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INSIGHT THROUGH *IN VIVO* IMAGING™

PRODUCT BRIEF:

Vevo® Vasc Vessel Wall Motion and Strain Analysis Package

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Part No: 50361
Item: Vevo Vasc Vascular Wall Motion and Strain Analysis Package

Description

The Vevo Vasc Analysis Package provides multiple analysis tools for quantifying and characterizing early indicators of vascular disease. It is the first software of its kind available for preclinical researchers studying vascular disease (optimized for mouse and rat models). The software includes tools for:

- Automatic and manual vessel wall detection and delineation
- Automated tracking of vessel motion
- Quantification of vessel velocity, displacement, strain and shear
- Clinically translational measures of arterial fitness, such as intima-media thickness, pulse wave velocity and elasticity

Vevo Vasc can be used with both longitudinal and transverse B-Mode and EKV™ cine loops of mouse and rat arteries.

Alpha Release Date
December 2012

Target Release date
Summer 2013

Software Compatibility
Version 1.5.0+

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Vevo® Vasc Vessel Wall Motion and Strain Analysis Package

Background
The ability to measure vascular strain/shear, micro-anatomy and stiffness *in vivo* provides researchers with the tools necessary to characterize vascular pathologies longitudinally in disease models or in response to therapy. Until now, there have been no vascular analysis tools for cardiovascular researchers to study pathological changes in vascular tissues *in vivo* in small animal models. Most likely this is the result of an inability to visualize vessels in small animal models due to limited spatial and temporal resolution of most imaging modalities. The Vevo 2100, however, makes these types of measurements possible because it has the capacity to generate cine loops at up to 10,000 frames per second with 30 µm resolutions.

Software Overview
The Vevo Vasc analysis package utilizes advanced speckle tracking algorithms on high-resolution ultrasound data to quantify vascular pathologies non-invasively and *in vivo*. It is the first software of its kind available for preclinical researchers studying vascular disease (optimized for mouse and rat models).

The software includes both qualitative and quantitative tools to study various vascular disease models. By taking advantage of the Vevo 2100's high spatial and temporal resolution, it is possible to visualize and quantify early indicators of vascular disease and/or remodeling.

Features
Vevo Vasc is a software application that can be used for visualizing vessel wall motion and quantifying arterial fitness in both longitudinal and transverse sections. The types of quantification with Vevo Vasc can be separated into three categories: 1) vessel wall tracking for motion and strain data; 2) vessel stiffness quantification using pulse wave velocity; 3) vessel wall analysis for measuring vessel micro-anatomy.

1) Vessel Wall Tracking
Qualitatively, Vevo Vasc displays motion of the vessel wall with vectors and lines overlaid on B-mode data. Tracking is based on speckle tracking techniques that track ultrasound interference patterns known as speckle. Together with time-dependent graphs of velocity, displacement, strain and shear, researchers can visualize and quantify their data with millisecond accuracy.

2) Vessel Stiffness Quantification Using Pulse Wave Velocity
The second quantification technique is the pulse wave velocity (PWV) tool, which provides a measure of arterial stiffness. This tool has been adapted from the clinical calculation of PWV, which typically relies on pulsed wave Doppler mode and ECG. Clinically, this measurement has been shown to be highly reproducible and correlative to cardiovascular events. Typically, two PW Doppler measurements and an ECG recording are performed in the clinic: one in the carotid, and one in the femoral artery. The arterial distance between these points is estimated using a measuring tape, and the time delay for the pulse is calculated based on the ECG.

Vevo Vasc takes advantage of the Vevo 2100's high temporal resolution making it possible to measure both the time delay across a distance in one image. Rather than using PW Doppler, Vevo Vasc uses reconstructed time-synced M-Mode images from EKV (ECG-gated B-Mode acquisition) data.

3) Vessel Wall Analysis and Micro-Anatomy

The third quantification feature is the vessel wall analysis tool, which has the primary purpose of measuring vessel dimensions, including (but not limited to) intima-media thickness (IMT). Clinically, IMT in the carotid artery is an indicator of cardiovascular risk. Vevo Vasc offers an IMT quantification tool in addition to semi-automated calculation of vessel diameter and area.

Further segmental or regional analysis is available in the Vevo Vasc software. For regional analysis, one or more regions can be selected directly on the image. Associated graphs are displayed for the selected regions and are color-coded for easy interpretation.

Typical Vevo Vasc Workflow

Vevo Vasc is an intuitive and easy-to-use post-capture image analysis application. The typical workflow follows:

1. Collect B-Mode or EKV cine loops of longitudinal and transverse vessel sections.
2. Seamlessly load the data into Vevo Vasc with the press of a button.
3. Using the built-in Anatomical M-Mode tool, select the desired cardiac cycle(s) for analysis.
4. Set the analysis parameters (longitudinal or transverse, manual or automatic, calculate IMT).
5. Trace the first contour, and the rest is automated.

Technical Note

The Pulse Wave Velocity tool relies on the high temporal resolution of EKV imaging. In order to offer the best value to our customers, VisualSonics is offering special pricing on our **Vevo Vasc Ultra (P/N: 50574) package**, which includes *both* Vevo Vasc and EKV.

References

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Cinthio M. Longitudinal movements and resulting shear strain of the arterial wall. *AJP: Heart and Circulatory Physiology*. 2006 Feb 24;291(1):H394–H402.

For more information on Vevo Vasc,
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