**Letter to the Editor**

# Carotid intima-media thickness measurement in children: is there any value to it?

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Pillai et al. published in a recent issue a study titled, “Carotid intima medial thickness and its association with cardiometabolic risk factors in children with overweight and obesity: A hospital based cross-sectional study” (1). The study’s objective was to analyze the association of the carotid intima media-thickness (cIMT), an ultrasound surrogate marker for preclinical atherosclerosis, (i) in children with obesity and (ii) to compare children with elevated (EcIMT) cIMT and normal cIMT (NcIMT) (1). The authors hypothesized that EcIMT will be found in children with higher obesity metabolic abnormalities than in children with NcIMT (1). 223 children aged 2-15 years were enrolled for the study. The majority of the study population were between 6 -10 years of age (n=109, 48.9%), males (n=139, 62.7%) and prepubertal (n=129, 57.8%) and had obesity (n=180, 80.7%) (1). The cIMT was measured bilaterally at the common carotid artery (CCA) (1). The authors found no statistically significant correlations between cIMT and various clinical and cardiometabolic parameters, no predictors for cIMT were identified on linear regression analysis (1). The authors concluded that “Our finding of elevated cIMT in nearly half of the study participants including young children is very concerning as these children are at increased risk of atherosclerotic cardiovascular disease in adulthood” (1). Some comments are needed to evaluate the results and cIMT related statements of this study (1) in a more balanced way. The authors concede, “Accuracy of cIMT measurement in young children may be limited by the relatively short neck compared to the length of the US transducer and the poor compliance” (1). Given this major technical limitation an exhaustive evaluation of the carotid artery is hampered. It is argued if at lower degrees of thickness and at early ages, the increased cIMT represents true atherosclerotic burden, rather than hypertrophy of the intimal and medial layers (2). The pioneers in cIMT research, Bots et al., wrote in 1997 in one of

their seminal papers, "Increased common carotid intima-media thickness. Adaptive response or a reflection of atherosclerosis? Findings from the Rotterdam Study", the following; "For observational and intervention studies, a question remains whether it matters very much should common carotid IMT below a certain degree not represent local atherosclerosis but merely reflect an adaptive response to altered flow, shear stress, and pressure. Obviously, the answer is "yes" when the main interest of research concerns atherosclerotic wall characteristics and its hemodynamic consequences. Compared with other large arteries, however, atherosclerosis of the common carotid artery tends to develop relatively late in life…IMT of the common carotid artery is unlikely to represent local atherosclerosis" (3).

The partial interrogation of the carotid artery (only the CCA) will lead unavoidably to inaccurate reflection of the atherosclerotic burden in the investigated subjects. Pillai et al. furthermore did not mention if the cIMT measure was synchronized with the cardiac cycle (1). The cIMT varies through the cardiac cycle reportedly by 30 μm, being thickest at end-diastole and thinnest at peak-systole (4). Pillai et al. (1) did not report if cIMT measurement was synchronized, as recommended with the cardiac cycle (i.e. the end-diastolic phase), introducing a further important measurement bias. It is very likely, as consequence of non-synchronization, that *for the same patient* the left cIMT was measured in diastole (higher cIMT) and for the right cIMT measurement occurred in systole (lower cIMT). Consequently, the cIMT measures cannot be compared nor for the same subject nor between the subjects. However, equally within this context to consider that the heart rate in children is higher rendering it challenging to synchronize precisely with the end-diastolic phase. The reported mean values cIMT of 0.41 ± 0.13 mm (1) are within the normal range and are without diagnostic and prognostic values. In conclusion: The cIMT is a delicate surrogate marker as its normal range is expressed at a sub-millimeter range and slightest inaccuracies suffice to misclassify subjects into different cIMT categories, from which equally (inaccurate) conclusions are deducted. In children, rather performing cIMT measures, the assessment for atherosclerosis should be based on validated and reliable clinical and laboratory parameters such as BMI, blood pressure and cholesterol-levels. Given these methodological flaws in the Pillai et al. study added by the intrinsic limitations of cIMT as surrogate marker of preclinical atherosclerosis especially in children, the reported cIMT results and related conclusions by Pillai et al. should be analyzed with caution (1).

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