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Cerebral blood flow velocity in humans exposed to 24 h of head-down tilt.

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This study investigates cerebral blood flow (CBF) velocity in humans before, during, and after 24 h of 6 degree head-down tilt (HDT), which is a currently accepted experimental model to simulate microgravity. CBF velocity was measured by use of the transcranial Doppler technique in the right middle cerebral artery of eight healthy male subjects. Mean CBF velocity increased from the pre-HDT upright seated baseline value of 55.5 +/- 3.7 (SE) cm/s to 61.5 +/- 3.3 cm/s at 0.5 h of HDT ($P < 0.05$), reached a peak value of 63.2 +/- 4.1 cm/s at 3 h of HDT, and remained significantly above the pre-HDT baseline for > or = 6 h of HDT. During upright seated recovery (1-5 h post-HDT), mean CBF velocity decreased to 87% of the pre-HDT baseline value ($P < 0.05$). Mean CBF velocity correlated well with calculated intracranial arterial pressure (IAP) ($r = 0.54$, $P < 0.001$). As analyzed by linear regression, mean CBF velocity = 29.6 + 0.32IAP. These results suggest that HDT increases CBF velocity by increasing IAP during several hours after the onset of microgravity. Importantly, the decrease in CBF velocity after HDT may be responsible, in part, for the increased risk of syncope observed in subjects after prolonged bed rest and also in astronauts returning to Earth.