Leadless pacing in a young patient with cardioinhibitory vasovagal syncope

Valentina De Regibus, Darragh Moran, Gian Battista Chierchia, Pedro Brugada, Carlo de Asmundis*

Heart Rhythm Management Center, Postgraduate Program in Cardiac Electrophysiology and Pacing, Universitair Ziekenhuis Brussel, Vrije Universiteit Brussel, Brussels, Belgium

Abstract

Vasovagal syncope is characterized by vasodilatation and/or bradycardia and thereby a fall in arterial BP and global cerebral perfusion in response to a trigger. Although it is a benign condition, patients with frequent and traumatic episodes need treatment in order to improve quality of life. We describe the case of a 17-years-old boy suffering from cardioinhibitory syncope. At the end of a complete negative cardiac and neurological examination, a loop recorder was implanted. During the subsequent follow-up the ILR documented a 9-s pause. To improve the patient’s compliance, and considering cardioinhibitory syncope as a temporary condition, a leadless pacemaker was eventually implanted.

1. Introduction

Syncope is defined as a transient loss of consciousness, associated with an inability to maintain postural tone, rapid and spontaneous recovery, and the absence of clinical features specific to another form of transient loss of consciousness [1]. It can be classified, on pathophysiological basis, as vasovagal syncope, cardiac syncope or syncope secondary to orthostatic hypotension. The term “vasovagal syncope” refers to a heterogeneous group of conditions in which cardiovascular reflexes become inappropriate, in response to a trigger, resulting in vasodilatation and/or bradycardia and thereby a fall in arterial blood pressure (BP) and global cerebral perfusion [2] and can be divided in vasodepressory syncope, cardioinhibitory syncope or mixed. Vasovagal syncope is a benign condition, but patients with frequent and traumatic episodes need treatment in order to improve quality of life. (see Figs. 1 and 2)

2. Case report

A 17-years-old boy complained of syncopal episodes occurring at rest, monthly, preceded by dizziness, visual blurring and bradycardia. He never complained of syncope during sport. Physical examination, echocardiogram, head-up tilt test, stress test and neurological examinations were normal. Baseline ECG documented sinus rhythm, normal conduction intervals, normal QRS and T wave morphology. 24-hour Holter monitoring documented normal daily heart rate variability, no pathological pauses nor tachyarrhythmia. An electrophysiological study was performed: neither ventricular nor supraventricular sustained arrhythmias were induced, sinus node function and atrio-ventricular conduction were normal. Ajmaline challenge was performed at the end of the electrophysiological study and it was negative for Brugada pattern and atrio-ventricular conduction disease. In 3 order to evaluate further episodes, considering that in patients suffering from cardioinhibitory syncope the electrophysiological examination can be normal, an implantable loop recorder, ILR (BioMonitor 2-AF, Biotronik, Berlin, Germany) was implanted. One month later, a new syncopal episode occurred and a 9-s sinus pause was recorded by the ILR (Fig. 1).

A definitive pacemaker implantation was then planned and we decided to implant Micra™ transcatheter pacing system (TPS, Model MC1VR01, Medtronic plc, Mounds View, MN, USA). At the
time of implantation, pacing threshold was 0.50 V @ 0.24 ms, sensing was 4.4 mV and impedance was 610 Ohm. No vascular complications occurred. We decided to leave in place the ILR because of the lack of Holter telemetry and remote monitoring of the TPS (Fig. 2). After one year of follow-up the patient is free from syncope and lead a normal 17-years-old life.

