Ocular Outcomes Comparison Between 14- and 70-day Head-down Tilt Bed Rest

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BACKGROUND

• Ophthalmological changes have been recently reported in some astronauts involved in long-duration space missions:
  - Elevated intracranial pressure resulting from μG-induced cephalad fluid shifts may be responsible for most of these findings
  - Head-down tilt bed rest (HDTBR) produces cephalad fluid shifts; used to simulate the effects of μG on the human body

PURPOSE

• To compare structural and functional ocular outcomes between 14- and 70-day HDTBR in healthy human subjects.
• Hypothesis: 70-day HDTBR induces ocular changes of greater magnitude as compared to 14-day HDTBR

METHODS

• Experimental protocols:
  - 14-day HDTBR
    - Visual Acuity (Distance & Near)
    - Modified Amsler Grid
    - Red Dot Test
    - Color Vision
    - Confrontational Visual Field
    - Cycloplegic Refraction
    - IOP (Goldmann)
    - IOP (Spectralis)
    - OCT (Spectralis)
    - Color Fundus Photography
  - 70-day HDTBR

• Pre/post-HDTBR differences in near visual acuity, spherical equivalent, IOP and SD-OCT average RNFL thickness were compared between the two studies

RESULTS

- Table showing comparison between 14-day and 70-day HDTBR
  - Near Visual Acuity, logMAR
  - Spherical Equivalent, D
  - IOP (Goldmann), mmHg
  - Average RNFLT (Spectralis OCT), μm

• In both studies:
  - subjects remained asymptomatic throughout the duration of HDTBR
  - distance and near visual acuity was 20/20 or better pre- and post-HDTBR in all subjects
  - modified Amsler grid, red dot test, color vision, confrontational visual field were within normal limits at all visits
  - no detectable changes on stereoscopic color fundus photography

CONCLUSIONS

• There were no significant pre/post-HDTBR differences between 14- and 70-day HDTBR for the structural and functional ophthalmological variables evaluated
• Further HDTBR studies with different duration and/or angle of tilt and/or environmental conditions (e.g., high CO2 exposure during HDTBR) may help determine the validity of the HDTBR analog to investigate microgravity-induced ophthalmological changes

SUPPORT

NASA Flight Analogs Project, 516724.03.04.01
NIH/NCAT 1UL1RR029876-01

DISCLOSURE

Cromwell, RL None; Taibbi, G None; Zanello, SB None; Yarbough, PO None; Ploutz-Snyder, RJ None; Vizzeri, G None
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