

## Left Axis Deviation in Children Without Previously Known Heart Disease

**Purpose:** Electrocardiograms (ECG) are obtained frequently in children and adolescents for a variety of cardiac and non-cardiac indications. Left axis deviation (LAD) is an uncommon ECG finding in the pediatric population, but it has been associated with various types of heart disease (HD). There is a paucity of current literature available to aid the clinician in determining when to obtain an echocardiogram to assess for HD in an otherwise healthy patient with LAD. Herein, we sought to better stratify which patients with LAD, but without previously known HD, may warrant an echocardiogram.

**Methods:** This was a 13-year retrospective, IRB-approved, electronic medical record review (1/2002 – 12/2014), in which we reviewed all patients  $\geq 1$  to  $< 18$  years of age, who had LAD (axis 0 to  $-90$ ) on ECG. Patients with known HD prior to their initial ECG were excluded. We analyzed demographic variables, ECG axis, echocardiographic findings (when an echocardiogram was performed), follow-up duration, and outcomes. In a subset of patients in whom HD was discovered, we also reviewed the type of HD, initial ECG indication, and the initial physical exam findings at the time of diagnosis.

**Results:** Overall, 296 patients met inclusion criteria ( $n = 181$  (61%) males; mean age  $10.8 \pm 4.6$  years [range 1-17 y]; mean ECG axis  $-24 \pm 22$  degrees; mean follow-up  $3.9 \pm 3.7$  y). A follow-up echocardiogram was performed in 158 (53%) patients, disclosing HD in 23 (15%) patients: secundum atrial septal defect = 4, dilated cardiomyopathy = 4, hypertrophic cardiomyopathy = 4, partial AV septal defect = 4, and 1 each = bicuspid aortic valve, congenitally corrected transposition, mitral stenosis, mitral valve prolapse, non-compaction cardiomyopathy, restrictive cardiomyopathy, membranous VSD. Abnormal physical exam findings were documented in 17 (74%) of those with HD. Compared to those with an echocardiogram but no HD ( $n = 135$ ), patients with HD had a significantly more negative mean ECG axis ( $-42$  vs  $-27$ ;  $p = 0.003$ ) and were more likely to have chamber enlargement or hypertrophy on ECG (35% vs 6%;  $p < 0.001$ ). Thirteen (57%) patients with HD had LAD between  $-42$  and  $-90$ , compared to 36 (27%) patients without HD ( $p = 0.007$ ). Mean follow-up for those without HD was  $4.2 \pm 3.7$  years, with a follow-up duration  $\geq 1$  y in 79% of these patients and none subsequently developed or died from HD.

**Conclusion:** LAD discovered in isolation in the asymptomatic pediatric patient may not necessitate further cardiovascular investigation. Clinicians should consider obtaining an echocardiogram in patients with LAD and ECG evidence of cardiac chamber enlargement or hypertrophy, an ECG axis  $\leq -42$ , and/or the presence of abnormal findings on cardiac physical exam.