

Pacemaker implantation for treating migraine-like headache secondary to cardiac arrhythmia

A case report

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Abstract

Rationale: Co-occurrence of headache and arrhythmia is not rare. However, their causal relationship remains unclear. Here, we described a case of migraine-like headache relieving with pacemaker implantation. Our case study indicates that arrhythmia is causal for migraine-like headache, which, to our knowledge, has never been reported.

Patient concerns: A 63-year-old woman patient suffered from paroxysmal headache with a visual aura presenting like migraine for 2 years. No ophthalmic or neurological disorder was found, but cardiac examination detected bradycardia, which was confirmed by 24-hour dynamic electrocardiogram (DCG) revealing sinus bradycardia mixed with ventricular premature beats and supraventricular tachycardia. Transcranial doppler (TCD) detected an equal echo flat plaque on the anterolateral wall of the common carotid artery (CA) bifurcation.

Diagnosis: Migraine-like headaches secondary to arrhythmia.

Interventions: The patient underwent pacemaker implantation.

Outcomes: Both visual aura and headache were resolved following pacemaker implantation.

Lessons: To the best of the authors' knowledge, we are the first to report migraine-like headache as a secondary symptom of arrhythmia. Arrhythmia may aggravate insufficient blood supply to the brain due to CA lesion and induce a migraine-like headache. This case study indicated that pacemaker implantation could be a fundamental treatment for migraine-like headaches caused by cardiac arrhythmia.

Abbreviations: CA = carotid artery, CHD = coronary heart disease, DCG = dynamic electrocardiogram, ECG = electrocardiogram, EEG = electroencephalogram, SCD = sudden cardiac death, SPB = supraventricular premature beats, SVT = supraventricular tachycardia, TCD = transcranial doppler.

Keywords: arrhythmia, bradycardia, cardiac cephalgia, migraine-like headache

1. Introduction

Migraines are a common type of primary headache that manifest as serious headache attacks and can be accompanied by varied

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YHM and XLM have contributed equally to this work.

Ethics approval and consent to participate: Though ethical approval was not required for this case report, the patient, provided written informed consent for publication and use of all accompanying images.

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arrhythmias, including bradycardia, tachycardia, premature beats, and abnormal T waves.^[1,2] Co-occurrence of migraine and arrhythmia is indicative of dysfunctional autonomic nerve pathogenesis.^[3,4] Multiple clinical studies have investigated the underlying link between arrhythmia and headaches, especially migraines, but a causal relationship between migraine and cardiac arrhythmias has not yet been elucidated and there is no effective treatment for the condition.

Here, we described a case of migraine-like headache with a visual aura occurring after cardiac palpitation. A 24-hour dynamic electrocardiogram (DCG) showed sinus bradycardia mixed with ventricular premature and supraventricular tachycardia. Both visual aura and headache resolved following pacemaker implantation, indicating that migraine-like headaches are secondary to arrhythmias.

2. Case report

A 63-year-old woman was admitted with a 2-year long paroxysmal headache that had been aggravated for 1 week. There was no clear trigger for the headache, such as physical activity, but the patient did report having sleep deprivation and nervousness. The patient also reported a visual aura that lasted approximately 10 minutes and appeared in a zigzag ripple with a shiny and vague center zone, followed by a distending pain on the calvaria, approximately the size of a hen egg. The headache spread gradually through the whole head and exhibited medium

