Response to Impact of Radial Artery Pressure Waveform Calibration on Estimated Central Pressure Using a Transfer Function Approach

We thank Segers et al1 for their interest in our recent study illustrating the importance of central-to-peripheral amplification of systolic blood pressure. Their concern regarding our data centers on the calibration of radial artery waves and the theoretical impact that this will have on amplification of pressure between the aorta and the brachial artery. Amplification expressed as a ratio between central and peripheral pulse pressure is a fiducial parameter. As such, the use of a generalized transfer function does not, in itself, affect this relationship, which is independent of calibration, relying instead on the shape of the waveform and Fourier analysis of its component harmonics. Moreover, Segers et al1 do not question the validity of the generalized transfer function used by the SphygmoCor system, and previous invasive studies would support its accuracy. Nevertheless, we accept that the absolute values of central systolic pressure will depend on the method used to calibrate radial artery pressure waves.

In our study,2 we assumed equivalent brachial and radial systolic pressures for the purpose of calibration, as is common practice. However, Segers et al1 suggest that pressure amplification continues in the arm leading to differences in brachial and radial systolic pressure, which may be as high as ~7 mm Hg. However, this figure is based on noninvasive data collected in a cohort of individuals from the Asklepios Study3 with a relatively narrow age range (35 to 55 years), which is likely to amplify any variability. Unfortunately, only very limited invasive data concerning brachial-radial amplification are available4,5 and suggest that the brachial-radial pulse pressure difference is ~5 to 6 mm Hg in young people (average age: 32 years). The alternative waveform calibration methods proposed by Segers et al1 each have their own limitations. In particular, all of the methods assume that mean and diastolic pressure remain constant in the arm. Moreover, methods 2 and 3 rely on a mathematical estimation of mean pressure rather than direct measurement. Method 4 will multiply the error associated with noninvasive recording of pressure waves and may introduce further errors resulting from fluctuations in blood pressure and heart rate during the calibration period. Although Segers et al1 have highlighted an important methodologic issue, it is vital that we understand the full impact of age, gender, and other physiological variables, such as mean arterial pressure, on the degree of pressure amplification in the arm using invasive methodologies. These data may then allow a standard method of waveform calibration to be developed.

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Carmel M. McEniery
Clinical Pharmacology Unit
University of Cambridge, Addenbrooke’s Hospital
Cambridge, United Kingdom

John R. Cockcroft
Department of Cardiology
Cardiff University, University Hospital
Cardiff, United Kingdom

Ian B. Wilkinson
Clinical Pharmacology Unit
University of Cambridge, Addenbrooke’s Hospital
Cambridge, United Kingdom

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Carmel M. McEniery, John R. Cockcroft and Ian B. Wilkinson

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