Comparison of the Flow-Mediated Dilation Response between the Popliteal and Fibular Arteries

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Objectives: Vascular health is controlled by competing neural sympathetic vasoconstrictor and endothelial-derived vasodilator mechanisms. However, the relationship between these mechanisms is poorly understood. In humans, muscle sympathetic nerve activity (MSNA) is commonly measured in the fibular nerve to assess vasoconstrictor activity, while flow-mediated dilation (FMD) measures of lower-limb endothelial dilatory function are routinely measured in the popliteal artery (PA). Ideally, FMD measures would come from the fibular artery (FA). However, fibular FMD responses are rarely reported and whether it responds similarly to the PA is unknown. Past literature has shown upper limb arteries with a larger baseline diameter exhibit smaller FMD responses, although this relationship isn't as strong in lower limb arteries (1). The aim of this study was to compare PA and FA FMD and corresponding changes in shear rate.

Methods: Ultrasound-derived diameters and Doppler flow velocities of the PA and FA were measured in 13 healthy participants (5F/8M, 22±2 years) at rest and after 5-minutes of distal cuff occlusion. Data were analyzed using automated edge-detection software. FMD was expressed as percent increase from rest (%FMD) and normalized to shear rate (%FMDnorm).

Results: Resting and peak post-occlusion diameters were higher in the PA than FA (4.95mm±0.59mm vs. 2.54mm±0.56mm, $P<0.001$ and 5.38mm±0.71mm vs. 2.82mm±0.63mm, $P<0.001$, respectively). However, %FMD and %FMDnorm were higher in the FA than PA (8.56±2.19 vs. 11.22±2.13, $P=0.001$ and 8.71±2.42 vs. 11.09±2.80, $P=0.01$, respectively). Total shear rate area under the curve was not significantly different between the PA and FA ($P=0.48$).

Conclusions: These results correspond with previous literature, indicating that arteries with smaller baseline diameters have greater FMD responses (1). There were no differences in shear rates despite different FMD responses. Our findings have implications for future research examining the effect of age and aerobic fitness on concurrent measures of FMD and resting MSNA.

*Supported by a Canadian Foundation for Innovation: Leader's Opportunity Fund and a Faculty of Health Professions Research Development grant.

References:

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