Takotsubo cardiomyopathy shortly following pacemaker implantation—case report and review of the literature

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Published online: 11 October 2012
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Abstract We describe a patient with acute heart failure shortly after pacemaker implantation. With the documentation of typical dyskinesia of the apical segments with hyperdynamic contractility of the basal segments and a normal coronary angiogram, pacemaker implantation-induced Takotsubo cardiomyopathy was diagnosed. Supportive care was administered and within several days the patient's symptoms resolved. After several weeks, the left ventricular function had fully recovered. A review of the literature on Takotsubo cardiomyopathy after pacemaker implantation is presented.

Keywords Takotsubo cardiomyopathy · Pacemaker · Complications · Heart failure

Introduction

Pacemaker implantations are increasing; in 2009 more than 700,000 implants were performed in 61 countries [1]. However, complications are common: 12.4 % within 2 months [2]. Still, acute heart failure following implantation is a very uncommon but potentially serious complication. We describe the occurrence of acute heart failure on the first day after implantation for third-degree atrioventricular (AV) block. Takotsubo cardiomyopathy was diagnosed in the absence of other identifiable causes and was confirmed by restoration of ventricular function within several weeks. A

discussion and review of the literature on Takotsubo cardiomyopathy following pacemaker implantation is presented.

Case report

A 61-year-old woman was referred to our department for complaints of dizziness and near-syncope. She had visited the neurological outpatient clinic earlier, where hyperventilation syndrome was diagnosed. An ECG had not been performed until she was referred to our department. She was not on any drugs, physical examination was unremarkable, her ECG showed third-degree AV block (Fig. 1a), laboratory investigations were normal and echocardiography showed normal left and right ventricular function without valvular disease (Fig. 2a). She was admitted and 5 days later she underwent an uncomplicated DDDR-pacemaker implantation (Medtronic Advia MRI SureScan).

However, the following morning she developed chest pain and orthopnoea with a raised central venous pressure and basal crepitations. Her ECG showed sinus rhythm with ventricular pacing (Fig. 1b). Chest radiography excluded pneumothorax and showed normal lead position; however, some pulmonary oedema was noticed. Pacemaker interrogation was unremarkable but echocardiography revealed a severely depressed left ventricular function with apical ballooning and hyperdynamic basal segments (Fig. 2b). Creatine kinase-MB (10 µg/l, upper limit of normal (ULN) <7) and troponin T (0.31 µg/l, ULN<0.01) were also raised but direct coronary angiography documented normal coronary flow and no coronary sclerosis. By exclusion of other diagnoses, pacemaker implantation-induced Takotsubo cardiomyopathy was considered to be the cause of this acute onset of heart failure. Accordingly, she was treated with a beta blocker, ACE inhibitor and diuretics. The left ventricular function improved over several

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Fig. 1 Electrocardiograms. **a** ECG at presentation showed a sinus tachycardia of 120 bpm with a third-degree AV block and an escape rhythm of 40 bpm. **b** ECG during Takotsubo cardiomyopathy after pacemaker implantation showed sinus rhythm of 75 bpm with ventricular pacing

days, and she could be discharged. After 3 weeks, her left ventricular function had returned to normal (Fig. 2c), the

heart failure medication was discontinued, and she remained well during follow-up after 3 and 9 months.

Fig. 2 Echocardiograms. Apical four-chamber views. **a** End-systolic echocardiogram before pacemaker implantation. **b** End-systolic echocardiogram during Takotsubo cardiomyopathy shortly after pacemaker

implantation; note the hyperdynamic basis and dyskinetic apical segments. **c** End-systolic echocardiogram 3 weeks after implantation; note that the LV function has returned to the baseline condition

Discussion and review of the literature

In 1980 the human equivalent of stress cardiomyopathy, which was earlier described in animal experiments, was recognised [3]. In the 1990s a similar entity was identified in Japan and related to temporal myocardial stunning due to coronary spasm [4, 5]. Interestingly, the typically seen apical ballooning mirrored the appearance of a Japanese pot with a round body and a small neck used to trap octopus, also known as a Takotsubo (Tako is octopus, tsubo is trap). Hence, this clinical picture became known as ‘Takotsubo cardiomyopathy’ in addition to the often-used ‘apical ballooning syndrome’. This intriguing entity is now more frequently recognised [6, 7] and appears to relate to an inappropriate cardiac response to excess catecholamines, almost exclusively in (post-menopausal) women. The presentation of patients with Takotsubo often mirrors an acute coronary syndrome with chest pain, dyspnoea, Q waves, ST deviations, T wave abnormalities and raised cardiac biomarkers. In addition, transient wall motion abnormalities (not related to a single coronary lesion) and, typically, apical ballooning with a hyperdynamic basis are present. The concomitant absence of atherosclerosis at coronary angiography makes the diagnosis of Takotsubo more likely. Characteristic is its temporary nature [5].

