

Vascular Physiology Assessment Services

Brachial artery flow-mediated dilation (FMD): commonly utilized non-invasive assessment of vascular endothelial function and biomarker of cardiovascular disease risk. The test is performed by a trained researcher using a high-resolution ultrasound machine (Logiq e9, GE Healthcare) to obtain images of the brachial artery diameter and blood flow at rest. The forearm is then occluded with a supra-systolic blood pressure cuff placed on the forearm for five minutes followed by immediate release. The artery diameter and blood flow are imaged again immediately after the sudden release of the cuff for 2 minutes to capture the vasodilation that occurs. The percentage dilation of the brachial artery (8-10% normal healthy adults) is measured off-line with image detection software (Vascular Analysis Tools, Medical Imaging Applications, LLC) and the magnitude of increase in blood flow (called reactive hyperemia) are recorded and increase in blood flow velocity or shear rate (=blood flow velocity/diameter) are used to quantify the 'shear' stimulus for dilation.

Brachial artery nitroglycerin (NTG) mediated dilation: used to quantify the endothelium-independent maximal vascular dilation following NTG administration. The setting remains the same as the previous test, however the cuff inflation and deflation is replaced by a single dose of 0.3 mg sublingual NTG tablet. Ultrasound imaging of the brachial artery is then recorded for 10 minutes and the percentage increase in dilation from baseline is recorded.

Pulse wave velocity (PWV): a non-invasive measure of arterial stiffness. Using the Non-invasive Hemodynamics Workstation (Cardiovascular Engineering, Inc) system (same device used in the Framingham Heart Study), the researcher places a tonometer on the skin at the pulse sites of the brachial (upper arm), radial (wrist), femoral (inner hip) and carotid (side of neck) arteries. Physical distances from those points to the suprasternal notch are recorded with a tape measure, along with standard blood pressure measurements and 3-lead ECG tracings.

REFERENCES:

[Expert consensus and evidence-based recommendations for the assessment of flow-mediated dilation in humans - PubMed \(nih.gov\)](#)

[Sex-specific effects of habitual aerobic exercise on brachial artery flow-mediated dilation in middle-aged and older adults - PubMed \(nih.gov\)](#)

[Arterial Stiffness and Long-Term Risk of Health Outcomes: The FHS - PubMed \(nih.gov\)](#)

[Arterial stiffness and cardiovascular events: the Framingham Heart Study - PubMed \(nih.gov\)](#)

[Elevated Muscle Sympathetic Nerve Activity Contributes to Central Artery Stiffness in Young and Middle-Age/Older Adults - PubMed \(nih.gov\)](#)