EDITORIAL

Arterial Mechanics and Dynamics in Hypertension

In the cardiovascular system, the heart is usually considered the main and most relevant element. On the other hand, blood vessels are traditionally considered simple conduits that connect the cardiac pump with the organs. Such a rudimentary approach underestimates the prominent role shown by blood vessels, in general, and by arteries, in particular, especially the Aorta, in regulating the blood flow periodically imposed by each cardiac ejection.

Hypertension is a chronic disease that affects at least one billion people worldwide. Nowadays, it is considered to be a leading cause of death, stroke, myocardial infarction, congestive heart failure, and chronic renal failure. At present, important evidence suggests that conduit arteries are clearly involved in both diagnosis and complications of arterial hypertension.

Therefore, analysis of the arterial system turns out to be of critical relevance. The arterial hydraulic load exhibited by the blood flow towards the left ventricle may be divided into three main components: systemic vascular resistance, arterial elasticity and the reflected wave present in the circulation. The contributors to this issue analyse each of these dynamic constituents of the circulation [1].

Authors have systematically reviewed the historical aspects of their research activities on the arterial mechanics area during the last three decades. The diagnostic techniques on arterial status are described from basic experimentation to clinical application, including the elastic, viscous and inertial properties of the arterial wall, the endothelium function, and the arterial pressure waveform analysis, among others. Currently, these studies are tools in the clinical arterial assessment of hypertensive patients [2]. Likewise, arterial stiffness, measured by pulse wave velocity, is considered a marker of cardiovascular and renal risk and a predictor of cardiovascular and all-cause mortality.

On the other hand, the purpose of adaptive filter to establish a relationship between instantaneous arterial pressure and instantaneous arterial diameter values is explained by the reviewers. Adaptive filter methodology development and identification, in cardiovascular dynamics research and clinical evaluation, is correspondingly described [3].

A new index, pulse wave velocity ratio, which measures central-to-peripheral arterial stiffness gradient, between carotid-femoral and carotid-radial pulse wave velocity, is reported in this issue. This index relevance consists in its significant association with increased mortality in haemodialyzed patients. Measurements performed on the vascular access side and on the contralateral side are compared, also in haemodialyzed patients [4]. Moreover, a revision on new indexes of arterial elasticity for patients with end-stage renal diseases and on haemodialysis is shown [5]. Similarly, results on arterial structural and functional changes in hypertensive children and adolescents are reported [6].

Throughout the last years, the role of uric acid has evolved as a component related to the metabolic syndrome. Authors discuss this crucial point, wherein serum uric acid was associated to increased arterial stiffness and to constituents of the metabolic syndrome, raising the possibility that a new approach to the role of uric acid, linked to cardiovascular stratification, might be considered [7].

The function of heart rate as a cardiovascular risk is also reviewed by the authors in this issue. The impairment imposed by heart rate on hypertension and arterial wall stiffness is described in detail by the authors, in order to assess cardiovascular risk accurately [8].

Supervised cardiac rehabilitation can improve hypertension incidence, prevalence and prognosis. Comparison of different protocols is discussed, showing the differences between supervised or partly supervised cardiac rehabilitation, in hypertensive patients subjected to them [9].

Another key review of this issue is related to the effect of different antihypertensive drugs on the arterial dynamics and on the endothelium role. When choosing the suitable antihypertensive drug therapy, it should be considered using drugs that may have specific effects on the endothelium, beyond blood pressure values control. It is well known that the combination of an angiotensin-converting enzyme inhibitor plus a calcium channel blocker is more effective, in reducing blood pressure, than an angiotensin converting enzyme inhibitor alone. Furthermore, one should also be acquainted with the fact that these compounds may also improve arterial distensibility and cardiovascular remodelling, as well [10].

Increases in Peripheral Systolic Pressure Levels and Z-score Associate Gradual Aortic Pressure Increase and Functional Arterial Impairment in Children and Adolescents [11].

The concepts described in this special issue can enlighten researchers about innovative developments, performed during the last decades, concerning the arterial tree from the functional point of view, and also as a target organ damaged by chronic arterial hypertension.
REFERENCES


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