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IMT and arterial stiffness — looking to the heart from a different angle

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The article by Lisowska et al. in this issue of *Folia Cardiologica* [1] focuses on a very important contemporary issue, that of the non-invasive assessment of the extent of cardiovascular disease and the determination of cardiovascular risk.

There is accumulating evidence that the functional and structural status of the peripheral arteries provides with invaluable information for cardiovascular risk assessment. Intima-media thickness (IMT) has been considered as a surrogate marker of generalized atherosclerosis. Various studies have elucidated its role as a predictor of cardiovascular events, such as myocardial infarction and stroke [2, 3], among them two large observational studies, such as the Rotterdam Study [4] and the Atherosclerosis Risk in Communities (ARIC) Study [5]. Furthermore, common carotid IMT has recently been associated with the occurrence of new vascular events, i.e. vascular death, myocardial infarction, and most strongly with stroke, in patients with manifest arterial disease in the SMART study [6]. As a result, the European Society of Hypertension — European Society of Cardiology guidelines recommend IMT measurement for the detection of high risk patients, especially in hypertensive patients with no other sign of target organ damage [7]. Finally, the superiority of calcium-channel blockers in stroke prevention and the beneficial effect of contemporary antihypertensive treatment on cardiovascular risk are possibly mediated, at least partly, through a decrease in carotid intima-media thickening [8].

Furthermore, arterial stiffness and wave reflections have been associated both with the extent of coronary artery disease and with cardiovascular prognosis. Stiffness of elastic type arteries (such as the aorta and the carotid artery) is associated with the presence and the degree of coronary atherosclerosis [9, 10] and predicts future cardiovascular events in patients with ischemic heart disease [11]. Furthermore, enhanced wave reflections are independent risk markers for premature coronary artery disease [12], and add incremental prognostic value in patients undergoing percutaneous coronary interventions [13]. Large artery stiffness is an independent predictor of cardiovascular and all-cause mortality in hypertensive patients [14]. Finally, as recently shown in a large clinical trial, the CAFÉ study (a substudy of the ASCOT), improvement in central hemodynamics with antihypertensive treatment is associated with better clinical outcome and lower cardiovascular mortality [15].

Beyond the major finding of the increased predictive value of the combination of IMT and pulse-wave velocity (PWV) measurement for the presence of atherosclerotic coronary lesions, this study [1] highlights several issues related to the function and structure of the large arteries. First, elastic-type arteries are more affected by age, as this is indicated by the high relationship between cfPWV and age and the no-existent relationship of cbPWV. The stronger relationship between stiffness of the elastic type arteries with age than that of the muscular type arteries is in line with the results of other studies [16]. The significant effect of age on aortic stiffness may also explain the weaker association of PWV with the number of vessels affected. Second, the study by Lisowska et al., underlines the importance of factors that influence arterial structure and

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function, such as smoking [17–19]. Third, the association between functional and structural variables of the great arteries is not consistent. The relationship of carotid-femoral PWV with IMT was not the same for all IMT measurements. This lack of association has also been observed in other studies [20], and deserves further investigation. As far as the carotid artery is concerned, methodological issues may ensue, since IMT measurement is not technically the same in all carotid sites. Furthermore, different propensity for atherosclerosis and arteriosclerosis of the different carotid sites may also play a role. Finally, the different media components of the femoral artery may account for the differences observed in the relation of femoral IMT compared to carotid IMT with coronary atherosclerosis [21].

In conclusion, this very interesting article by Lisowska et al. provides with invaluable insights into the ability of IMT and PWV to predict coronary atherosclerosis, and highlights several determinants of these parameters. As the authors also state, a limitation of the study is the small number of patients. Undoubtedly, larger studies are needed to clarify whether negative or weak associations in this study are due to this relatively small number.

Non-invasive techniques are of paramount importance to assess disease severity and cardiovascular risk. IMT and PWV allow viewing of the heart and its vessels form afar. We only need to clear further our somewhat blurred, at this stage, view.

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