The Importance Of Holter Monitoring In A Clinically Normal Child With Implanted Epicardial Pacemaker

Epikardiyal Kalp Pili Takılmış Klinik Olarak Normal Bir Çocukta Holter Monitörizasyonun Önemi

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ABSTRACT

Arrhythmias in congenital heart diseases may be seen due to structural disorders or they may develop as a result of surgical interventions due to repair. The incidence of complete atrioventricular block after cardiac surgery for congenital heart disease was reported to be between 1-3%. Permanent pacemaker implantation may be required in some rhythm problems after open heart surgery. Here, we present a five-year-old boy who has been followed up regular intervals for three years in our outpatient clinic. When he was four-month-old, he had been undertaken congenital heart surgery in another centre and then permanent epicardial pacemaker implantation had been done due to development of complete atrioventricular block. Despite very little or no problems were seen in electrocardiographic evaluations, we determined serious rhythm problems (failure to capture, oversensing and also long pauses up to 5.5 seconds) via holter ECG monitoring performed with regular intervals. In the event of any significant change of setting or battery/lead change in the devices of patients with permanent pacemaker implantation, careful examination of the holter ECG monitoring is essential to avoid unexpected conditions.

Keywords: *Atrioventricular block, Cardiac pacemaker, Holter ECG monitoring*

ÖZET

Konjenital kalp hastalıklarında yapısal bozukluklara bağlı aritmi görülebileceği gibi, onarım nedeni ile yapılan cerrahi girişimler sonucunda da gelişebilmektedir. Konjenital kalp hastalığı nedeniyle yapılan kalp cerrahisi sonrası atriyoventriküler tam blok görülme sıklığı %1-3 arasında olduğu bildirilmiştir. Açık kalp cerrahisi sonrası ortaya çıkan bazı ritim problemlerinde kalıcı kalp pili takılması ihtiyacı olabilmektedir. Burada polikliniğimizde üç yıldır düzenli aralıklarla takip edilen beş yaşında erkek bir olgu sunulmuştur. Olgu dört aylıkken başka bir merkezde konjenital kalp cerrahisi geçirmiş ve sonrasında atriyoventriküler tam blok gelişmesi nedeniyle epikardiyal kalıcı kalp pili takılmıştır. Elektrokardiyografik değerlendirmelerinde çok az veya hiç sorun görülmemesine rağmen düzenli aralıklarla yapılan holter EKG monitörizasyonunda ciddi ritim problemleri (yakalama başarısızlığı, aşırı algılama ve 5,5 saniyeyi bulan duraklamalar) saptandı. Kalıcı kalp pili takılı olguların cihazları ile ilgili herhangi bir önemli ayar değişikliği veya batarya/lead değişikliği durumunda beklenmeyen bir durumla karşılaşmamak için mutlaka holter EKG monitörizasyonun dikkatli bir şekilde incelenmesi hayati önem arz etmektedir.

Anahtar Kelimeler: *Atriyoventriküler blok, Kalp pili, Holter EKG monitorizasyonu*

INTRODUCTION

Arrhythmia is one of the most common complications of congenital heart disease and is the leading cause of hospitalization and death.(1) Arrhythmias may be due to structural disorders or as a result of surgical interventions for repair. Despite advances in the management of

congenital heart diseases, damage to the conduction system during surgical repair leads to the development of various degrees of postoperative arrhythmias. Permanent pacemaker implantation may be needed for rhythm problems after open heart surgery. With the increase in permanent pacemaker implantations, a large number of operated congenital heart patients are exposed to device-related complications.(2) Arrhythmias developing after surgery of congenital heart defects are among the most important causes of morbidity and mortality.(3) The purpose of this report is to emphasize the crucial role of holter ECG monitoring in a child with epicardial permanent pacemaker.

