FLUID SHIFTS

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INTRODUCTION: Mechanisms responsible for the ocular structural and functional changes that characterize the visual impairment and intracranial pressure (ICP) syndrome (VIIP) are unclear, but hypothesized to be secondary to the cephalad fluid shift experienced in spaceflight. This study will relate the fluid distribution and compartmentalization associated with long-duration spaceflight with VIIP symptoms. We also seek to determine whether the magnitude of fluid shifts during spaceflight, as well as the VIIP-related effects of those shifts, can be predicted preflight with acute hemodynamic manipulations, and also if lower body negative pressure (LBNP) can reverse the VIIP effects. **METHODS:** Physiologic variables will be examined pre-, in- and post-flight in 10 International Space Station crewmembers including: fluid compartmentalization (D_2O and NaBr dilution); interstitial tissue thickness (ultrasound); vascular dimensions and dynamics (ultrasound and MRI (including cerebrospinal fluid pulsatility)); ocular measures (optical coherence tomography, intraocular pressure, ultrasound); and ICP measures (tympanic membrane displacement, otoacoustic emissions). Pre- and post-flight measures will be assessed while upright, supine and during 15º head-down tilt (HDT). In-flight measures will occur early and late during 6 or 12 month missions. LBNP will be evaluated as a countermeasure during HDT and during spaceflight. **RESULTS:** The first two crewmembers are in the preflight testing phase. Preliminary results characterize the acute fluid shifts experienced from upright, to supine and HDT postures (increased stroke volume, jugular dimensions and measures of ICP) which are reversed with 25 mmHg LBNP. **DISCUSSION:** Initial results indicate that acute cephalad fluid shifts may be related to VIIP symptoms, but also may be reversible by LBNP. The effect of a chronic fluid shift has yet to be evaluated. **Learning Objectives**: Current spaceflight VIIP research is described, including novel hardware and countermeasures.