Comments from a Senior Investigator in Hypertension

For more than a century, the indirect measurement of blood pressure (Riva-Rocci and Korotkov method) has been the most important parameter in the detection, evaluation and management of hypertension. However, understanding the nature of such hemodynamic alteration requires a much more sophisticated analysis of the physics and dynamics of pulsatile circulation, the basis of which were presented about 2 century ago by Young (Elastic module, 1808), Posiseuille (Pressure-flow gradient, 1840), and Bernoulli (Flow equation,1725). In fact, it has been recently recognized that although cardiac stroke volume plays a role in the generation of systolic BP, the syndrome of essential hypertension is much more dependent on a series of changes in the vasculature, including aortic and central arterial stiffness, reflected pressure waves and also systemic vascular compliance and resistance, all of them beyond the scope of the routine measurement of BP.

In order to approach this problem, several investigators introduced the recording and analysis of the arterial pulse pressure and flow waveforms by means of intra-arterial catheters, plestimography, arterial tonometry or Echo-Doppler methods. In this way, Murgo JP (1944), and O'Rourke MF, Nichols WW, Safar M E, Cohn JN, from 1960 to 1980, developed our current concepts on Reflected Pressure Wave (RPW), Travel Time of Reflected Wave (TTRW), Pulse Wave Velocity (PWV), Aortic and arterial stiffness (AS), arterial distensibility (AD), Systemic Vascular Compliance (SVC) and Resistance (SVR).

In the 1990's, Chio SS developed the computerized non-invasive arterial Pulse Wave Analysis (PWA, DynaPulse) by means of a cuff sphygmomanometer a micro-sensor device. This technology became a novel advance for studying the cardiac and vascular hemodynamics. Three are the most significant advances considered. First, being the first reproducible non-invasive measurement of Central arterial pressure (End-Systolic, End-Diastolic BP and PP), equivalent brachial BP, along with cardiac parameters (LVET, LV dP/dT max., cardiac output, SV and indexes). Second, the expanded vascular parameters (SVR/SVC along with Brachial AD/BAC/BAR); and last but not less, the fact that such measurements greatly reduces the inter or intra-observer differences. Indeed, it is the first time that most of the hemodynamic factors are readily available for routine clinical use. In fact, while the studies by Murgo JP, O'Rourke, Nichols, Safar and Cohn opened the path for better understanding of the hemodynamic of hypertension, the device by Chio allowed its more comprehensive and reliable estimation for clinical practice.

In this context, since 2000, we have been using the PWA for a large number of research studies in essential hypertension, normotensive offsprings of hypertensives and in their normotensive subjects. From these works, we have characterized new information in both essential hypertension (Hemodynamic Characterization of Systolic Hypertension: New Findings and CV Parameters, Am J Hypertens.2001; Improved LV Function, Systemic Vascular and Brachial Artery Parameters in Hypertension: the Venezuelan Telmisartan Study, Am J Hypertens.2001; Suprasystolic Arterial Pulse Waveform Analysis: New Hemodynamic Parameter for Hypertension, Am J Hypertens.2002), as well as in human vascular physiology (Travel Time of the Reflected Wave: Gender Differences Independently of Age, Height or Weight, Am J Hypertens.2003; Total Body Potassium and Systemic and Local Arterial Stiffness: the GenNet Study, Am J Hypertens.2004), including those for prediction of Hypertension (Arterial Stiffness in Young Normotensive Students: Differences Between Hypertensive and Normotensive Offspring, 2005).

In general, these studies changed rapidly our concepts of essential hypertension, from a simple measurement of BP to those of a hemodynamic alteration much more complex than previously assumed. Further, the hemodynamic studies established the basis for new therapeutic measures improving the hypertension and some of its critical complications (Assessment of Potassium

Homeostasis and Vascular Function, Circulation. 2002; Reversion of ST-T Alteration in Hypertensives with LVH or Coronary Artery Disease, Am J Hypertens.2004).

In summary, this very short history of accomplishment in our Hypertension Research Unit, has thus became the more clear evidence and academic support that I am delighted to write on our experience with such novel DynaPulse device.

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