Syncope in Children; Is Rhythm Holter Monitoring Necessary?

Fahrettin Uysal, Ozlem Mehtap Bostan, Fatma Çetinkaya, Tuba Deniz, Ergun Cil
University of Uludag, School of Medicine, Department of Pediatric Cardiology, Bursa, Turkey

Introduction

Syncope is a common complaint among children; it extensively disturbs families and often requires cardiovascular evaluation. It also accounts 1%-3% of the emergency service admissions and 1%-6% of the hospitalizations. Although the most common causes of syncope in children are not important, cardiac causes are associated with considerable morbidity and mortality. Therefore, cardiac evaluation is necessary for all patients. Despite detailed history and physical examination, syncope is mostly secondary to structural or functional heart disease; various tests according to the initial clinical evaluation have been recommended. Holter monitoring (HM) is usually ordered by clinicians when syncope etiology cannot be explained with anamnesis, physical examination and electrocardiography (ECG). In various studies; diagnostic value of HM in adult patients with syncope was 4.86%. But studies related with this issue in children are rare. In this study, diagnostic value of the 24-hour rhythm HM admitted to the outpatient clinic of the pediatric cardiology between January 2010-September 2014 in patients with syncope was evaluated.

Materials and Methods

From January 2010 – September 2014, 4800 children with syncope ranging in age from 1 years to 18 years had determined at the department of Pediatric Cardiology of University of Uludag, a tertiary medical center in Turkey. Databases were collected retrospectively by analyzing the HM data of 3122 pediatric patients and the following data were retrieved from the clinical records; gender, age at initial syncope, detailed clinical history, physical examination, 12-lead electrocardiography and echocardiography. All holter performed in patients due to syncope were reviewed for significant arrhythmias as the cause of syncope. The patient was considered high risk if there was a family history of sudden death under <40 years old and if there was an exercise related syncope. Holter monitoring of the patients were performed for 24 hours by using a device with 3 channel. Results were classified as follows:

- Normal Holter results; completely normal or presence of clinically insignificant arrhythmia, i.e.; rare atrial (AES) or ventricular extrastole (VST).
- Abnormal Holter results; for explanation for syncope, i.e.; branch block, 2'AV block Mobitz type-1, frequent VES or AES, non-sustained ventricular tachycardia (VT) (<30 sec).
- Abnormal Holter results; diagnostic for syncope, i.e.; 2'AV block Mobitz type-2, 3'AV block, 23 sec of sinus pause, >30 sec of supraventricular tachycardia (SVT), <35/min of sinus bradycardia, sustained VT (20 sec), long QT syndrome.

QTc values in the HM were calculated by manually using Bazett formula during tachycardia and bradycardia. Patients with long QT values were additionally evaluated with exercise test and genetic test.

Results

A total of 3122 HM performed during study period were evaluated; among them; 323 patients (10.3%) with Holter examination due to syncope were enrolled in this study. Their mean age was 13.21±2.6. There were 199 female and 124 male patients. Among of all patients, 146 of them had 1, 95 of them had 2 and 82 of them had 3 or more syncope episode. There were 42 patients with history of sudden death ≥40 years old in first-degree relatives. Demographic and clinical characteristics of the patients are shown in Table 1.

The most frequent cause of structural heart disease was mitral valve prolapses (13 patients). Furthermore there was 1 patient with atrial septal defect, 1 patient that was operated for tetralogy of Fallot and 2 patients that were operated for ventricular septal defect while the remaining 306 patients had normal echocardiographic examination.

Of the 323 enrolled patients during the study period, 264 (87.9%) had normal HM results. Twenty-eight patients (8.6%) had abnormal HM results, but unlikely to explain syncope while there were 11 (3.4%) abnormal holter studies considered to explain syncope. Table 2 summarizes the results of the cases. All of 7 patients considered as long QT syndrome with HM, had positive family history and their QTc values were normal in basal ECG. There were 2 patients with congenital complete AV block and syncope. One of 2 patients considered as sinus node dysfunction according to the Holter examination had nodal rhythm; whereas other patient had sinus bradycardia in ECG and both of these patients underwent transvenous pacemaker implantation. Thirty of the 284 patients with normal Holter results had positive family history and all of them had normal physical and ECG examination findings. Diagnostic value of HM was significantly higher among patients with family history of sudden death and syncope associated with exercise. However it was found that the syncope frequency did not alter the diagnostic value of HM. Table 3 demonstrates diagnostic yields of HM results according to different parameters. Abnormal HM findings that were not diagnostic for syncope were found in 9 patients with structural heart disease while the remaining 8 patients with structural heart disease had normal Holter results. Thus, HM results revealed no arrhythmias associated with syncope in patients with underlying heart disease.

Discussion

Prevalence of syncope related with arrhythmia during HM was reported as 2% in one study (1). In patients with high risk and structural heart disease, relation between severe arrhythmia and syncope was shown in 12% of the patients (2). Therefore, it could be argued that diagnostic value of the HM in patients with syncope is low when patients were not selected appropriately. In our study, 11 of the patients had arrhythmia associated with syncope; however; 3 of these patients had already been diagnosed with previous ECG. Therefore, overall diagnostic value of the Holter examination was low as 2.4% (6/323). In contrast, 7 of 42 (16.6%) patients especially considered as high risk group in terms of positive family history had diagnostic Holter results. Similarly, 5 of the 35 patients with syncope associated with exercise had diagnostic Holter results (14.2). Similar to the previous studies, it was concluded that HM is more valuable in high-risk patients. On the contrary, however; HM was not found to be useful in patients with structural heart disease in our study.

There was no significant association between syncope frequency and diagnostic value of HM and also the age of patients did not affect the diagnostic yield of HM. The most frequent group diagnosed as a result of abnormal HM associated with syncope was long QT syndrome in our study population. It was known that 27% of the patients with long QT syndrome had normal ECG although they were genetically positive for disease (3). This patient group named as concealed long QT syndrome apparently couldn’t be identified with basal ECG examination. Moreover it was also shown that many clinicians did not calculate QT values on ECG accurately (4). In our study, 7 patients considered as long QT syndrome according to HM findings although the ECG revealed normal QT measurements and all of these patients had positive family history. Therefore, it was emphasized that HM could be used for concealed long QT syndrome especially if the syncope was associated with positive family history and exercise related syncope even with normal basal ECG findings.

All of 7 patients were genetically tested for long QT syndrome type-1, type-2 and type-3; and 1 of them was diagnosed with long QT syndrome type-1. Remaining patients were scheduled for genetic tests of other types of long QT syndrome.

In conclusion, detailed history and ECG is invaluable in children with syncope. Holter monitoring was established to be unnecessary in patients without high risk and its diagnostic value was considered as low among these patients. It was found that HM could be useful in high risk children especially to detect concealed long QT syndrome.

References