

CASE REPORT

Second-degree atrioventricular block type II and third-degree atrioventricular block requiring cardiac pacing after tooth extraction

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Funding Information

No sources of funding were declared for this study.

Received: 16 April 2014; Revised: 12 August 2014; Accepted: 4 December 2014

Clinical Case Reports 2015; 3(4): 274–277

doi: 10.1002/ccr3.197

Introduction

The systemic complications of dental treatment include hyperventilation, anaphylaxis, local anesthetic intoxication, and aspiration. However, the most common systemic complication is vasovagal reflex, which is caused by excessive stress, such as anxiety or pain, and is accompanied by pallor, nausea, feelings of faintness, and bradycardia [1, 2].

Atrioventricular (AV) block is one type of bradyarrhythmia. Common causes of AV block include ischemic heart disease, various drugs (e.g., digitalis and calcium channel blockers), connective tissue disorders, and rheumatic fever [3, 4]. In particular, because second-degree AV block type II and third-degree AV block can cause cardiovascular collapse, the rapid management of these conditions is necessary. This is the first report of both second- and third-degree AV blocks occurring after tooth extraction and necessitating cardiac pacing.

Case Report

The patient was an 82-year-old man due to undergo right first premolar extraction after being diagnosed with apical

Key Clinical Message

Because atrioventricular block can cause cardiovascular collapse, the rapid management of this condition is necessary. An 82-year-old man complained of discomfort after tooth extraction, and electrocardiography showed second- and third-degree atrioventricular blocks. Dentists should monitor patients who report discomfort using electrocardiography because of the possibility of life-threatening arrhythmia.

Keywords

Atrioventricular block, cardiac pacing, tooth extraction, vasovagal reflex.

periodontitis (Fig. 1). He was taking a calcium channel blocker (amlodipine) for hypertension and had been examined by Holter monitoring at a general hospital near our hospital in 2012 because he experienced discomfort and bradycardia. However, no abnormalities were noted on Holter monitoring. The patient complained of anxiety about tooth extraction before starting the treatment. After local anesthesia with 1.8 mL of 2% lidocaine and 1/73,000 adrenaline, he complained of discomfort. After a short rest, he recovered, and tooth extraction was started, but he again complained of discomfort. Thus, blood pressure (BP) and heart rate (HR) were measured by the attending oral surgeon and were 170/68 mmHg and 45 beats per minute (bpm), respectively. After another short rest, the attending oral surgeon confirmed recovery, and the tooth extraction resumed. BP and HR changed to 160–170/70–80 mmHg and 40–50 bpm, respectively, during tooth extraction. Electrocardiography (ECG) was not performed during dental treatment. After tooth extraction, the patient was moved to the waiting room. Ten minutes later, he complained of discomfort and showed signs of bradycardia. Therefore, the attending oral surgeon contacted the Department of Anesthesiology for



Figure 1. Preoperative panoramic radiograph.

assistance. We arrived immediately and measured BP, HR, and ECG (lead II). BP and HR were 166/64 mmHg and 36 bpm, respectively, and the patient's heart rhythm showed second-degree AV block type II. His consciousness appeared normal, and his replies to our questions were clear, despite his developing severe bradycardia. He also reported slight discomfort and told us that he would most likely be able to go home after a short rest. Symptomatic bradycardia was excluded as a possible diagnosis, so we gave priority to a 12-lead ECG, which indicated second-degree AV block type II (Fig. 2). Because there was no cardiovascular medicine department at our hospital, we immediately transported the patient by ambulance to the Department of Cardiovascular Medicine at the general hospital, where the patient had previously received Holter monitoring. On admission, a 12-lead ECG monitoring was started. Due to his heart rhythm deteriorating

to third-degree AV block, temporary transvenous pacing was performed. Blood examination revealed hypothyroidism (thyroid-stimulating hormone [TSH], 40.34; free thyroxine [FT4], 0.66) for which levothyroxine was administered. Amlodipine was changed to an angiotensin II receptor blocker (telmisartan) because amlodipine might have caused the AV block. Although the patient's heart rhythm improved to a normal sinus rhythm 2 days after transvenous temporary pacing, a permanent pacemaker (DDD) was placed on hospital day 4 (Fig. 3). Improved hypothyroidism (TSH, 10.04; FT4, 1.00) was noted on hospital day 7, and the patient was discharged. After discharge from the hospital, dental treatment was resumed in our hospital. For the upper jaw, full dentures on the remaining roots of the teeth were applied because the patient no longer desired tooth extraction. For the lower jaw, a facing cast crown was applied for the left canine and first premolar, and removal of the partial denture was performed for tooth defects.

