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**STROBE Reporting Guidelines: Additional Details and Exceptions**

This manuscript followed the STROBE Reporting Guidelines for a cohort study, with additional details and a few exceptions described below.

1. **Setting:** Dates, including periods of recruitment and data collection, are not included due to attributability concerns for astronaut and cosmonaut crewmembers.
2. **Study size:** A sample size calculation was performed for the larger Fluid Shifts study and determined that a minimum sample size of 10 crewmembers was required. Fourteen crewmembers were included to account for any missing data.
3. **Descriptive Data:** Missing data are described below:
   1. One subject dropped out of the study after flight day (FD) 50 for reasons unrelated to the study
   2. Lower body negative pressure (LBNP) data was not included for two subjects:
      1. One subject did not participate in inflight LBNP due to development of a retinal hemorrhage
      2. One subject had scan quality issues on FD50 and scheduling constraints on FD150
   3. Five Russian subjects were unable to return for imaging 10 days after return to Earth (R+10) due to travel constraints

All other items on the STROBE checklist are addressed in the main text of the manuscript.

**eTable 1. *P*-values for change in each parameter during and after spaceflight relative to the preflight seated value**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **FD50**  **vs.**  **Preflight** | **FD150**  **vs.**  **Preflight** | **R+10**  **vs.**  **Preflight** | **R+30**  **vs.**  **Preflight** | **R+180**  **vs.**  **Preflight** |
| **MRW (µm)** | < .001 | < .001 | < .001 | .007 | .46 |
| **Cup volume (mm3)** | < .001 | < .001 | < .001 | < .001 | > .99 |
| **BMO height (µm)** | .06 | .009 | .78 | .97 | .24 |
| **TRT250 (µm)** | < .001 | < .001 | < .001 | .002 | .36 |
| **TRT500 (µm)** | < .001 | < .001 | < .001 | .002 | .24 |
| **TRT1000 (µm)** | .72 | .02 | .27 | .13 | .02 |
| **TRT1500 (µm)** | .33 | .77 | .46 | .96 | .007 |
| **MT500 (µm)** | < .001 | < .001 | < .001 | .003 | .07 |
| **MT1500 (µm)** | < .001 | < .001 | < .001 | .38 | .13 |
| **MT2500 (µm)** | .11 | .10 | .06 | .53 | .41 |

MRW, minimum rim width; BMO, Bruch’s membrane opening; TRT, total retinal thickness; TRT250, TRT from BMO to 250 µm; TRT500, TRT from 250 to 500 µm; TRT1000, TRT from 500 to 1000 µm; TRT1500, TRT from 1000 to 1500 µm; MT, macular thickness; MT500, MT from the fovea to 500 µm; MT1500, MT from 500 to 1500 µm; MT2500, MT from 1500 to 2500 µm; FD, flight day; R+, days after return to Earth.

The R+10 time point includes only 8 subjects, as several international crewmembers did not return directly to Houston

**eTable 2. Estimated marginal mean *(95% CI)* for each parameter without and with lower body negative pressure during spaceflight.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **FD50** | **FD50 + LBNP** | **FD150** | **FD150 + LBNP** |
| **MRW (µm)** | 386.4  *(349.2 – 423.5)* | 385.6  *(348.3 – 422.8)* | 398.6  *(361.4 – 435.8)* | 402.1  *(364.9 – 439.3)* |
| **Cup volume (mm3)** | .167  *(.076 – .258)* | .168  *(.077 – .259)* | .158  *(.067 – .249)* | .155  *(.063 – .246)* |
| **BMO height (µm)** | -124.7  *(-156.3 – -93.0)* | -125.0  *(-156.7 – -93.3)* | -127.2  *(-158.8 – -95.6)* | -122.2  *(-153.9 – -90.6)* |
| **TRT250 (µm)** | 413.0  *(387.5 – 438.6)* | 412.9  *(387.3 – 438.5)* | 424.4  *(398.9 – 450.0)* | 427.3  *(401.7 – 452.9)* |
| **TRT500 (µm)** | 381.7  *(365.4 – 398.1)* | 381.0  *(364.6 – 397.4)* | 387.6  *(371.2 – 404.0)* | 388.6  *(372.2 – 405.0)* |
| **TRT1000 (µm)** | 339.9  *(329.3 – 350.5)* | 339.6  *(329.0 – 350.2)* | 341.5  *(330.9 – 352.0)* | 341.9  *(331.3 – 352.5)* |
| **TRT1500 (µm)** | 303.2  *(294.9 – 311.4)* | 303.2  *(294.9 – 311.4)* | 302.7  *(294.5 – 311.0)* | 303.4  *(295.1 – 311.7)* |
| **MT500 (µm)** | 268.7  *(258.6 – 278.7)* | 269.5  *(259.4 – 279.6)* | 267.2  *(257.1 – 277.2)* | 267.0  *(256.9 – 277.1)* |
| **MT1500 (µm)** | 345.5  *(336.6 – 354.4)* | 345.9  *(336.9 – 354.8)* | 344.4  *(335.5 – 353.4)* | 344.2  *(335.3 – 353.2)* |
| **MT2500 (µm)** | 314.8  *(307.1 – 322.4)* | 315.3  *(307.6 – 322.9)* | 314.7  *(307.1 – 322.4)* | 314.0  *(306.3 – 321.7)* |

MRW, minimum rim width; BMO, Bruch’s membrane opening; TRT, total retinal thickness; TRT250, TRT from BMO to 250 µm; TRT500, TRT from 250 to 500 µm; TRT1000, TRT from 500 to 1000 µm; TRT1500, TRT from 1000 to 1500 µm; MT, macular thickness; MT500, MT from the fovea to 500 µm; MT1500, MT from 500 to 1500 µm; MT2500, MT from 1500 to 2500 µm; FD, flight day; LBNP, lower body negative pressure.

