Use of event recorder in decision for pacemaker implantation in child's syncope

Henri A. Verhaaren - Olivier Vanakker - Rudy Van Coster - Daniel De Wolf - Katrien François - Dirk Matthys

From the Division of Paediatric Cardiology, University Hospital Ghent, De Pintelaan 185, 9000 Ghent

Correspondence to:
Henri A. Verhaaren MD, PhD
Division of Pediatric Cardiology
University Hospital Ghent
De Pintelaan 185
B-9000 Gent
Tel: +/32.9.240.24.19
Fax.: +/32.9.240.38.56
E-mail: henri.verhaaren@rug.ac.be

Abstract

The use of a patient-triggered and automatic event recorder is documented in a 17 month old girl presenting with paroxysmal episodes of loss of consciousness. After pacemaker implant the paroxysmal attacks disappeared.We recommend a more frequent use of the event recorder in the investigation of syncope, even in small children.

Key words: syncope, ambulatory electrocardiography, pacemaker

Introduction

Syncope, defined as sudden transient loss of consciousness, relates more to neurological or vasomotor tone disorders and seldom to severe arrhythmia. The indications for pacemaker implant in children are not well defined. The present case illustrates the use of the event recorder in the decision for pacemaker implant in a seventeen month old girl.

Case report

D.W is the first-born of non-consanguineous parents. Birth was uneventful, anthropometric measurements were normal and she developed normally in the first months of life.

Paroxysmal episodes first occurred at four months. They always started with a painful cry and always occurred during activity. There were no signs of breath-holding, neither did she cry for a long period before fainting. After the painful cry, the girl lost consciousness, respiration became difficult and generalised stiffening of the muscles, cyanosis of the lips, rotation of the eyes and spastic closing of the mouth were observed. This lasted only seconds. Then, she became flaccid and unresponsive. A few times, shaking of the arm occurred. Few minutes later, when respiration had normalised and consciousness regained, she was drowsy and plaintive for several hours. Intensity and frequency of these episodes gradually increased.
At nine months, she was admitted to a local hospital for observation, but no episodes were noticed or abnormalities found on examination. Family history was negative for epilepsy. Blood and urine tests were normal. EEG showed fairly structured base activity for this age without epileptic waves.
The child was seen at one year of age in our institution. Psychomotor development was excellent. General physical and neurologic examination was normal. History and age of the girl pointed to the hypothesis of vaso-vagal syncope. EEG was still normal. 12-lead ECG showed regular sinus rhythm, normal voltages for this age and a QTc of 320 ms (normal). To rule out cardiac arrhythmia, 24-hour ECG monitoring was performed. This showed one transient pause of 2,4 seconds (Figure 1). No clinical symptoms were observed on the day of recording. To exclude a possible role of beta-adrenergic hypersensitivity, the girl was treated with atenolol. Under this treatment the attacks became more frequent instead of disappearing. To relate the attacks to periods of dysrhythmia, an 8 day rhythm recording using an event recorder was performed.
During the recording period short pauses were noted and on one of the days of the recording a pause of 4,26 seconds is noted, at exactly the time of clinical fainting. Because of sinus pause

a pacemaker (Pacesetter Microny SR+ 2425T in VVI modus) was implanted, using epicardial steroid coated leads. At a follow-up period of more than one year, the girl did not experience any episode of syncope or fainting. On repeated 24-hour ECG pauses were seen which were adequately overridden by the pacemaker.

Discussion

A minority of children with syncope present with severe symptoms, endangering cerebral function [7,2]. The diagnosis of the underlying reason for these attacks is often difficult, mainly because of its paroxysmal character. Monitoring over an extended period of time, while the patient accomplishes his usual activities, is required. Holter monitoring and long-term event recorders are frequently used methods of investigation. However, due to the 24-hour limit of the Holter technique, its effectiveness has been questioned in the detection of transient arrhythmia [9,14]. Recently, implantable Holter device has been proposed for long-term monitoring. Unfortunately, this is an invasive and costly procedure and therefore less acceptable in children then event recorder [6,13]. Interestingly, the latter were more frequently used in veterinary medicine [7,9]. Only few authors report its use in humans [5,14]. At first, the devices were only patient-triggered, which made them dependent on patient compliance and impossible to use in children. Newer devices, such as the R-test evolution (Novacor), feature both automatic and patient-triggered recordings and allow up to seven days of monitoring and can be used in children [9].

