

Restoration of Atrioventricular Conduction After Atropine Administration During Electrophysiologic Study in A Patient With Congenital Complete Atrioventricular Block

Konjenital Atrioventriküler Tam Blok'lu Bir Hastada Elektrofizyolojik Çalışma Sırasında Atropin Uygulanması Sonrası Atrioventriküler İletimin Düzelmeleri
Kardiyoloji

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Özet

Konjenital olarak adlandırılmasına karşın, konjenital atrioventriküler tam kalp bloğu (CCAVB) olanların %40'ı çocukluk çağına kadar herhangi bir belirti göstermezler. Bununla birlikte, CCAVB aralıklı olarak görülebilir (özellikle ilk tespit sırasında) ve CCAVB'li hastalarda atrioventriküler iletimin kendiliğinden veya ilaç uygulaması sonrası düzelmesi bu geç yansımanın olası nedenlerinden biri olabilir. Biz bu makalemizde yeni CCAVB tanısı olan 15 yaşında bir erkek hastada elektrofizyolojik çalışma sırasında atropin verilmesinden sonra atrioventriküler düğüm fonksiyonunun düzelmesini tanıttığımız veya tartışacağız.

Anahtar kelimeler: *Konjenital tam blok, Atropin Atrioventriküler iletimin düzelmesi Elektrofizyolojik çalışma*

Abstract

Although named as a congenital, as many as 40 percent of cases of complete congenital atrioventricular block (CCAVB) do not present until childhood. Nonetheless, CCAVB may be intermittent, especially when first detected, and improvement of atrioventricular conduction in patients with CCAVB either spontaneously or after drug administration may be a potential reason of late presentation. We herein will report and discuss the restoration of atrioventricular node function after administration of atropine during electrophysiology study in a 15-year-old male patient newly diagnosed as CCAVB.

Keywords: *Congenital complete heart block, Atropine Restoration Electrophysiology study*

Introduction

Congenital complete atrioventricular block (CCAVB) is usually secondary to abnormal development of the conduction system and has been recognized for almost 100 years¹. Its incidence is approximately 1 in 15.000 to 22.000 live births². Maternal connective tissue disease, especially maternal systemic lupus erythematosus (SLE) is responsible for 60-90% of cases of CCAVB³. Also, myocarditis, storage disorders (eg, Hurler syndrome, Hunter syndrome) and structural congenital heart disease, especially congenitally corrected transposition of the great arteries can cause CCAVB⁴. The diagnosis is suspected when a slow pulse ascertained at an early age and heart block must be demonstrated electrocardiographically. In addition, there must be no history of infection such as diphtheria or rheumatic fever and no evidence of ischaemic heart disease or other cardiomyopathy, nor a history of previous cardiac surgery. Approximately 40% of CCAVB usually recognizes in later childhood and the manifestation varies with the age at presentation⁵. The restoration of atrioventricular conduction in patients with CCAVB is not something many expected. We herein report the restoration of atrioventricular node function after administration of atropine during electrophysiology study in a 15-year-old male patient newly diagnosed as CCAVB.

Case Report

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A 15-year-old male patient newly diagnosed CCAVB during a routine physical examination for sports competition was referred to our institute for evaluation of the need for a pacemaker. In his medical history, he had never any syncopal episodes, he had no significant illness in his life and there was no relevant family. On his physical examination, blood pressure was normal with 120/80 mmHg, heart rate was 46 bpm. Electrocardiography (ECG) revealed complete atrioventricular (AV) block with heart rate 45 bpm. Echocardiography revealed only mild mitral insufficiency with normal left ventricular sizes and function. We performed an electrophysiology study in order to determine the level of atrioventricular block and decide on the need for a pacemaker.

Informed patient consent form was obtained. After fasting for eight hours prior to the procedure, patient was undergone electrophysiology laboratory. An electrode catheter was inserted percutaneously through right femoral vein and then advanced further to retrieve recordings from the atrium, his-bundle, and the right ventricle.. Baseline his recordings were made and revealed complete AV block. Proximal to the His- bundle, at the supra-His level, atrioventricular block was observed. Intracardiac recordings showed a 46 msec-His bundle-ventricle interval (Figure 1).



Figure 1

Baseline intracardiac recording shows atrioventricular block at the supra-His level

There was no tachycardia with programmed ventricular stimulation. Subsequently, we administered 1 mg atropine and cardiac rhythm of the patient was returned to Wenkebach type AV block and then to the first degree AV block (Figure 2).



Figure 2

Improvement of conduction through the atrioventricular node after atropine administration.

During electrophysiologic study any pathologic sign besides AV block was not encountered. Close clinical follow-

up and holter monitoring were recommended.

Discussion

CCAVB, mostly characterized pathologically by fibrous tissue that either replaces the AV node and its surrounding tissue or by an interruption between the atrial myocardium and the AV node⁴. Also, congenital absence of the AV node may be a cause of CCAVB. Although named as a congenital, as many as 40 percent of cases of CCAVB do not present until childhood (mean age five to six years). Cases currently missed in fetal life have preserved AV conduction at birth and decrease in heart rate becomes prominent with increasing age thereafter. In their study, Michaëlsson et al.⁶ showed that a decline in ventricular rate was noted with increasing age with a mean heart rate at age 15 of 46 bpm and a mean heart rate after age 40 of 39 bpm.

The change of rhythm in patients with CCAVB is less well studied. Some patients with chronic complete heart block change constantly between first, second, and third degree heart block⁷. Michaëlsson et al.⁶ reported that AV block changing into first-degree AV block in 5 patients and second-degree block in one patient, among 102 patients. CCAVB may be intermittent, especially when first detected. However, sinus rhythm restoration in patient with CCAVB is not usual. Holdright et al.⁸ reported a case of restoration of sinus rhythm during two consecutive pregnancies in a woman with CCAVB and noted that even before pregnancy the patient had documented episodes of sinus rhythm three times. Also, in their study of investigation of the long-term outcome of pediatric patients with isolated CCAVB, Weng et al.⁹ reported that 2 patients without symptoms had transient restoration of sinus rhythm.

Diagnostic electrophysiologic studies can be performed to assess AV conduction and to discern the level of AV block. Although His-Purkinje level block is almost always acquired, the congenital form of complete heart block usually occurs at the level of the AV node. Administration of atropine often improves the ventricular rate by reducing vagal tone via receptor blockage if the site of block is in the AV node whereas it is unlikely to be successful where the site of the block is below the level of the AV node. In our case, AV block was observed at the supra-His level and administration of atropine improved the conduction through the AV node.

Although their risk of sudden death and need for pacing is not well-defined, most, if not eventually all, of these patients require pacemaker implantation. In the other hand, patients with CCAVB are relatively asymptomatic at rest and may revert to a lower degree of AV block throughout their lives. On the other hand, the psychological impact of pacemaker implantation in a child should be kept in mind. Patients paced for CCAVB are at risk of dilated cardiomyopathy due to detrimental ventricular remodeling of chronic right ventricular apical pacing. Also, pacing system-related complications such as lead fracture, malsensing, and pacing system infections may develop. Therefore, it may be very difficult to recommend a pacemaker in asymptomatic patients.

In conclusion, improvement of conduction through the AV node either spontaneously or after administration of atropine may be seen in patients with CCAVB. Since it might indicate a better prognosis than those of persistent CCAVB, a physician should think twice before decides a pacemaker implantation.

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