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.

METHODS

• Experimental protocols:
  - Pre-HDTBR, Post-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>
<thead>
<tr>
<th>14-day HDTBR</th>
<th>70-day HDTBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>37.75 ± 8.78</td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>12/4</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Caucasian/African-American 10/5</td>
</tr>
<tr>
<td>Number of Subjects</td>
<td>16</td>
</tr>
<tr>
<td>Visual Acuity, logMAR</td>
<td>-0.05</td>
</tr>
<tr>
<td>Spherical Equivalent, D</td>
<td>-0.27</td>
</tr>
<tr>
<td>IOP (Goldmann), mmHg</td>
<td>-0.95</td>
</tr>
<tr>
<td>Average RNFLT (Spectralis OCT), μm</td>
<td>1.16</td>
</tr>
</tbody>
</table>

METHODS

• Two integrated, multidisciplinary studies conducted at NASA Flight Analogs Research Unit (FARU): 14- and 70-day 6º HDTBR

NASA bed rest studies STANDARDIZED CONDITIONS

✓ Subject to rest in bed at all times
✓ Monitoring by a subject monitor and an in room camera 24 hrs a day
✓ Daily measurement of vital signs, body weight, fluid intake and fluid output
✓ No napping permitted between 6:00 am and 10:00 pm
✓ Standardized diet

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

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DISCLOSURE

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