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Tilt-table testing of patients with pacemaker and recurrent syncope

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ABSTRACT

The diagnosis of recurrent syncope in patients with pacemakers (PM) is quite challenging and the etiology of syncope is often multifactorial. To portray the mechanism of syncope in PM patients, we report the results of head-up tilt table testing (HUT) in a series of patients with PM, originally implanted for reasons other than neurally mediated syncope, referred due to syncope or pre-syncope (aborted syncope, vertigo, suspected orthostatic hypotension).

Forty-one patients with PM undergoing a HUT in our syncope unit between January 1st, 2007 and December 31st 2011 were included. A standard HUT protocol with nitroglycerine provocation was used and the test results were classified according to current guidelines. Baseline data were retrieved from the medical records.

Overall, 54% of patients had a positive response to HUT. Vasodepressor or orthostatic hypotensive response were the most prevalent responses accounting for 72% of patients with a positive test. There were no differences between groups with positive or negative test result regarding age, gender, resting blood pressure and heart rate, daily fluid intake, pacing mode, pacing indication or pacing rhythm at rest.

HUT in patients with pacemakers has a high diagnostic yield. Although, the majority of patients had a vasodepressor or orthostatic hypotensive response, cardioinhibitory response leading to syncope was also seen.

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Introduction

Reflex syncope, also known as neurally-mediated syncope or neurocardiogenic syncope is prevalent with a mixed reaction of vasodilatation and bradycardia (vasovagal syncope) being the most common response [1,2]. Even though the cause of reflex syncope is benign, recurring syncope can have profound impact on the quality of life comparable to chronic illnesses such as rheumatoid arthritis [1,3]. Diagnosing reflex syncope can be challenging and patients often undergo multiple diagnostic tests (i.e., echocardiography, Holter monitoring, CT scans etc). HUT is suggested for the evaluation of suspected reflex syncope both in patients with and without structural heart disease [4]. In trials focusing on pacemaker (PM) treatment for neurocardiogenic syncope, the recurrence rate for syncope in patients with PM varies quite considerably (0–78%) depending on mode of pacing and population investigated [5–11] illustrating that PM treatment does not exclude the presence of reflex syncope. However, little information is available concerning these patients with "break-through" episodes– especially concerning the type and mode of syncope.

The aim of our study was thus, to further illustrate the relation between recurrent syncope and pacemaker therapy and its mechanisms. We wanted to describe the outcome of head-up tilt table test (HUT) in patients with pacemakers implanted for a variety of conditions and referred with syncope or pre-syncope to our syncope unit.

Methods

Forty-one patients with PM undergoing a HUT in our syncope unit between January 1st, 2007 and December 31st, 2011 were included. No patients were excluded due to technical issues or lack of data. A standard protocol was used with an initial 10 min of supine rest and then 20 min head-up tilt to 60° [1,12,13]. If only limited changes in heart rate (HR) or blood pressure (BP) had occurred, nitroglycerine 400 μg was administered sublingually and patients remained tilted for up to 15 min. After discontinuation of tilting patients were monitored for a minimum of 5 min in the supine position. HR and BP were continuously measured using standard 3-lead ECG and finger photoplethysmography (Finometer, Finapres Medical Systems B.V., The Netherlands) respectively. The accuracy of finger-BP was assured by continuously comparing to standard arm BP, not allowing for more than 25 mmHg divergence [13]. HR and BP together with temporal markers for tilt start, nitroglycerine dosing and tilt stop were recorded digitally by commercial software (Chart 5.59 with HRV module, AD Instruments Inc, Colorado Springs, CO, USA). Tilting was discontinued if syncope or severe symptoms occurred coinciding with significant HR or BP changes or with completion of the protocol in the absence of symptoms. The test was supervised by an experienced nurse with a physician immediately available if needed. Tests were classified according to the current guidelines [1,13,14]. In order for a test to be designated positive, HR and/or BP changes had to occur simultaneously with symptoms, which the patient could associate with earlier experienced syncope/pre-syncope episodes [1,13]. Patients were divided in two groups according to tilt table outcome, one group with any type of positive HUT and the other group with negative (normal) HUT. Data were retrieved from the department's digitized medical records. All patients had normal functioning PM, with normal checks and pacemaker readout before and after tilt table testing. The distribution of PM types were as follows –18 with DDD-R pacemakers (one of which was an ICD), 10 with ICD-VVI-R pacemakers, 9 with VVI-R pacemakers, 3 with AAI-R pacemakers and one with VDD pacemaker. Indications for PM implantations were as seen in Fig. 1, and no patients had PM implanted specifically due to neurocardiogenic syncope.

Statistics

Descriptive statistics are presented as mean and SD, categorical data are presented in percentage. In tables with comparisons mean and SEM are used. Patients were allocated into two groups according to tilt table test outcome (positive/negative). A student t-test was used to test for difference between the groups for numerical data and tested with chi^2-test for categorical data. In case of less than 5 expected values in any column, Fisher's exact test was computed. A two-sided P value less than 0.05 was considered significant. All statistics were done in SAS 9.1.3 (SAS Institute Inc, Cary, NC).

Results

A total of 41 patients were included with a mean age 64 ± 17 years (range 16–85 years) and 66% were men (Table 1).

Symptoms that lead to referral for tilt table testing included syncope in 61% and pre-syncope including vertigo or suspected orthostatic hypotension in 39%. Indications for PM implantation in the included population are shown in Fig. 1, with the majority of patients having received pacemakers due to AV-block, SA-block, or sinus node dysfunction. Patients with ventricular tachycardia or cardiomyopathy all had received an ICD (ICD_V, single ICD_D). None of the patients had received PM specifically for neurocardiogenic syncope. Two patients had prophylactic ICD pacemakers due to ischemic heart disease and left ventricular dysfunction. Three patients with other indications all had DDD-pacemakers due to bundle branch block (triphasic/right) and one due to suspected sinus caroticus syndrome.

The outcome of tilt table testing is shown in Fig. 2. Overall, 54% of patients had a positive response. Vasodepressor or orthostatic hypotensive response was the most prevalent accounting for 39% of all patients and 72% of patients with positive test.

In 6 patients that predominately had sinus rhythm, a cardioinhibitory or mixed response was seen with activation of pacing that could not prevent syncope or significant BP/HR drops. The pacemakers were activated due to bradycardia associated with BP drop in 3 patients with mixed response, one patient had second degree AV-block in association with BP drop (mixed response), one patient developed third degree AV-block and one patient had 15 s asystole (no