Orthostatic Intolerance and Autonomic Cardiovascular Changes after Parabolic Flight

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INTRODUCTION: It is not clear that orthostatic intolerance (OI) in returning astronauts is strictly contingent upon prolonged exposure to microgravity. To gain insight into acute conditions that may exacerbate postspace-flight OI, we investigated the effects of brief parabolic flights—and of parabolic flight-induced vomiting—on orthostatic tolerance and autonomic cardiovascular function. CURRENT STATUS OF RESEARCH:

Methods: R-R interval and arterial pressure power spectra, carotid-cardiac baroreflex and Valsalva responses, and tolerance to 30 min of 80-degree head-up tilt (HUT) were measured in 16 healthy subjects both before and after brief (2 hr) parabolic flights in the seated position. Results: After parabolic flight: 1) the incidence of OI increased fourfold, with 8 of 16 subjects unable to tolerate 30-min of HUT, compared to 2 of 16 subjects before flight; 2) 6 of 16 subjects vomited; 3) new intolerance to HUT was associated with exaggerated falls in total peripheral resistance (P<0.05), whereas vomiting was associated with increased supine R-R interval variability and carotid-cardiac baroreflex responsiveness (P<0.05); and 4) the mode of new OI differed in subjects who did and did not vomit, with newly-intolerant Vomiters experiencing comparatively isolated upright hypocapnia and cerebral vasoconstriction and newly-intolerant non-Vomiters developing signs and symptoms reminiscent of the clinical postural tachycardia syndrome. Conclusions: Results suggest first, that syndromes of OI resembling those occurring after space flight can occur after a brief (2 hr) parabolic flight; and second, that recent vomiting can influence not only responses to HUT, but also the results of supine tests of autonomic cardiovascular function commonly measured in returning astronauts. FUTURE PLANS: An investigation of autonomic cardiovascular responses to rapid HUT (in both pitch and roll) in labyrinthine-deficient vs. age- and gender-matched healthy individuals. INDEX TERMS: Postural tachycardia syndrome, vomiting, microgravity, hypergravity, vestibular, autonomic, baroreflex.