Discussion

To our knowledge, this is the first report of AV block occurring during dental treatment. Bradycardia and nausea are symptoms of vasovagal reflex, which is the most frequently encountered complication of dental treatment. The cause of vasovagal reflex is vagal overactivity resulting from anxiety or pain [1, 2]. Therefore, many dentists will consider vasovagal reflex if a patient with anxiety prior to dental treatment has bradycardia, as in the present case.

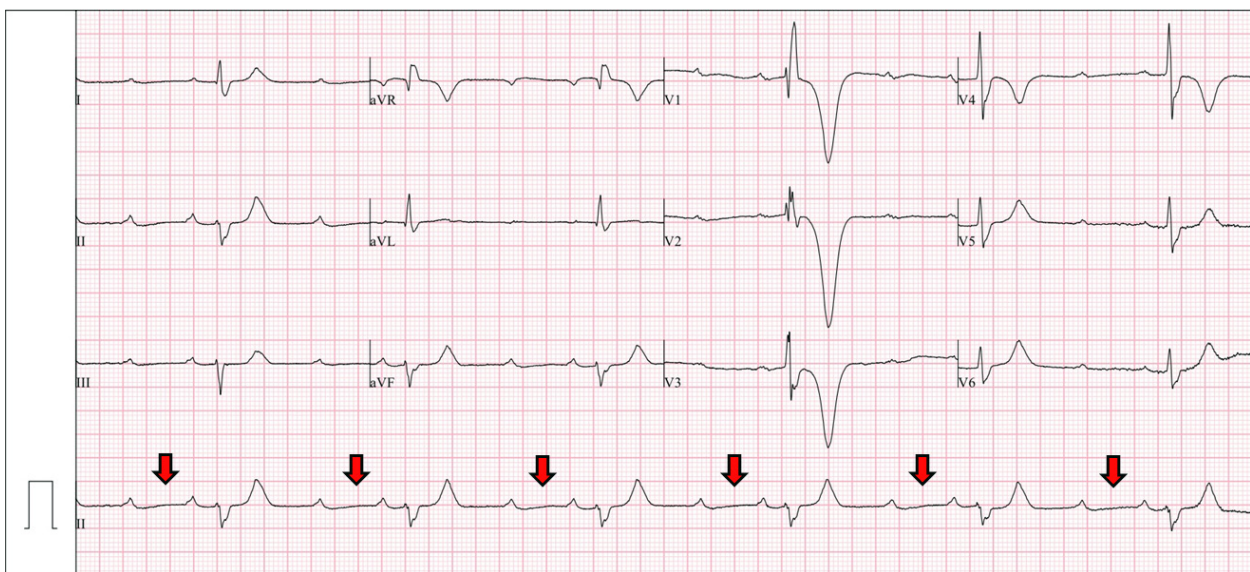


Figure 2. Twelve-lead ECG performed at our hospital. The patient's heart rate was 37 beats per minute (bpm). The PR intervals were fixed, but the QRS complex was missing for every two P waves (2:1 second-degree atrioventricular block type II). Red arrows indicate dropped QRS complexes.

