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## NEW NUMERICAL MODEL PREDICTS REDUCED INTERNAL JUGULAR FLOW IN SPACE

**Abstract**

We have created a numerical model of circulatory system relevant to SANS. The model includes a circulatory sub-model with both a head and body loop. The head loop includes the competing venous drainage pathways from the head. An eye aqueous humor sub-model and a cerebrospinal fluid sub-model are also included. Importantly, this model includes both hydrostatic effects on the circulation as well as the effects of tissue weight. Tissue weight, and the compressive forces produced by tissues, are often not considered in most numerical models. In the model, tissue compressive forces are represented as an external force acting on vessels that counters the vessels' internal pressure, in effect reducing the vessel's ability to expand under increased internal pressure. We have previously shown that this model accurately predicts the central venous pressure and intracranial pressure decreases seen with short-term microgravity exposure. Another newly identified problem in weightlessness is reduced or retrograde flow in the jugular vein. We used the model to predict changes in jugular venous flow in weightlessness compared to the supine position. Although carotid flow did not change significantly in the modeled weightless condition compared to supine, jugular venous flow was significantly reduced. This may reflect effects on the compliance of the veins in the brain and neck due to removing tissue weight and hydrostatic forces. These results suggest the model is accurately modeling the unique effects of weightlessness (i.e. decreased CVP, ICP, and jugular flow compared to supine) rather than predicting changes that might occur when moving from the supine to head-down tilt condition on Earth, which is often used as a model of weightlessness. This talk will describe and explain the model and offer potential applications of the model to understanding the jugular venous findings in space as well as its application to the spaceflight-associated neuro-ocular syndrome.