CASE

Three years ago, a two-year old boy came to our clinic to be followed up. He had been operated for perimembranous ventricular septal defect at age of four months. After surgery, epicardial permanent pacemaker with VVIR mode had been implanted due to complete atrioventricular block. In his first examination, patient had no complaint and, his clinical and laboratoary examinations were in normal limits. Cardic defect was observed as ocluded and, cardiac functions were evaluated as normal in echocardiography. Twenty-four-hour holter monitoring showed lower limit of heart rate was 95 beats/min (bpm) and adjusted to 75 bpm. Thus patient felt more comfortable and long battery life was provided. He was evaluated six months intervals with no rhythm problems during two years. One year ago, we recognised rare failures to capture that one QRS complex was not seen after pace spike on holter monitoring. He was followed up clinically because the pause duration did not exceed two seconds. However after six months, pause increased up to four seconds (Figure 1). This finding is evaluated as an increased risk for syncope and sudden cardiac arrest. For this reason, pacing amplitude was increased. As pacing amplitude was increased, failure to capture was significantly reduced. Then another problem came into stage that battery life was rapidly decreased. Patient was brought to our institution by his parents due to fatigue one months after battery change. Physical examination and echocardiographic evaluation were similar to previous findings. However, frequent pauses with a maximum duration of 5.5 seconds were observed on holter monitoring (Figure 2). In addition, there was oversensing problem together with failure to capture. These findings were thought to be probably due to battery leads. So patient was again in a life threatening condition and recently referred for transvenous pacemaker implantation.

Figure 1. Failure to capture and long pause are seen

Figure 2. Long pause, failure to capture and also oversensing problem are seen

DISCUSSION

Arrhythmias following cardiac surgery are common in both early and late periods. The incidence and type of arrhythmias vary according to the underlying lesion, surgical type, age and technique of surgeon. Although most rhythm problems are transient, some of them may be resistant to treatment or even life-threatening.(4) Arrhythmia can be seen in 30% of children after ventricular septal defect closure, 35% of children after Tetralogy of Fallot repair, and 47% of children after atrioventricular canal defect repair. Several studies have shown that the risk factors for early postoperative arrhythmias were lower body weight, younger age, longer cardiopulmonary bypass time, higher surgical complexity, and residual defect.(5) In general, arrhythmia occurring during the postoperative period can be classified into bradyarrhythmia or tachyarrhythmia. Junctional ectopic tachycardia is encountered in 2.0–11.2% of children undergoing cardiac surgery and It is considered to be the most common type of tachyarrhythmia seen during early postoperative care.(6) After repair of ventriculer septal defect, junctional ectopic tachycardia can be seen in early period. Ventricular arrhythmias can be seen after repair of Tetralogy of Fallot and Ross procedures. Sinus node dysfunction and atrial arrhythmias have been reported more frequently after Senning and Fontan operations.(4) Late presenting heart block may appear after months or even years. The incidence of postoperative arrhythmia has been reported in the literature ranging from 8.0% to 79.1%.(7) The incidence of complete atrioventricular block after cardiac surgery for congenital heart disease was seen between 1-3%. Most of these cases occur as a result of operations around the atrioventricular node. The greatest risk for atrioventricular block occurs with surgery for left ventricular outflow tract obstruction followed by closure of a ventricular septal defect and repair of Tetralogy of Fallot.(8) The need for permanent pacemaker implantation in rhythm problems after open heart surgery has been reported between 0.8% and 6% in various studies. This need is mainly beacause of damage to the sinoatrial node or other conduction system. The main contribution in the occurrence of damage is mechanical trauma to the conduction system such as valve surgeries, myectomy and ventricular septal defect repair.(9) Temporary pacemaker is important in the management of arrhythmias after cardiac surgery, and it is life-saving in cases of bradyarrhythmia.(6) Pacemaker implantation is an invasive procedure and may lead to in the early period; pneumothorax, hemothorax, arterial injury, hematoma, air embolism and lead to in the late period; venous thrombosis, skin erosion, Twiddler syndrome (battery rotation),

battery displacement, electrode breakage, displacement.(10) Apart from these technical problems, rhythm problems developed during follow-up, detection and excitation problems of the device may cause the device to malfunction as programmed.(11) In our patient, despite there was no significant symptom which he was suffered, we detected several times so essential findings while examining holter ECG. This indicates that using only standard electrocardiography for evaluation of such patients with implanted pacemaker during follow up can be probably insufficient and also risky. In conclusion, It is so important to regularly perform routine holter ECG monitoring follow-up in children with permanent pacemaker implantation even in clinically normal. Moreover it is essential to carefully examine the records to avoid undesirable conditions after significant adjustment or battery/lead replacement.

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