Flawed Measurement of Brachial Tonometry for Calculating Aortic Pressure?

To the Editor:

The article by Segers et al.1 on aortic-radial wave transmission and amplification casts doubt on the present approach to the calculation of central aortic pressure from the radial artery tonomographic waveform; this assumes that brachial and radial pressures are substantially identical. Findings of high amplification (~8 mm Hg1 between brachial and radial systolic pulse pressure) cannot support the present practice of calibrating the radial pressure wave from brachial cuff pressures and could strengthen the view that indices of pressure waves that do not depend on cuff pressure (eg, amplification, as a percentage, or augmentation index) might be preferred to estimations of central aortic pressures.1,4

The requirements for accurate tonometry cannot be met at the brachial site, because the artery lies under the stiff bicipital aponeurosis, and its anterior surface cannot reliably be flattened under the sensor. Applanation tonometry is accurate at carotid and radial sites, because the artery can be applanated against the radial bone or vertebral bodies and ligaments behind.3,4 We and others have been happy to use radial and carotid tonometry, because we have been able to record similar noninvasive and invasive waveforms consistently in radial and carotid arteries.3,5 However, we have not been consistently able to record similar waveforms in the brachial artery, where the tonometric brachial pulse is usually blunted compared with the normally peaked intra-arterial trace.1,4 Our transfer function studies have shown almost identical modulus values between the aortic-to-brachial as between the aortic-to-radial artery.3

Our concerns will remain until Segers et al.1 are able to show that there is greater amplification of invasively recorded pressure waveforms between brachial and radial arteries than between the central aorta and brachial artery and that brachial tonometry can accurately measure pulse waveforms at the brachial artery. We have been unable to confirm either. The consequence of the approach by Segers et al.,1 also used by others, is that there is little or no difference in calculated systolic or pulse pressure between the central and brachial arteries1 instead of the ~10 mm Hg universally agreed on for invasive studies and shown in trials such as REASON, CAFE, and Strong Heart Study.

Disclosures

M.F.O. is the founding director of AtCor Medical (Sydney, Australia), maker of a pulse-wave analysis system.

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

Kenji Takazawa
Tokyo Medical University
Hachioji Medical Center
Tokyo, Japan


Flawed Measurement of Brachial Tonometry for Calculating Aortic Pressure?

To the Editor:

The article by Segers et al.1 on aortic-radial wave transmission and amplification casts doubt on the present approach to the calculation of central aortic pressure from the radial artery tonomographic waveform; this assumes that brachial and radial pressures are substantially identical. Findings of high amplification (~8 mm Hg1 between brachial and radial systolic pulse pressure) cannot support the present practice of calibrating the radial pressure wave from brachial cuff pressures and could strengthen the view that indices of pressure waves that do not depend on cuff pressure (eg, amplification, as a percentage, or augmentation index) might be preferred to estimations of central aortic pressures.1,4

The requirements for accurate tonometry cannot be met at the brachial site, because the artery lies under the stiff bicipital aponeurosis, and its anterior surface cannot reliably be flattened under the sensor. Applanation tonometry is accurate at carotid and radial sites, because the artery can be applanated against the radial bone or vertebral bodies and ligaments behind.3,4 We and others have been happy to use radial and carotid tonometry, because we have been able to record similar noninvasive and invasive waveforms consistently in radial and carotid arteries.3,5 However, we have not been consistently able to record similar waveforms in the brachial artery, where the tonometric brachial pulse is usually blunted compared with the normally peaked intra-arterial trace.1,4 Our transfer function studies have shown almost identical modulus values between the aortic-to-brachial as between the aortic-to-radial artery.3

Our concerns will remain until Segers et al.1 are able to show that there is greater amplification of invasively recorded pressure waveforms between brachial and radial arteries than between the central aorta and brachial artery and that brachial tonometry can accurately measure pulse waveforms at the brachial artery. We have been unable to confirm either. The consequence of the approach by Segers et al.,1 also used by others, is that there is little or no difference in calculated systolic or pulse pressure between the central and brachial arteries1 instead of the ~10 mm Hg universally agreed on for invasive studies and shown in trials such as REASON, CAFE, and Strong Heart Study.

Disclosures

M.F.O. is the founding director of AtCor Medical (Sydney, Australia), maker of a pulse-wave analysis system.

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

Kenji Takazawa
Tokyo Medical University
Hachioji Medical Center
Tokyo, Japan

Flawed Measurement of Brachial Tonometry for Calculating Aortic Pressure?
Michael F. O'Rourke and Kenji Takazawa

Hypertension. 2009;54:e131; originally published online September 14, 2009;
doi: 10.1161/HYPERTENSIONAHA.109.139915

Hypertension is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2009 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/54/5/e131

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/