**eTable 3. *P*-values for change in each parameter with LBNP and between flight days without LBNP**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **FD50**  **vs.**  **FD50 + LBNP** | **FD150**  **vs.**  **FD150 + LBNP** | **FD50**  **vs.**  **FD150** |
| **MRW (µm)** | .76 | .20 | < .001 |
| **Cup volume (mm3)** | .85 | .06 | < .001 |
| **BMO height (µm)** | .90 | .07 | .31 |
| **TRT250 (µm)** | .93 | .17 | < .001 |
| **TRT500 (µm)** | .63 | .28 | < .001 |
| **TRT1000 (µm)** | .63 | .43 | .04 |
| **TRT1500 (µm)** | .94 | .15 | .43 |
| **MT500 (µm)** | .30 | .84 | .05 |
| **MT1500 (µm)** | .54 | .76 | .06 |
| **MT2500 (µm)** | .32 | .18 | .99 |

MRW, minimum rim width; BMO, Bruch’s membrane opening; TRT, total retinal thickness; TRT250, TRT from BMO to 250 µm; TRT500, TRT from 250 to 500 µm; TRT1000, TRT from 500 to 1000 µm; TRT1500, TRT from 1000 to 1500 µm; MT, macular thickness; MT500, MT from the fovea to 500 µm; MT1500, MT from 500 to 1500 µm; MT2500, MT from 1500 to 2500 µm; FD, flight day; LBNP, lower body negative pressure.

**eTable 4. Estimated marginal mean *(95% CI)* for each parameter with posture changes before and after spaceflight.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Preflight Seated** | **Preflight Supine** | **Preflight HDT** | **R+10 Seated** | **R+10 Supine** | **R+10 HDT** |
| **MRW (µm)** | 359.5  *(330.3 – 388.6)* | 360.8  *(331.6 – 389.9)* | 363.6  *(334.4 – 392.7)* | 380.7  *(351.4 – 410.0)* | 380.2  *(351.0 – 409.5)* | 383.5  *(354.2 – 412.7)* |
| **Cup volume (mm3)** | .193  *(.102 – .284)* | .197  *(.106 – .288)* | .190  *(.099 – .281)* | .162  *(.071 – .253)* | .163  *(.072 – .255)* | .160  *(.069 – .251)* |
| **BMO height (µm)** | -118.3  *(-146.7 – -89.8)* | -122.7  *(-151.2 – -94.3)* | -121.2  *(-149.7 – -92.8)* | -114.0  *(-142.6 – -85.3)* | -115.9  *(-144.5 – -87.3)* | -112.9  *(-141.5 – -84.2)* |
| **TRT250 (µm)** | 394.3  *(375.9 – 412.7)* | 391.8  *(373.4 – 410.1)* | 394.2  *(375.8 – 412.6)* | 410.0  *(391.5 – 428.5)* | 409.8  *(391.3 – 428.3)* | 412.6  *(394.2 – 431.1)* |
| **TRT500 (µm)** | 370.9  *(358.6 – 383.2)* | 370.2  *(357.9 – 382.5)* | 370.9  *(358.6 – 383.2)* | 381.1  *(368.7 – 393.5)* | 379.9  *(367.5 – 392.3)* | 381.2  *(368.8 – 393.5)* |
| **TRT1000 (µm)** | 337.6  *(327.7 – 347.5)* | 337.1  *(327.2 – 347.0)* | 336.9  *(327.0 – 346.8)* | 340.5  *(330.6 – 350.4)* | 340.2  *(330.3 – 350.1)* | 339.5  *(329.6 – 349.4)* |
| **TRT1500 (µm)** | 302.5  *(294.2 – 310.8)* | 302.1  *(293.8 – 310.5)* | 301.7  *(293.4 – 310.1)* | 302.4  *(294.1 – 310.8)* | 302.4  *(294.0 – 310.8)* | 302.3  *(294.0 – 310.7)* |
| **MT500 (µm)** | 272.4  *(262.7 – 282.1)* | 272.0  *(262.3 – 281.7)* | 271.1  *(261.4 – 280.9)* | 267.6  *(257.8 – 277.3)* | 266.7  *(257.0 – 276.5)* | 265.9  *(256.1 – 275.6)* |
| **MT1500 (µm)** | 348.1  *(339.3 – 356.9)* | 348.5  *(339.7 – 357.3)* | 348.1  *(339.3 – 356.9)* | 345.1  *(336.3 – 353.9)* | 344.3  *(335.5 – 353.1)* | 343.7  *(334.9 – 352.6)* |
| **MT2500 (µm)** | 315.7  *(307.9 – 323.5)* | 316.3  *(308.5 – 324.2)* | 316.0  *(308.2 – 323.8)* | 314.7  *(306.8 – 322.5)* | 314.3  *(306.5 – 322.2)* | 313.6  *(305.8 – 321.4)* |

MRW, minimum rim width; BMO, Bruch’s membrane opening; TRT, total retinal thickness; TRT250, TRT from BMO to 250 µm; TRT500, TRT from 250 to 500 µm; TRT1000, TRT from 500 to 1000 µm; TRT1500, TRT from 1000 to 1500 µm; MT, macular thickness; MT500, MT from the fovea to 500 µm; MT1500, MT from 500 to 1500 µm; MT2500, MT from 1500 to 2500 µm; HDT, head-down tilt; R+, days after return to Earth.

The R+10 time point includes only 8 subjects, as several international crewmembers did not return directly to Houston.