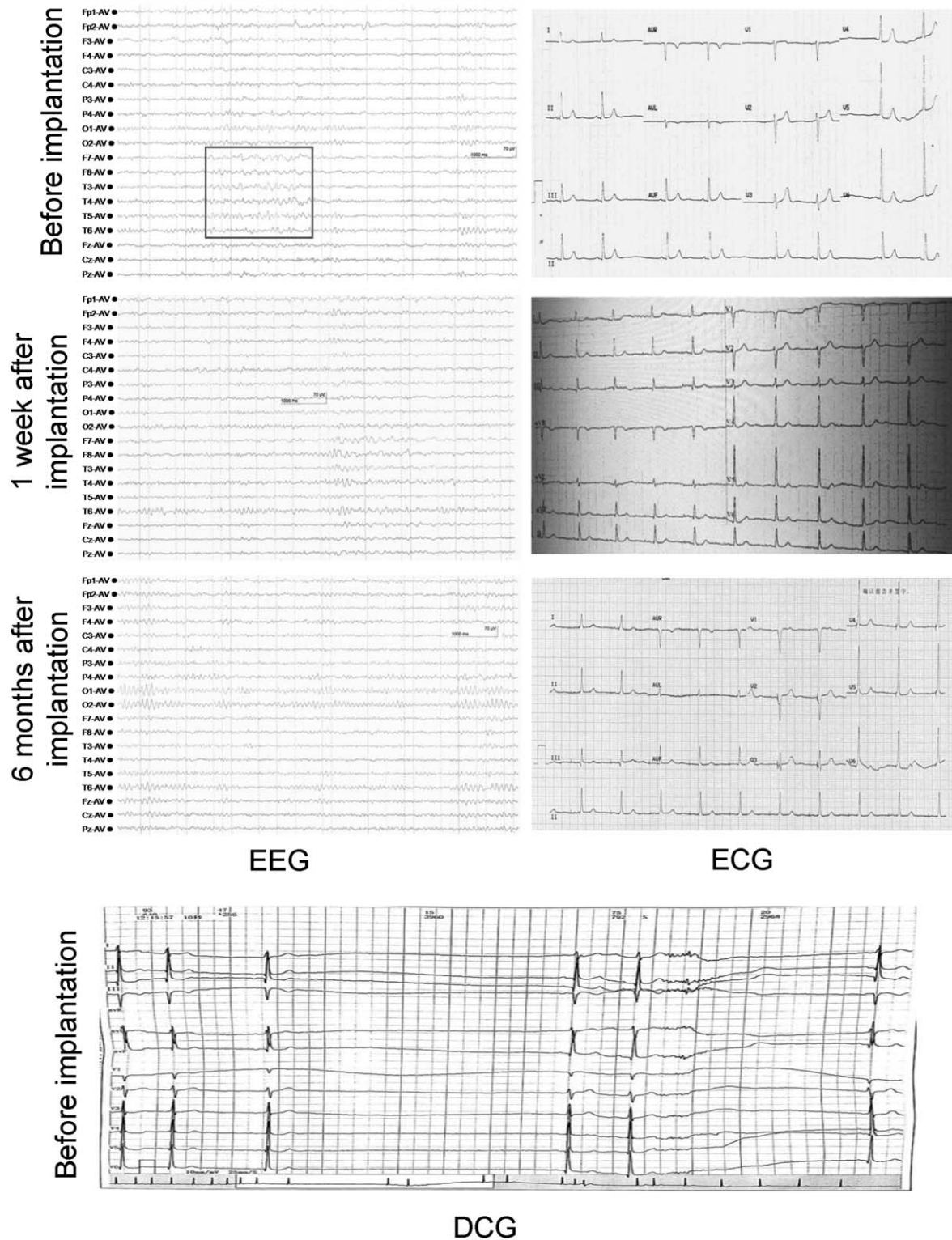


Figure 1. Electroencephalogram (EEG), electrocardiogram (ECG), and 24-hour dynamic electrocardiogram (DCG) before, 1 week, and 6 months after pacemaker implantation. Blue square indicates EEG feature before implantation showing numbers of θ wave at left temporal region with medium amplitude at a rate of 5 to 7 waves/s.

to severe (Visual Analog Scale 6–8) distending or throbbing pain, during which the patient had photophobia and phonophobia, and thus feared moving, resulting in having to stay in bed. After 10 minutes to 1 hour, the pain spontaneously remitted. These symptoms arose nearly once a week and, under most circum-

stances, palpitation existed ahead of visual disorder or headache and was resolved with pain mitigation. The patient had never visited the hospital and occasionally took ibuprofen for pain management. One week before consulting, headache occurred more frequently at a rate of 2 to 3 times a day, following cardiac

