Editorial

Clinical and Epidemiological Significance of Left Ventricular Mass Assessed in Children and Adolescents

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The ability to measure left ventricular mass (LVM) by echocardiography has led to an important understanding of the contribution of inappropriate LVM to the pathogenesis of cardiovascular disease. In particular, the identification by Levy et al,1 in the Framingham Study, of increased LVM as a risk factor for cardiovascular morbidity and mortality independent of conventional risk factors, including obesity and hypertension, initiated many studies by independent investigators to better understand the clinical significance of this finding.

See p 1901 and p 1907

Because children and adolescents grow rapidly and their blood pressure increases with age, pediatric studies have been important in understanding the evolution of LVM in generally healthy individuals. Cross-sectional studies have shown that the major determinants of left ventricular growth are body size and sex, with a smaller contribution made by blood pressure.2,3 Allometric relationships between somatic and cardiac growth have been established, and although these coefficients vary slightly from study to study, they consistently explain a significant percentage of mass variation.2,3 The importance of somatic growth as the major determinant of left ventricular growth has been established by repeat measurements of mass over a 5-year interval in the Bogalusa Heart Study and by the recognition that lean body mass contributes somewhat more to cardiac growth than fat mass.4,5

In this issue of Circulation, Schieken et al6 complete the epidemiological work necessary to understand the characteristics of LVM in children. LVM tracks from early to late adolescence in black and white boys and girls to about the same degree as other important risk factors, such as cholesterol and blood pressure, with a correlation coefficient of ∼0.4. Furthermore, race, sex, body size, heart rate, and blood pressure have small but important interactive effects with change in LVM. Although studies that link tracking of LVM from adolescence into adulthood remain to be performed, the concept that at least some factors associated with cardiac growth are in place early in life is firmly established.

However, epidemiological studies do not help establish the difference between appropriate and excessive increases in LVM. The notion that such pathological increases exist is supported by the increased risk for cardiovascular mortality associated with LVM independent of body size and blood pressure.1,7 To define excessive LVM, investigators have taken two approaches: indexing LVM for body size and defining patterns for left ventricular hypertrophy that may confer increased risk.8

In this issue of Circulation, Daniels et al9 apply an allometric definition of excessive mass (>51 g/m²) and definitions of patterns of hypertrophy (concentric, eccentric, and concentric remodeling) to a cohort of children with essential hypertension followed up in a pediatric hypertension clinic. They have shown that these children have a distribution of LVM shifted toward excessive hypertrophy, that a small but significant percentage have pathological levels of LVM, and that a significant percentage also have the concentric pattern associated with increased mortality in adults. These finding have clinical significance. They establish the concept that cardiac end-organ damage from hypertension exists in children, that LVM assessment is important in the management of childhood hypertension, and that clinical trials to determine the effect of medical therapy of pediatric hypertension on LVM should be performed.

When interpreted collectively, the studies by Schieken et al6 and Daniels et al9 resolve an apparent controversy in the pediatric literature: how important is blood pressure in the acquisition of LVM in children?10 Cross-sectional and longitudinal studies of generally healthy children have shown predominantly positive effects of body size and very small positive effects of blood pressure on LVM, whereas comparisons of hypertensive children with normotensive children have shown large, significant differences in mass.4,11 In the study by Daniels et al,9 patients’ average blood pressure was 25 mm Hg higher than in the study by Schieken et al,6 and study entry was contingent on elevated blood pressure being sustained over a period of time. This is in contrast to children and adolescents in population-based studies in which blood pressure may have significant variability. Thus, for healthy children, the primary prevention of obesity is the most important approach to maintenance of normal LVM; for hypertensive children with established left ventricular hypertrophy, more aggressive treatment approaches are required.

What is the current status of LVM assessment in children? For the clinician, measurement of LVM should be performed in those with elevated blood pressure and perhaps in those with significant obesity. The presence of increased LVM or concentric remodeling may suggest the need for more aggressive therapy. For epidemiologists and researchers, the challenge will be to further refine the assessment of LVM. At any given level of blood pressure or body mass index, a signifi-
cant range of LVM remains, from normal adaptation to pathological hypertrophy. What are the determinants of this variation? And is all "excess" mass pathological? Are there physiological markers that distinguish appropriate increases in mass associated with exercise from an excessive response to hypertension or obesity?

Over the past 25 years, the concept of identifying cardiovascular risk factors in youth has become firmly established, as has the concept of beginning primary prevention efforts at earlier ages through diet, physical activity, maintenance of normal weight for height, and the avoidance of tobacco. Studies of end-organ damage, such as that by Daniels et al., suggest that a new dimension should be considered in preventive cardiology for youths. If a child or adolescent has an identified risk factor, such as hypertension, and an identified adverse sequela, such as left ventricular hypertrophy, why should pharmacological therapy be withheld because of the patient’s age? The time for better definitions of candidates for secondary prevention in youth has arrived.

References
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