12.04: HOW MUCH DOES PRESSURE WAVE REFLECTION CONTRIBUTE TO AUGMENTATION INDEX?

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To cite this article: A. Guilcher, S. Brett, B. Clapp, P. Chowienczyk (2011) 12.04: HOW MUCH DOES PRESSURE WAVE REFLECTION CONTRIBUTE TO AUGMENTATION INDEX?, Artery Research 5:4, 201–201, DOI: https://doi.org/10.1016/j.artres.2011.10.189

To link to this article: https://doi.org/10.1016/j.artres.2011.10.189

Published online: 14 December 2019
Aortic pulse pressure can be partitioned into the height of the first systolic shoulder (P1) and augmentation pressure AP. P1 is thought to be determined by an outgoing pressure wave generated by ventricular contraction and AP by a backward wave “reflected” from the distal circulation. Augmentation Index (AIx = AP / cPP) is commonly used to quantify wave reflection. Nitroglycerin (NTG) has a powerful effect to reduce AIx which has been attributed to a reduction in wave reflection. The objectives of this study were to examine the contribution of forward and backward waves to AIx at rest and after administration of NTG.

Methods: A ComboWire 9500 catheter (VolcanoCorp, USA) with a Doppler probe and a pressure sensor at the tip was placed in the aortic root in 21 subjects (11 men, aged 45-81). Simultaneous measurements of aortic blood flow velocity and blood pressure were made at baseline and after the administration of sublingual NTG (400 μg). Using wave decomposition, AIx was expressed as the summation of forward and backward components, Fm and Bm respectively.

Results: AIx decreased by 17.3% (from 39.5 ± 3.6 to 22.2 ± 5.0%, P < 0.001) after NTG. The decrease in AIx was attributable to a similar decrease in both forward and backward components (decreases in Fm and Bm by 8.7% and 8.6% respectively (P < 0.05).

Conclusions: These results suggest the forward wave is a major determinant of AIx and that the role of reflection in mediating effects of NTG may be less than previously thought.

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AMBULATORY ARTERIAL STIFFNESS INDEX: ANOTHER AMBIGUOUS STIFFNESS INDEX?

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Introduction: The Ambulatory Arterial Stiffness Index (AASI), derived from ambulatory blood pressure (ABPM) recordings, has been proposed as a surrogate marker of arterial stiffness. However, there is controversy to which extent it reflects stiffness or is affected by other parameters. Using a computer model of the arterial circulation, the relative importance of the different determinants of the AASI was explored.

Methods: Arterial distensibility (inverse of stiffness), peripheral resistance, heart rate, maximal cardiac elastance and venous filling pressure were varied from 80 to 120% of their initial value in steps of 10% to generate 3125 BP-values, mimicking the daily fluctuations in one theoretical subject. From this dataset, we assessed the confidence with which AASI can be derived in this subject, as well as the influence of different individual parameters on AASI. To assess the ability of AASI to detect large changes in arterial stiffness, two additional subjects were simulated with a distensibility of 50% and 25% of the default distensibility, respectively.