Timing and Amplitude of Wave Reflection

To the Editor:

Dr Mitchell is to be complemented on a perceptive, articulate editorial on detection and interpretation of wave reflection in the human arterial system.1 While we have differed in the past, modification of 2 points would bring his views into line with ours.

First, we see no specific implication of “impedance matching” (increasing proximal aortic stiffness with age and unchanged peripheral muscular artery stiffness). Although this could alter amplitude and apparent location of reflection sites, there is little evidence of this in detailed studies of ascending aortic impedance at cardiac catheterization.2 Increased pulsatility in the microvasculature is attributable to arterial stiffening3 and would actually be greater (and worse for the microvasculature) if peripheral arterial stiffness increased as much as proximal.

The second problem we have is with identification of wave reflection. Dr Mitchell believes that this “hovers in a relatively narrow range (110 to 150 ms) across the full human life span” after aortic valve opening. We disagree. Like London et al4 we have seen values >200 ms in young persons (where return of wave reflection is close to the cardiac incisura), and well <80 ms in older persons. Examples of very early return of wave reflection in older persons were included in the article by Westerhof et al on which the editorial was based. It is very difficult to separate the beginning of wave reflection when it returns early and modifies the initial upstroke of the pressure wave. This is one purpose of the technique described by Westerhof et al and has been applied by Qasem and Avolio.5 Very early return of wave reflection can boost the initial rise of aortic and left ventricular pressure before the peak of aortic flow, and if unrecognized, can lead to overestimation of characteristic impedance and underestimation of augmentation caused by wave reflection. This may have occurred in Dr Mitchell’s previous studies, as referenced.

We agree with Dr Mitchell that timing of wave reflection is difficult, and that difficulties influence interpretation of aging change and of drugs on the proximal aorta and peripheral arteries. Like Dr Mitchell, we welcome new approaches such as that of Westerhof and colleagues.

Disclosures

M.F.O. is founding director of AtCor Medical, manufacturer of systems for analyzing the arterial pulse. W.W.N. is a consultant to AtCor Medical.

Michael F. O’Rourke
Victor Chang Cardiac Research Institute/
University of New South Wales/St. Vincent’s Clinic
Sydney, Australia

Wilmer W. Nichols
Departments of Medicine and Physiology
University of Florida
Gainesville, Fla

Timing and Amplitude of Wave Reflection
Michael F. O'Rourke and Wilmer W. Nichols

Hypertension. 2007;49:E3; originally published online November 6, 2006;
doi: 10.1161/01.HYP.0000250823.15229.37
Hypertension is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2006 American Heart Association, Inc. All rights reserved.
Print ISSN: 0194-911X. Online ISSN: 1524-4563

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://hyper.ahajournals.org/content/49/1/E3

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Hypertension can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Hypertension is online at:
http://hyper.ahajournals.org//subscriptions/