Modification of otolith reflex asymmetries following space flight

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We hypothesize that changes in otolith-mediated reflexes adapted for microgravity contribute to perceptual, gaze and postural disturbances upon return to Earth's gravity. Our goal was to determine pre- versus post-fight differences in unilateral otolith reflexes that reflect these adaptive changes. This study represents the first comprehensive examination of *unilateral* otolith function following space flight. Ten astronauts participated in unilateral otolith function tests three times pre-flight and up to four times after Shuttle flights from landing day through the subsequent 10 days. During unilateral centrifugation (UC, ± 3.5cm at 400°/s), utricular function was examined by the perceptual changes reflected by the subjective visual vertical (SVV) and by video-oculographic measurement of the otolith-mediated ocular counter-roll (OOR). Unilateral saccular reflexes were recorded by measurement of collic Vestibular Evoked Myogenic Potential (cVEMP). Although data from a few subjects were not obtained early post-flight, a general increase in asymmetry of otolith responses was observed on landing day relative to pre-flight baseline, with a subsequent reversal in asymmetry within 2-3 days. Recovery to baseline levels was achieved within 10 days. This fluctuation in the asymmetry measures appeared strongest for SVV, in a consistent direction for OOR, and in an opposite direction for cVEMP. These results are consistent with our hypothesis that space flight results in adaptive changes in central nervous system processing of otolith input. Adaptation to microgravity may reveal asymmetries in otolith function upon to return to Earth that were not detected prior to the flight due to compensatory mechanisms.

Abstract for 35th MidWinter Meeting of the Association for Research in Otolaryngology, San Diego, CA, February 25-29, 2012