Concordance of Left Ventricular Mass Index and Reported Left Ventricular Hypertrophy in Hypertension

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Background

• Left ventricular hypertrophy (LVH) is the most common form of target organ damage associated with hypertension. It is found in 41% of patients with childhood hypertension.

• The AAP Fourth Report recommends that any child diagnosed with HTN must have an echocardiogram done to assess for LVH because LVH is an indication to initiate or intensify anti-hypertensive therapy.

• There are variable methods of diagnosing LVH:

   - Left Ventricular Mass Z-score
       Posterior wall thickness Z-score
       Intraventricular septum thickness Z-score
   - Left Ventricular Mass Index $(g/m^{2.7})$
       LVMI =(1.04 [(IVST+LVID+PWT)3
       −LVID3]−14 g)/BSA

• The AAP Fourth Report recommends the use of LVMI >99th% to diagnose LVH
   - LVH > $51 g/m^{2.7}$

• Age Specific Reference Values for LVMI have been developed (Khoury et al, 2009)

Age	Gender	95th Percentile LVMI
< 6 mo	Boys	80.1
	Girls	85.6
6 mo ≤ 2y	Boys	68.6
	Girls	57.1
2 ≤ 4 y	Boys	52.4
	Girls	55.3
4 ≤ 6y	Boys	48.1
	Girls	44.3
6 ≤ 8y	Boys	44.6
	Girls	43.5
≥9y	Boys	45
	Girls	40

Objective

• To determine the concordance of diagnosis of LVH on echocardiogram reports using wall thickness z-score and diagnosis by LVMI criteria.

Methods

• Retrospective chart review of all pediatric HTN patients in past 3 years at a single tertiary care center.

• Echocardiogram reports were assessed for diagnosis of LVH by cardiologists relying on LV mass z-score

• LVMI $(g/m^{2.7})$ was calculated for each echocardiogram using measurements of intraventricular septal thickness, LV end diastolic dimension and LV posterior wall thickness.

• Diagnosis of LVH was assigned by two criteria:

1) age-specific reference values for LVMI ≥ 95% and 2) AAP guidelines of LVMI ≥ $51 g/m^{2.7}$

Statistical Analysis

• Cohen's kappa statistic was used as a measurement of agreement between the cardiologist's reading of LVH and diagnosis using LVMI.

• Concordance was measured on a scale of 0 to 1 with 0 indicating no concordance at all and 1 representing complete concordance.

Results

Table 1. Demographics

Patients	79
Female	31 (40%)
Male	48 (60%)
Age	11.9 4.6
Secondary Hypertension	30 (38%)
Number of Echocardiogram reports	112
Mean LVMI	62 23
LVMI Range	41.7-133.1 $g/m^{2.7}$
LVH reported on echocardiogram by z-score criteria	11 cases (10%)

Table 2: LVH diagnosed by AAP Guidelines of LVMI > $51 g/m^{2.7}$

LVH diagnosed by AAP Guidelines of LVMI > 51g/m2.7	38 cases (34%)
Percent agreement with z-score diagnosis of LVH	29%
Cohen's kappa statistic	0.2

Table 3: LVH diagnosed by age specific LVMI reference values >95%

LVH diagnosed by age specific reference values	55 cases (49%)
Percent agreement with z-score diagnosis of LVH	20%
Cohen's kappa statistic	0.03

Conclusions

• There was poor concordance of diagnosis of LVH on echocardiogram reports using wall thickness z-score and diagnosis of LVH using LVMI criteria.

• LVH may be under-diagnosed if the classification is based on ventricular wall z-score rather than LVMI.

• Age specific reference criteria for LVMI are more sensitive than the AAP Guidelines of LVMI > $51 g/m^{2.7}$ in the diagnosis of LVH.

• It is important to establish a consensus method for diagnosing LVH because of the high risk of cardiovascular complications in children with long-standing hypertension.