palpitation every time. Feature, severity, and duration of the pain, as well as visual aura, were consistent with previously reports. The patient did not report having hypertension, diabetes, coronary heart disease (CHD), or physical activity elicited palpitation, chest tightness, and pain. No head trauma or addiction to smoking or alcohol was reported. The patient had no long-term exceptional medication history. The ocular, neurological check, and the brain Magnetic Resonance Imaging (MRI) were unremarkable. Transcranial doppler (TCD) and ultrasound detected a 13.6×1.5 mm equal echo flat plaque on the antero-lateral wall at the common carotid artery (CA) bifurcation. The spectrum in the right vertebral artery suggested a relatively high resistance of blood flow. Electroencephalogram (EEG) showed a θ wave at the left temporal region with a medium amplitude at the rate of 5 to 7 waves/s (Fig. 1). Electrocardiogram (ECG) at the onset of headache indicated sinus bradycardia with heart rate (HR) of 45 beats/min (Fig. 1). DCG detected 12,883 supraventricular premature beats (SPB), 417 paired SPB, 136 SPB bigeminy, and 13 supraventricular tachycardia (SVT), mixed with paroxysmal atrial tachycardia and aberrant ventricular conduction. Moreover, frequent sinus arrest was recorded when palpitation occurred with the longest RR interval of 3960 seconds (Fig. 1). The TCD foaming test detected an innate minor right to left atrial shunt. Since the patient reported no history and presented no symptoms of angina, and neither ECG nor DCG showed evidence of myocardial ischemia, coronary angiography was not performed. Based on the following procedure, the patient underwent permanent pacemaker implantation. Under local anesthesia with 1% lidocaine, the left subclavian vein was punctured to insert 2 8F peelable sheath introducers, in which 2 guide wires were located. The sheath was advanced under the fluoroscopy to the inferior vena cava area, after which a small incision was made in the puncturing area where a subcutaneous pocket was created. Next, the guidewires were retracted, followed by lead insertion, which was advanced and attached to the right ventricular septum and the right atrial appendage. Afterwards, the sheath was removed. Following the sensing and pacing tests, the lead was sewn to the subcutaneous tissue and the generator was set to the pocket and connected to the lead. Finally, the incision was closed and ECG was monitored until normal pace-making rhythm was achieved. One week after implantation, visual disorder and headache ceased and the EEG indicated less medium amplitude slow waves at the left temporal region (Fig. 1), and ECG was normal (Fig. 1). During the 6-month telephone follow-up, no palpitation, visual disorder, or headache was reported. EEG and ECG were reviewed 6 months after implantation, which showed a normal pattern (Fig. 1).

3. Discussion

This report presents a case of medium or severe throbbing headache after >10 minutes of visual disorder with concomitant photophobia and phonophobia aggravated by daily activity. Compared with typical migraines, which last for 4 to 72 hours, the patient's headache persisted for a relatively short time, with the longest period of 1 hour. Palpitation before visual disorder and headache onset were noticeable, and the EEG showed evidence of sinus bradycardia with scattered SPB and SVT.

Co-occurrence of headache and arrhythmia is not rare. Mamdouh et al^[5] reported atypical migraine-like headache

and sinus bradycardia in 2 cases of dengue meningitis infection. Monroe et al^[6] discovered migraine and bradycardia in a young man with sudden cardiac death (SCD). However, the causal relationship between migraine and cardiac arrhythmias remains unclear. In this case, EEG showed sinus bradycardia during headache attack while DCG recorded frequent sinus arrest at the onset of palpitation. Pacemaker implantation reduced the abnormal EEG wave and simultaneously and significantly alleviated visual disorder and headache, indicating that arrhythmia is causal of migraine-like headache, which to our knowledge has not been previously reported. Although the TCD foaming test in this case showed a light right to left atrial shunt, it might not be enough to result in a clinical outcome. Thus, the underlying mechanism of this arrhythmia-initiated headache is likely attributed to sinus bradycardia and the suspected congenital dysplasia of the right vertebral artery, which may reduce blood supply to the brain, triggering visual disorder, and subsequent headache.

In this case study, the patient had no evidence of myocardial ischemia, which excludes the diagnosis of cardiac cephalgia.^[7] Therefore, additional case studies are required to determine whether migraine-like headaches secondary to arrhythmias are attributable to a novel headache category.

4. Conclusions

To the best of the authors' knowledge, this is the first report of migraine-like headache secondary to arrhythmia in the scientific literature. Arrhythmia may aggravate insufficient blood supply to the brain due to CA lesions and induce migraine-like headache. This case study indicates that DCG, TCD, and pacemaker implantation could be a fundamental treatment strategy for similar cases.

Author contributions

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Investigation: Ting-Min Yu, Gang Yao.

Writing – original draft: Yu-Hong Man.

Writing – review & editing: Gang Yao.

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