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COMMENT

Focusing on cardiovascular health in early life: the application of echocardiography

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Numerous studies have shown that cardiovascular disease (CVD) that ultimately results in disability and premature death outcomes begins in childhood and progresses into adulthood [1–5]. Among childhood CVD risk factors, BMI is the strongest predictor of adult metabolic syndrome [6], defined as a cluster of abnormalities, including central obesity, increased blood pressure, lipid abnormalities, and impaired glucose tolerance, all are well-documented risk factors for CVD. Imperatively, Childhood obesity has been identified as one of the most serious public health challenges of the 21st century. The problem is global and is steadily affecting many low- and middle-income countries. The prevalence has increased at an alarming rate [7]. Globally, in 2020, an estimated 60 million preschool children (under age 5) were overweight and obese [8].

Overweight and obese children are more likely to stay obese into adulthood and more likely to develop noncommunicable diseases like diabetes and CVD at a younger age [7]. In addition, a study from De Jonge LL et al. [9] has found that overweight and obese children show cardiac adaptations already at the age of 2 years. Therefore, it is increasingly important to focus on the evaluation of cardiovascular structure and function in young childhood to potentially prevent CVD in adulthood [10]. However, studies on the typical developmental trajectories of cardiovascular structure and function in childhood are limited, especially for right ventricular (RV) function.

To identify trajectories of RV function in childhood, Chen et al. [11] established the age-specific and body surface area (BSA)-specific percentiles and Z-score curves of tricuspid annular plane systolic excursion (TAPSE, a surrogate of RV longitudinal contraction index, which accounts for 80% of RV systolic function) in a total of 702 healthy Chinese children age from 0 to 15 years. All subjects were divided into sixteen groups according to BSA and nineteen groups according to age. The results were reported in this issue of the Journal.

The study shows no statistically significant differences in TAPSE values between boys and girls in different BSA and age subgroups. However, the mean value of TAPSE presented by Z-score and percentile values showed a steady increasing trend with both age and BSA, respectively. The mean TAPSE value increased from 10.1 mm in neonates to 22.7 mm in 15-year-old children; similarly, the mean value of TAPSE increased from 9.1 mm for infants with BSA $\leq 0.2m^2$ to 23.3 mm for children with BSA $> 1.6m^2$. The smoothed lambda-mu-sigma TAPSE curves exhibited a rapid increase with age nonlinearly and reached the adult level (17 mm) until one year old, then displayed a low increase until 15 years old, both in Z-scores and percentiles.

After comparing the 50th percentile of TAPSE curves among different studies, the authors found that the 50th percentile of TAPSE in Chinese children was closer to Japanese children and approximately 1–4 mm higher than those reported by Koestenberger et al [12] before seven years old. However, its growth curve became flattered after seven years old compared with studies from other countries. More interestingly, the 50th percentile of TAPSE data for Turkish children obtained in 2020 was 1–2 mm higher than that obtained in 2015. This may be attributed to social-economic and lifestyle changes. However, until now, it remains unclear whether this increasing trend of TAPSE by calendar year differs by race and country.

This study demonstrated the typical trajectory curves of RV function and established reference values of the TAPSE

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index for each age-specific and BSA-specific subgroup in Chinese children. First of all, it is beneficial for decision-making in clinical practice, especially for children with impaired RV function due to congenital heart disease, such as atrial septal defect, anomalous pulmonary venous drainage, pulmonary stenosis, RV dysplasia, etc. How to accurately evaluate RV function for these patients is particularly important for selecting surgical timing and procedures, as well as postoperative health management. On the other hand, the results of this study can also help identify susceptible children with impaired RV function early in life during health surveillance programs.

Research on cardiovascular health in early life has received increasing attention in recent years. It is believed that echocardiography will be playing a pivotal role in the evaluation of cardiovascular structure and function during this critical lifetime because of its unique advantages. It is expected that future longitudinal cohort studies with repeated measurements would provide more efficient and compelling insights for understanding the trajectories of cardiovascular health in early life.

Declarations

Disclosures of Conflicts of Interest None.

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