Editorial

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Is the Measurement of Epicardial Fat in Obese Adolescents Valuable?

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Epicardial adipose tissue is a visceral fat originated from splanchnophrenic mesothelial cells and has same origin with mesenteric and omental fat.[1] It is located between the parietal and visceral pericardium. Although paracardial fat on external surface of the parietal pericardium is located very close to the epicardial fat, it's origin-the primitive thoracic mesenchyme, is different from epicardial fat. Currently known functions[2] of the epicardial adipose tissue include: 1) to buffer the coronary artery against the tension or torsion induced by the arterial pulse wave; 2) to easily expand the environment of the coronary arteries; 3) to act as a buffer taking up fatty acids to avoid levels that are toxic to the myocardium; 4) to act as a local energy source for cardiac muscle; 5) to facilitate coronary artery remodeling; 6) to act in the anatomic environment for the intrinsic cardiac nervous system as numerous ganglia and interconnecting nerves.

The clinical significance of epicardial fat has not been studied extensively. However, the studies on the clinical utility of epicardial fat have gradually been increasing. Body mass index (BMI) was significantly correlated with the amount of epicardial fat[3] and one review showed that elevation of body adiposity was related well with increase in epicardial adipose tissue.[2] Metabolic syndrome, an agglomeration of inter-related metabolic risk factors, is strongly related to cardiovascular diseases. Several studies[3][4] reported that metabolic syndrome is highly related to an elevation in the amount of epicardial fat and the number of components of metabolic syndrome increased linearly as epicardial fat thickness increased. The ability of epicardial fat to predict metabolic syndrome might be useful in patients with non-high BMI.[5] Therefore, the measurement of epicardial fat would be useful in relatively thin status such like Asian. The association with coronary artery disease (CAD) is an interesting subject in the study of epicardial fat. Some studies[4][6] revealed that epicardial fat thickness was correlated with the presence, extent and severity of coronary disease. Interestingly, the increased volume of epicardial fat in patients with BMI <27 kg/m^2 was associated with CAD and extensive coronary calcium.[7] The relationship to the left ventricular mass is also interesting. The left ventricular mass, when measured by echocardiography, correlates well with the thickness of the epicardial adipose tissue, independent of BMI or age.[8]

Most of the clinical studies of epicardial fat are conducted targeting adults, not adolescents. Obesity in childhood or adolescence, however, is very important because childhood obesity can predict adult obesity.[9] According to the Bogalusa Heart Study,[10] 19% of children and adolescents who have a BMI between 85th and 95th percentile had 2 or more cardiovascular risk factors and 5% had 3 or more risk factors. When the BMI was above the 95th percentile, 39% had 2 or more risk factors and 18% had 3 or more risk factors. When the cardiovascular risk factors had existed during childhood, the fatal and nonfatal cardiovascular events increase in adulthood.[11] So the evaluation of obesity is very important in childhood and adolescents as well as in adulthood.

Kim et al.[12] have reported the utility of epicardial fat as a tool for assessment of obese adolescents. In that study, epicardial fat thickness measured by echocardiography had significantly increased in the obese (n=65) as compared to the control group (n=34) (1.5±0.3 vs. 1.1±0.1 mm in male, p<0.05; 1.5±0.3 vs. 1.2±0.2 mm in female, p<0.05).

In obese adolescents, epicardial fat thickness correlated well with BMI, waist circumference, fat mass, fat percentage, subcutaneous fat tissue, and properitoneal fat tissue by univariate analysis. A multivariate analysis showed that fat percentage, serum adiponectin and right brachio-ankle pulse wave velocity were significantly re-

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lated to epicardial fat thickness. The authors concluded that epicardial adipose tissue correlated well with obese parameters even in adolescents. It is meaningful that the clinical utility of epicardial adipose tissue would be extended to childhood and adolescence.

However, some limitations have to be resolved to see a clinical impact. The authors have already mentioned the problems in the paper. First, the reliability of measurement should be proven. The epicardial fat thickness by echocardiography increases linearly with age.[4] Therefore, fat thickness might be low in childhood or adolescence. The mean epicardial fat thickness was 1.5 mm in the obese, while the mean and median thickness of adults[4] was 3.2±2.5 mm and 3.0 mm. The possibility of measurement error is high because the examiner has to discriminate one or low millimeter using commercially available echo-machine. To minimize this error and to provide the reliability of measurements, the inter- and intra-observer variability is critically checked. Second, echocardiography has a limitation of measuring the amount of whole epicardial fat as the authors mentioned this problem. To resolve this problem, the correlation between epicardial thickness by echo and the amount of epicardial fat by CT scan was performed in adults.[13] Because children and adolescents have lower amounts of epicardial adipose tissue than in the adulthood, the agreed measurements by different diagnostic modalities should be proven. In spite of less accuracy of echocardiography to measure epicardial adipose tissue, echocardiography has strong advantages in safety, accessibility and repeatability. The strengths of echocardiography are especially important in the pediatric area. The comparability of measurement of epicardial fat between echocardiography and CT scan would be studied in the near future to improve clinical applications in children and adolescents.

Until now, the clinical significance of epicardial fat is not well known. The location is very close to the coronary artery and myocardium and the endocrine and paracrine functions inform us that the epicardial adipose tissue might be a clinically important organ or tissue. Although the relation with obesity, cardiometabolic risk factors and coronary disease was published, most of these studies are observational and have limited sample sizes. The pathophysiologic role of epicardial fat has not been studied clearly. Seeking the role and utility of epicardial fat are just starting. Join with new field will take you to unexperienced world in the future.

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