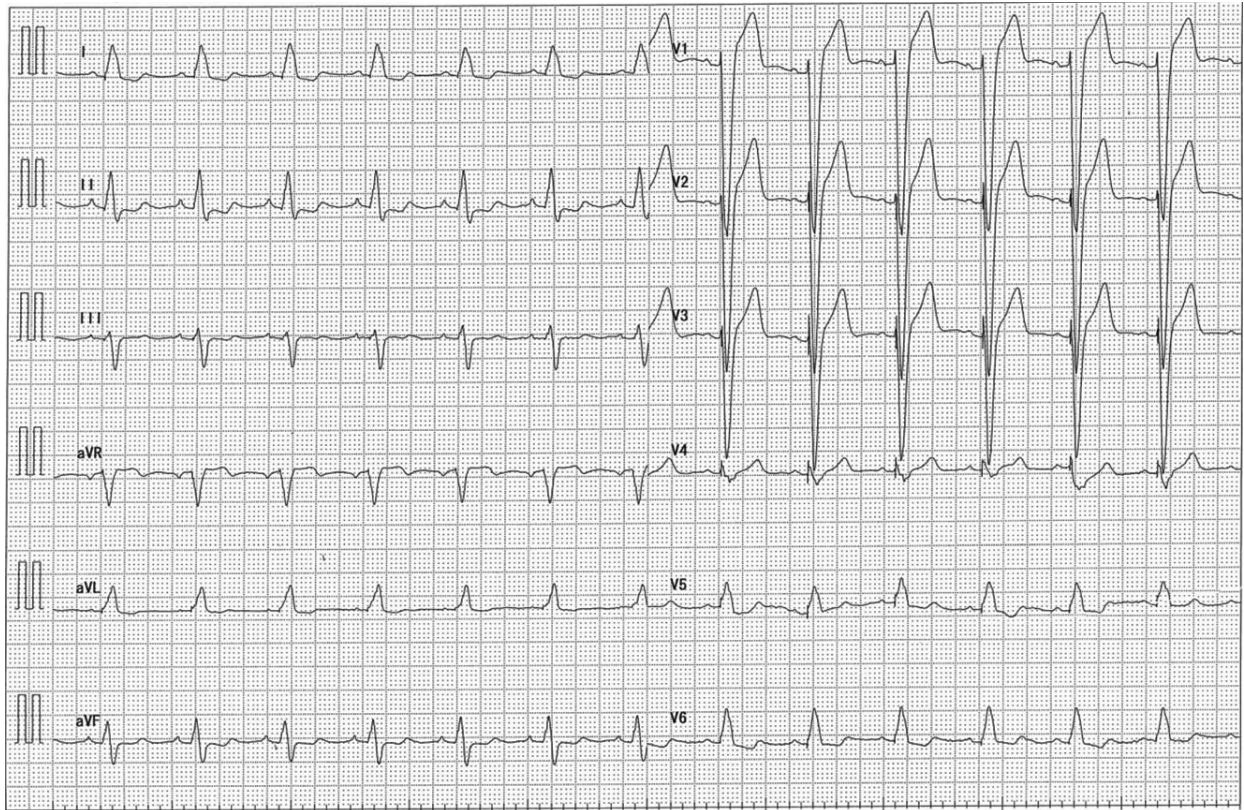


Figure 3. Twelve-lead ECG after placing a permanent pacemaker (DDD), showing clear QRS complexes after the P waves. The patient's heart rate was 83 bpm.

Most cases of vasovagal reflex are associated with a heart rate reduction in 10–50%, but sinus rhythm usually returns to baseline upon halting the surgical stimulus [5]. Furthermore, vasovagal reflex typically resolves spontaneously without intervention, and to date, no cases of trans-thoracic cardiac pacing for the management of reflex bradycardia attributed to vasovagal reflex have been reported [5, 6]. The present patient exhibited second-degree AV block type II and third-degree AV block, a type of life-threatening arrhythmia, after tooth extraction. Dentists should monitor patients experiencing discomfort and bradycardia during or after treatment with ECG, to distinguish sinus rhythm from life-threatening arrhythmia.

The American Heart Association's bradycardia algorithm specifies the administration of atropine sulfate as the first treatment for patients with symptomatic bradycardia, and transcutaneous pacing (TCP) or dopamine or adrenaline infusion as the second treatment if atropine sulfate is ineffective [7]. Because the present patient showed slight discomfort and clear consciousness when we arrived at the scene, we excluded symptomatic bradycardia as a possible diagnosis and performed a 12-lead

ECG. Thereafter, we transported the patient to the general hospital. According to the American Heart Association's bradycardia algorithm [7], monitoring and observation are recommended in patients with asymptomatic bradycardia. Therefore, we followed these recommendations. In addition, the American Heart Association's bradycardia algorithm also recommends placement of TCP electrodes (standby pacing) for asymptomatic second-degree AV block type II and third-degree AV block [7]. We thus considered it better to place TCP electrodes in anticipation of clinical deterioration.

AV block was not likely due to vagal overactivity in response to anxiety about tooth extraction in this case because second-degree AV block type II does not result from increased parasympathetic tone [8] and because organic diseases, such as ischemic heart disease, are a more common cause of AV block [3]. Therefore, the causal relationship between AV block and tooth extraction is unknown. Because the blood work at the general hospital revealed hypothyroidism, it is likely that the AV block during tooth extraction was the result of the hypothyroidism. Hypothyroidism is not an uncommon cause of third-degree AV block. Permanent pacemaker insertion is

necessary in similar cases because almost all cases of AV block associated with thyroid dysfunction can recur after normalization of thyroid function [9]. Therefore, thyroid function should be investigated in cases of recurrent AV block because it is possible that hypothyroidism is masked by AV block.

Conclusions

We experienced a case of second-degree AV block type II and third-degree AV block after tooth extraction, in which both blocks were likely due to hypothyroidism. Dentists should be aware of the possibility of life-threatening arrhythmia during or after dental treatment and should monitor patients complaining of discomfort and bradycardia with ECG.

Conflict of Interest

The authors declare that there are no conflicts of interests regarding the publication of this paper.

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