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Left-ventricular hypertrophy and diastolic dysfunction in children with chronic kidney disease

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Objectives : Left-ventricular (LV) hypertrophy (LVH) and LV diastolic dysfunction are early marker of cardiovascular disease in pediatric chronic kidney disease (CKD), and the early detection of LVH is important to prevent morbidity and mortality in children with CKD. However, there is no consensus on the ideal method of defining LVH in pediatric CKD patients. Recent studies have addressed a few methods to diagnose LVH including (1) LV mass index (LVMI) calculated as LV mass in grams divided by height in meters to the 2.7th power ≥ 38 g/m2.7, (2) age-specific reference values for LVMI ≥ 95th percentile and (3) LV wall-thickness z-score > 1.64. The aim of this study was (1) to assess the influence of the method of definition on the prevalence of LVH and (2) evaluate LV diastolic dysfunction in children with CKD.

Methods : The study comprised 29 children with CKD stage 3-5 (predialysis) in Samsung Medical Center, and the echocardiography was performed within 3 months of the diagnosis of CKD. The patients with cardiorenal syndrome type 1 and 2 were excluded.

Results : The mean age of the patients was 6.0±4.5 years, and male to female ratio was 2.2. The mean value of LVMI was 49.4 g/m2.7. The mean ejection fraction and fractional shortening was 89.4 and 36.4 %, respectively. According to an LVH diagnosis of LVMI ≥ 38 g/m2.7, 20 patients (69 %) were diagnosed with LVH. Although the patients with LVH show the tendency to be younger compared with those with no LVH (4.9±4.2 vs.8.3±4.3 years), there was no significant difference. Using the age-specific reference values, 8 patients (28 %) were diagnosed with LVH, and all patients with LVMI ≥ 95th percentile were also compatible with LVH diagnosis using LVMI ≥ 38 g/m2.7. Two patients (7.0 %) were diagnosed with LVH using LV wall-thickness z-score > 1.64, and the patients with LVH by using z-score > 1.64 were compatible with LVMI ≥ 38 g/m2.7 and the age-specific reference values for LVMI ≥ 95th percentile. There was a significant difference in diastolic function (E'/A'= early/late diastolic myocardiac velocity) between children with LVH by z-score and those without LVH. The diastolic function by the ratio of mitral peak velocity of early filling (E) to early diastolic mitral annular velocity (E') (E/E' ratio) was

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evaluated in 23 patients, and 21 patients showed the value > 8.0. Among 21 patients with presumed diastolic dysfunction, 4 patients were not compatible with the definition of LVH.

Conclusions : The results of this study show that the prevalence of LVH in pediatric CKD might be influenced by the method of definition of LVH. The LVH by LV wall-thickness z-score > 1.64 could be associated with diastolic dysfunction. Further investigation to find a better method of defining LVH to predict cardiac dysfunction in the children with CKD is necessary.

Keywords : Chronic kidney disease, Left-ventricular hypertrophy , children