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PRE AND POST-FLIGHT CORTICAL VEIN ENLARGEMENT AND ITS ASSOCIATION WITH
SPACEFLIGHT-ASSOCIATED NEURO-OCULAR SYNDROME

Abstract

Spaceflight-associated neuro-ocular syndrome (SANS) occurs in approximately 40-60

Because ultrasound cannot assess the upstream, intracranial veins, we conducted quantitative and qualitative analysis of magnetic resonance images of the intracranial venous system performed in 11 astronauts before and after long-duration spaceflight. Venous structures (superior sagittal sinus, left and right transverse/sigmoid sinuses) were segmented using a semi-automated pipeline (ITK-snap 3.2, available at itksnap.org) and pre- to post-flight percent changes in venous volumes were calculated. Additionally, the paired pre- and post-flight images were independently assessed by a board-certified neuroradiologist in a randomized order who rated the venous structures as either increased, decreased, or no change in size between the two image sets.

Based on published guidelines¹, 4 of 11 astronauts met the diagnostic criteria for SANS post-flight. These four astronauts demonstrated a statistically significant enlargement of the venous sinuses post-compared with pre-flight. No significant change in venous volumes was noted among the seven astronauts without SANS. Blinder reader agreement with the quantitative assessment was high.

Our study, in conjunction with the growing body of evidence of abnormal blood flow dynamics during space-flight, suggests a correlation between intracranial venous congestion and SANS. The implication thus exists that individuals with increased venous sinus compliance may be at increased risk to develop SANS. These findings should be confirmed in a larger astronaut population.