M[illegible]-induced alteration in the central nervous system – variations in anatomical structures by alterations of intracranial pressure

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Background: Space environment and microgravity may induce anatomical structure alterations in the central nervous system by influencing intracranial pressure homeostasis. Investigation of underlying causes will be an important subject of future medical aerospace research – especially in the light of long-term missions.

Material and methods: Retrospective analysis. MEDLINE® database search strategy: "(brain OR cerebral OR structure) AND (spaceflight OR microgravity OR astronaut) AND (pathology OR changes OR disease OR problem)". A total of 987 studies were identified. Altogether, data of 14 relevant papers were included.

Objective: The aim of the present study was to gather evidence on alterations in the central nervous system of astronauts who stayed in space.

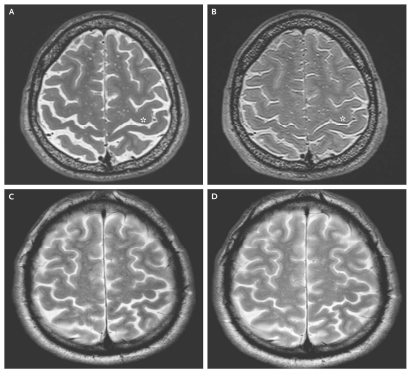
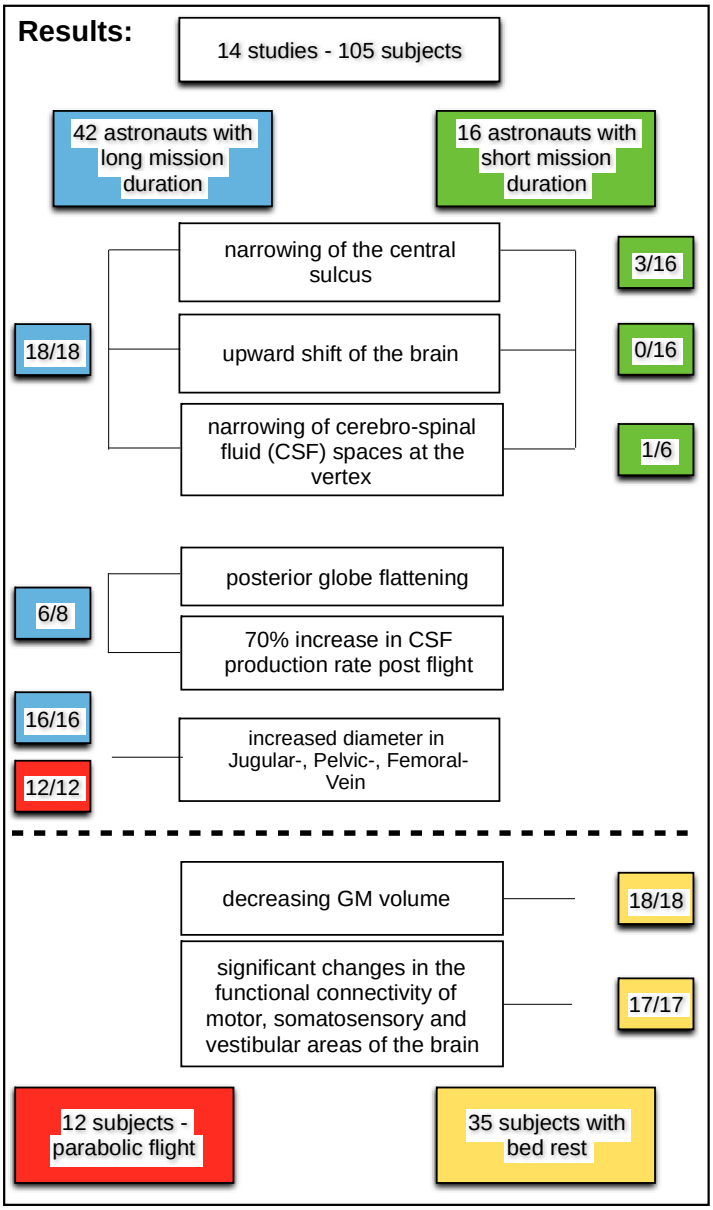


Fig. 1: Representative Images of long-term preflight (A) and long-term postflight (B) and short-term preflight (C) and short-term postflight (D) missions.

Results:



Conclusions: In recent studies, the most likely mechanisms of spaceflight-induced increased ICP include a **cephalic shift of body fluids** and **venous outflow obstruction** [1] that lead to **disruption in CSF flow** [2]. These changes in turn may provoke structural remodeling and altered cerebral autoregulation [3]. Further investigation, including repeated post-flight imaging is required to determine the clinical significance of these changes.

Literature:
[1] Michael AP1, Marshall-Bowman K. (2015) Spaceflight-Induced Intracranial Hypertension. Aerosp Med Hum Perform. 2015 Jun;86(6):557-62.
[2] Curtis R. Taylor (2013) Spaceflight-induced alterations in cerebral artery vasoconstrictor, mechanical, and structural properties: implications for elevated cerebral perfusion and intracranial pressure. FASEB J. 2013 Jun; 27(6): 2282–2292.
[3] Ken-ichi Iwasaki (2007) Human cerebral autoregulation before, during and after spaceflight. J Physiol 579.3 (2007) pp 799–810 799