

Extension of right-sided T wave inversion to Lead V4: an ECG marker of atrial septal defect in children

Saito-Benz M. (1), Gnanapragasam J. (2)
University of Otago, Wellington, New Zealand (1)
University Hospital Southampton, Southampton, UK (2)

Introduction: Atrial septal defect can be difficult to diagnose in childhood, for even relatively large lesions can remain asymptomatic in children. Moreover, fixed splitting of the second heart sound, which typically distinguishes it from an innocent murmur clinically, can be absent in young children. This study aims to improve the diagnostic value of ECG in children with ASDs. We hypothesise that, with the effect of volume overload and ventricular strain, ASDs may be associated with an extension of right-sided T-wave inversion to precordial lead V4 in ECG.

Methods: All patients under the age of 18 years who underwent device or surgical closure of isolated secundum ASD at University Hospital Southampton between January 2008 and August 2012 were identified retrospectively using existing local database, and their ECGs prior to transcatheter/surgical intervention were reviewed. Children with multiple congenital cardiac abnormalities were excluded from the study. In order to avoid duplication, only one ECG was selected from each patient in any one year. □□

Results: A total of 84 patients and 177 ECGs were identified using the study methods described above. Of all ECGs reviewed, T-wave inversion was observed in V1 in 92%, V2 in 54%, V3 in 41%, V4 in 33%, V5 in 4% and V6 in 0.6%. The extension of T-wave inversion to lead V4 was more commonly observed in children who required surgical closure for their ASDs rather than transcatheter device closure (50% vs 22.4%, $p < 0.0005$). T-wave inversion in lead V4 was more commonly observed in younger age groups.

Conclusions: T-wave inversion in right precordial leads is seen in healthy children whereas T-wave inversion in the left precordial leads is considered abnormal in all age groups. This study suggests that extension of right-sided T-wave inversion to lead V4 is seen in up to a third of children with ASDs requiring either surgical or transcatheter intervention. Along with RSR' pattern in lead V1 and evidence of right ventricular enlargement in ECG, the extension of right-sided T-wave inversion to lead V4 should raise the suspicion of ASD in children with a clinically innocent flow murmur.