

24-hour Heart Rate is Related to Lower Extremity Venous Vascular Function in Persons with Paraplegia

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The 24-hour heart rate (HR) has been previously demonstrated by our group to be elevated in individuals with paraplegia (Para) compared to able-bodied (AB) controls, and now we speculate that this may be related to changes in lower extremity venous vascular function in persons with spinal cord injury (SCI). **PURPOSE:** Prospective cross-sectional study to explore the relationship between 24-hour HR and venous vascular function in persons with Para compared to AB controls. **METHODS:** Sixteen individuals with paraplegia (Para: T1-T12) and 10 AB controls were studied. An ambulatory Holter monitor was used to assess 24-hour HR (bpm). Venous occlusion strain gauge technology was used to determine lower extremity peak fill rate (PFR: % volume change per min), venous volume variation (VVV: % volume change), peak emptying rate (PER: % volume change per min), and venous compliance [VC: (venous volume variation/ occlusion pressure) * 100]. **RESULTS:** The 24-hour HR was significantly elevated in the Para group compared to the AB group (80±12 vs. 70±9 bpm, respectively; p=0.025), as has been previously demonstrated. PFR was significantly increased in the Para compared to the AB group (8±9 vs. 2±1 %, respectively; p=0.032), but group differences were not noted for VVV, PER or VC. Further, lower extremity PFR was associated with 24-hour HR in the Para group ($R^2 = 0.32$, p=0.023) but not in AB group. **CONCLUSION:** Increased PFR in persons with paraplegia as compared to the AB group likely represents loss of venous vascular tone due to remodeling after SCI. Our findings support the hypothesis that loss of venous vascular tone contributes to lower extremity blood pooling and a compensation mechanism of increasing HR, as evidenced by the significant association between PFR and 24-hour HR in these individuals with SCI. The potential deleterious long-term cardiovascular consequences of this association warrant further investigation.

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