To establish the current experience with pacemaker-induced Takotsubo cardiomyopathy, a PubMed review of the literature was performed. We used the search term; (“takotsubo cardiomyopathy”[MeSH Terms] OR apical ballooning[Text Word] OR Takotsubo[Title]) AND (Pacemaker[Text Word] OR “pacemaker, artificial”[MeSH Terms]) AND English[Language]. Criteria for inclusion were (i) original data; (ii) transient apical ballooning, (iii) coronary artery disease excluded; (iv) other cardiomyopathy ruled out or unlikely; and (v) occurrence shortly following pacemaker implantation. The search (May 2012) revealed 19 hits published between 2006 and 2011; 6 were eligible for inclusion. Publications were excluded because of: Takotsubo not following pacemaker implantation ($n=10$), double hit in PubMed ($n=1$) [8], occurrence 2 months after pacemaker implantation ($n=1$) [9], and persistent left ventricular dysfunction ($n=1$) [10]. The included publications involved case reports regarding 7 female patients, mean age 71 years (range 54–86 years) [8, 11–15]. The acute onset of heart failure with echocardiographic characteristics of Takotsubo was seen with a delay of 10 min to 3 days after implantation. All patients recovered completely but some needed supportive care with diuretics and ACE inhibitors. In one patient a left ventricular thrombus developed without embolic events [14]. Recurrence was not reported and the outcome was always benign. Our patient seems to fit very well into this series of case reports on Takotsubo after pacemaker implantation, which may mirror the clinical picture of tamponade or myocardial infarction. Echocardiography or LV

angiography is essential in this matter and will guide further clinical decision making [16].

Conclusions

We describe a patient with acute heart failure shortly following pacemaker implantation. With the documentation of typical apical ballooning and normal coronary angiography, pacemaker implantation-induced Takotsubo cardiomyopathy was diagnosed. Supportive care was administered and within several days the patient’s symptoms resolved. After several weeks, the left ventricular function had fully recovered. A review of the literature on Takotsubo cardiomyopathy after pacemaker implantation is presented.

Conflicts of interest none.

References

1. Mond HG, Proclemer A. The 11th world survey of cardiac pacing and implantable cardioverter-defibrillators: calendar year 2009—a world society of Arrhythmia’s project. *Pacing Clin Electrophysiol*. 2011;34(8):1013–27.
2. Udo EO, Zuithoff NP, van Hemel NM, et al. Incidence and predictors of short- and long-term complications in pacemaker therapy: the FOLLOWPACE study. *Hear Rhythm*. 2012;9(5):728–35.
3. Cebelin MS, Hirsch CS. Human stress cardiomyopathy. Myocardial lesions in victims of homicidal assaults without internal injuries. *Hum Pathol*. 1980;11(2):123–32.
4. Dote K, Sato H, Tateishi H, et al. Myocardial stunning due to simultaneous multivessel coronary spasms: a review of 5 cases. *J Cardiol*. 1991;21(2):203–14.
5. Gianni M, Dentali F, Grandi AM, et al. Apical ballooning syndrome or Takotsubo cardiomyopathy: a systematic review. *Eur Heart J*. 2006;27(13):1523–9.
6. Hartmann M, van Houwelingen GK, Lambregts HPCM, et al. Tako-tsubo cardiomyopathy triggered by paroxysmal supraventricular tachycardia in an octogenarian. *Neth Heart J*. 2011;19(1):52–4.
7. Bird-Lake E. Severe transient left ventricular dysfunction induced by thyrotoxicosis. *Neth Heart J*. 2011;19(7–8):352–4.
8. Kohnen RF, Baur LH. A Dutch case of a Takotsubo cardiomyopathy after pacemaker implantation. *Neth Heart J*. 2009;17(12):487–90.
9. Rotondi F, Manganelli F, Di Lorenzo E, et al. Tako-tsubo cardiomyopathy in a patient with pacemaker syndrome. *Europace*. 2009;11(12):1712–4.
10. Kurisu S, Inoue I, Kawagoe T, et al. Persistent left ventricular dysfunction in Takotsubo cardiomyopathy after pacemaker implantation. *Circ J*. 2006;70(5):641–4.
11. Golzio PG, Anselmino M, Presutti D, et al. Takotsubo cardiomyopathy as a complication of pacemaker implantation. *J Cardiovasc Med (Hagerstown)*. 2011;12(10):754–60.
12. Abu Sham’a RA, Asher E, Luria D, et al. Apical ballooning syndrome: a complication of dual chamber pacemaker implantation. *Indian Pacing Electrophysiol J*. 2009;9(4):229–32.
13. Brunetti ND, Ieva R, Correale M, et al. Combined exogenous and endogenous catecholamine release associated with tako-tsubo like syndrome in a patient with atrio-ventricular block undergoing pace-maker implantation. *Acute Card Care*. 2011;13(2):112–4.

14. Kimura K, Tanabe-Hayashi Y, Noma S, et al. Images in cardiovascular medicine. Rapid formation of left ventricular giant thrombus with Takotsubo cardiomyopathy. *Circulation*. 2007;115(23):e620–1.
15. Chun SG, Kwok V, Pang DK, et al. Transient left ventricular apical ballooning syndrome (Takotsubo cardiomyopathy) as a complication of permanent pacemaker implantation. *Int J Cardiol*. 2007;117(1):e27–30.
16. van der Bilt IA, van Dijk J, van den Brink RB, et al. Examining the octopus pot: multimodality imaging of a typical Takotsubo cardiomyopathy. *Echocardiography*. 2008;25(7):794–6.