT AND ITS EFFECTS ON INTRACRANIAL PRESSURE: A REVIEW AND THEORETICAL DELVE INTO THE PHYSIOLOGY AND MANAGEMENT OF INTRACRANIAL PRESSURE ELEVATION IN MICROGRAVITY ENVIRONMENT

Abstract

Several neurologic complaints and symptoms such as spaceflight associated neuro-ocular syndrome (SANS), cognitive changes and headaches are theorized to be connected to changes in intracranial pressure (ICP) during spaceflight. These conditions pose operational risks as they may impair astronauts' abilities to perform their responsibilities or respond to rapidly evolving situations. Herein, we review the factors that contribute to the physiology of increased ICP in terrestrial models, as well as explore the available studies and literature that exists regarding increased ICP in microgravity-analogues. Additionally, we will review the underlying physiology that contributes to changes in intracranial pressure, Furthermore, as we begin to unravel the physiologic components that influence ICP in a microgravity environment, the management of pathological changes that can occur in space must be addressed.

Acute, elevated ICP management is well established terrestrially and requires effective coordination of medical and surgical interventions. As commercial aerospace travel continues to grow and involve more civilian passengers, there is an increasing probability of an acute ICP crisis occurring secondary to trauma, intracerebral hemorrhage, venous thrombosis, or acute cerebral swelling secondary to other conditions. Currently, the management of such an event has not been delineated nor have the diagnostic devices, vital sign parameters, or tools for intervention been adapted for aerospace travel and a microgravity environment By better understanding the role that increased ICP plays on Earth and in microgravity-analogues, we will be more equipped to address any potential complications that may occur while in space. That extends to potential preventative measures, emergency triaging and pharmacologic interventions. Through this application of existing knowledge on terrestrial pathophysiology, current prevention and management techniques can be designed to address theoretical scenarios that could occur and, more importantly, mitigate potential associated complications that may arise.