Studies have shown that the sensitivity of the R-test Evolution in detecting pauses was 100 % with a specificity of 90 % [9]. Its prime cost is less than 3000 $. Cost-effectiveness-studies have shown that these event recorders are more efficient and more cost-effective than 48-hour Holter recorders [5,9,10]. Table 1 summarises the advantages of event recorders.
Event recorders should be used on strict indication. The diagnosis of breath holding spells is primarily based on the clinical history. They can rarely necessitate pacemaker implantation [12]. Sinus dysfunction often with severe pause, as in our patient, is probably more frequent in children than often assumed. In our opinion, the leading indication for using the event recorder is the exploration of syncope. The main indications of event recording are summarised in table 2.

In our patient the use of the automatic and patient-triggered event recorder enabled us to clearly prove the relation of the arrhythmia with the clinical event, and the need for pacemaker implant is obvious from this observation. As stated by Perry et al. [8], beta-adrenergic hypersensitivity has to be ruled out. We conclude that this type of event recorder is a helpful asset for diagnosing severe arrhythmia in children. Its use is easy, low-cost and well accepted by the child. It is, in our opinion wrongly, underused in human medicine.

References.

1. Bright JM, Coli JV (2000) Clinical usefulness of cardiac event recording in dogs and cats examined because of syncope, episodic collapse or intermittent weakness: 60 cases (1997-1999). J Am Vet Med Assoc 26 : 1110-1114

2. Feldman W (2000) Common cardiovascular problems: Syncope. In: Evidence-Based Pediatrics. Hamilton B.C. Decker Inc, pp 204-212

3. Goodwin JK (1998) Holter-monitoring and cardiac event recording. Vet Clin North Am Small Anim Pract 28 : 1397-1407 viii

4. Hammill SC (1997) Value and limitations of noninvasive assessment of syncope. Cardiol Clin 15(2) : 195-218

5. Kinlay S, Leitch JW, Neil A, Chapman BL, Hardy DB, Fletcher PJ (1996) Cardiac event recorders yield more diagnosis and are more cost-effective han 48-hour Holter monitoring in patients with palpitations. Ann Intern Med 124 : 16-20

6. KrahnAD, Klein GJ, Yee R, Skanes AC (2001) Randomized assesment of syncope trial. Conventionel diagnostic testing versus a prolonged monitoring strategy. Circulation 104 : 46-51

7. McHarg ML, Shinnar S, Rascoff H, Walsh CA (1997) Syncope in Childhood. Pediatr Cardiol 18 : 367-371

8. Perry JC, Friedman RA, Moak JP, Garson A (1991) Bradycardia and syncope in children not controlled by pacing: beta-adrenergic hypersensitivity. Pacing Clin Electrophysiol 14(3) : 391-394

9. Roche F, Gaspoz JM, Pichot V,Costes F, Isaaz K, Ferron C, Roche C, Geyssant A, Lacour J-R, Barthélémy J-C (1997) Accuracy of an automatic and patient-triggered long-term solid memory ambulatory cardiac event recorder. Am J Cardiol 80 : 1095-1098

10. Steinschneider A, Santos V, Freed G (1995) Cost implications of event recordings in apnea/bradycardia home monitoring: a theoretical analysis. Pediatrics 95 : 378-380

11. Strasburger JF (1991) Cardiac arrhythmias in childhood. Diagnostic consideration and treatment. Drugs 42(6) : 974-983

12. Villain E, Lucet V, Do Ngoc D, Bonnet D, Fraisse A, Kachaner J (2000) Stimulation cardiaque dans les spasmes du sanglot de l'enfant. Arch Mal Coeur Vaiss 93(5) : 547-552

13. Waktare JE, Malik M (1997) Holter, loop recorder and event counter capabilities of implanted devices. PACE 20 : 2658-2669

14. Zimetbaum P, Kim KY, Ho KKL, Zebede J, Josephson ME, Goldberger AL (1997) Utility of patient-activated cardiac event recorders in general clinical practice. Am J Cardiol 79 : 371-372

Figure 1

ECG tracing, recorded by Holter monitoring

Figure 2

ECG tracing, recorded by event recorder

Table 1. Advantages of Event-Recorder

- lightweight design (45 g)
- small device
- patient-triggered and electronic event recording
- long term autonomy (up to seven days)
- high specificity and sensitivity in detecting episodes of bradycardia and pauses
- more cost-effective than a 48-hours Holter monitoring

Table 2. Indications for the use of event recorder

- syncope, especially with a normal EEG
- palpitations
- presyncope (including dizziness, light-headedness)
- drug monitoring
- transient arrhythmia: paroxysmal bradycardia
  supraventricular tachycardia
  ventricular tachycardia
- pacemaker evaluation