



Letter to the Editor

Byung Gyu Kim et al.: Reduced systemic vascular resistance is the underlying hemodynamic mechanism in nitrate-stimulated vasovagal syncope during head-up tilt-table test

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Dear Editor

We read with great interest the well-crafted article by Kim et al. [1], which reported that presyncopal symptoms during nitrate-stimulated tilt-testing could be explained by decreased systemic vascular resistance (SVR) rather than reduced cardiac output (CO). The study setup is sound, but being accustomed to this methodology [2,3], we noticed inaccuracies in Tables 2 and 3. The SVR values appear correct, whereas the systemic vascular resistance index (SVRI) values presented seem incorrect. SVR is calculated as $80 \times (\text{MAP} - \text{CVP}) / \text{CO}$, where MAP is mean arterial pressure and CVP is central venous pressure. The normal values of SVR range from 800 to 1200 dynes s/cm⁵ [4], consistent with the original article [1]. SVRI is calculated as $80 \times (\text{MAP} - \text{CVP}) / \text{CI}$, where CI is cardiac index [5]; and the formula equals $80 \times (\text{MAP} - \text{CVP}) / (\text{CO} / \text{BSA})$, where BSA is body surface area. This formula may also be presented as $\text{SVRI} = \text{SVR} \times \text{BSA}$, and the normal values of SVRI range from 1900 to 2400 dynes s m²/cm⁵ [2,3,5]. Notably, the reported SVRI values in the article by Kim et al. [1] range from 612 to 683 and the units are given as dynes s/cm⁵/m², indicating that the SVR values were divided and not multiplied by BSA. The correct SVRI units should be presented as either dynes s/(cm⁵/m²) or dynes s m²/cm⁵. We estimated that the proper SVRI values in the study conducted by Kim et al. [1] would range from 1900 to 2300 dynes s m²/cm⁵. We agree with the general results and conclusions of the article; however, the SVRI results should be recalculated.

Conflict of interest

All authors declare no conflict of interest related to this study.

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References

- [1] Kim BG, Cho SW, Lee HY, et al. Reduced systemic vascular resistance is the underlying hemodynamic mechanism in nitrate-stimulated vasovagal syncope during head-up tilt-table test. *J Arrhythm* 2015;31(4):196–200.
- [2] Tahvanainen AM, Tikkakoski AJ, Leskinen MH, et al. Supine and upright haemodynamic effects of sublingual nitroglycerin and inhaled salbutamol: a double-blind, placebo-controlled, randomized study. *J Hypertens* 2012;30(2):297–306.
- [3] Tikkakoski AJ, Tahvanainen AM, Leskinen MH, et al. Hemodynamic alterations in hypertensive patients at rest and during passive head-up tilt. *J Hypertens* 2013;31(5):906–15.
- [4] Stamler JS, Loh E, Roddy MA, et al. Nitric oxide regulates basal systemic and pulmonary vascular resistance in healthy humans. *Circulation* 1994;89(5):2035–40.
- [5] Borlaug BA, Melenovsky V, Redfield MM, et al. Impact of arterial load and loading sequence on left ventricular tissue velocities in humans. *J Am Coll Cardiol* 2007;50(16):1570–7.

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