3. Discussion

Vasovagal syncope is characterized by vasodilatation and/or bradycardia and thereby a fall in arterial BP and global cerebral perfusion in response to a trigger. Although it is a benign condition, patients with frequent and traumatic episodes need treatment in order to improve quality of life. Currently, according to the international guidelines and consensus, pacing should be considered only for patient older than 40 years [1,2], nevertheless, definitive pacing has proven to be an effective treatment for vasovagal syncope in children [1,3], either DDD or VVI pacemaker. Taking into account these recommendations, we decided to implant a leadless pacemaker in our young patient in order to avoid symptoms due to bradycardia or sinus pauses and to allow him to live in normal 17-years-old lifestyle with no restriction on physical activity and aesthetic discomfort, unlike what would have happened with a traditional pacemaker. The leadless pacemaker eliminates important sources of complications associated with traditional pacing systems, like lead’s failure, pocket complications and infection, while providing similar pacing performance and potentially better psychological and aesthetic results. Recent studies documented the lower rate of hospitalizations due to device’s complications and implant revision in leadless device patient cohort, compared to historical control cohort of VVI PM patients [4]. The leadless pacemaker would achieve also a higher compliance to the device decreasing the impact of it on the patient’s daily life, thanks to the lack of subcutaneous pocket and of the risk of lead’s fracture. The

![Image](https://via.placeholder.com/150)

**Fig. 1.** Sinus pause recorded by the internal loop recorder during syncope.
main concern about TPS consist on the managing of the end of service (EOS) in patients with expected longevities. Nowadays, there are only two case reports describing successful retrieval of TPS after few weeks from implantation [5,6], while it has proven to be possible to implant up to 3 TPS even in small RV [7]. This concern is of greater importance in such young patient as the boy we implanted. In our patient, the decision of implanting a leadless device was influenced also by the evidence that several studies documented a high probability of no-recurrence of vasovagal and even unexplained syncope [2,8]. During the long-term follow-up, the recurrence of the 6 episodes will be evaluated and, in case of no-recurrence, at the time of the elective battery replacement, we would consider the possibility not to replace the device.

Disclosures

Carlo de Asmundis receive compensation for teaching purposes and proctoring from AF solutions, Medtronic, member steering committee ETNA-AF-Europe Daiichi Sankyo Europe and research grants on behalf of the centre from Biotronik, Medtronic, St Jude Medical Abbot, Livanova, Boston Scientific. Gian Battista Chierchia receive compensation for teaching purposes and proctoring from AF solutions, Medtronic. Pedro Brugada receives and speakers fees from Biotronik, Medtronic.

References

[1] Task Force for the Diagnosis and Management of Syncope, European Society of Cardiology (ESC), European Heart Rhythm Association (EHRA), et al. Guidelines for the diagnosis and management of syncope (version 2009). Eur Heart J 2009 Nov;30(21):2631–71.
[2] Sheldon RS, Grubb 2nd BP, Olshansky B, et al. 2015 heart rhythm society expert consensus statement on the diagnosis and treatment of postural tachycardia syndrome, inappropriate sinus tachycardia, and vasovagal syncope. Heart Rhythm 2015 Jun;12(6):e41–63.
[3] McLeod KA, Wilson N, Hewitt J, Norrie J, Stephenson JB. Cardiac pacing for severe childhood neurally mediated syncope with reflex anoxic seizures. Heart 1999 Dec;82(6):721–5.
[4] Reynolds D, Duray GZ, Omar R, et al. Micra transcatheter pacing study group. A leadless intracardiac transcatheter pacing system. N Engl J Med 2016 Feb 11;374(6):533–41.
[5] Karim S, Abdelmessih M, Marieb M, Reiner E, Grubman E. Extraction of a Micra transcatheter pacing system: first-in-human experience. HeartRhythm Case Rep 2015 Oct 23;2(1):60–1.
[6] Koay A, Khelee S, Wei KK, Muhammad Z, Mohd Ali R, Omar R. Treating an infected transcatheter pacemaker system via percutaneous extraction. HeartRhythm Case Rep 2016 May 10;2(4):360–2.
[7] Omdahl P, Eggen MD, Bonner MD, Iaizzo PA, Wilks K. Right ventricular anatomy can accommodate multiple Micra transcatheter pacemakers. Pacing Clin Electrophysiol 2016 Apr;39(4):393–7.
[8] Barón-Esquivias G, Errázquin F, Pedrote A, et al. Long-term outcome of patients with vasovagal syncope. Am Heart J 2004 May;147(3):883–9.