Second-Degree Atrioventricular Block Occurring After Tooth Extraction

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Although cardiac arrhythmias are occasionally associated with dental extractions and dental anesthesia, atrioventricular block is rarely seen during dental procedures. We report a rare case of type I second-degree atrioventricular block (Wenckebach phenomenon) occurring after bilateral extraction of impacted mandibular third molars under general anesthesia in a 16-year-old Japanese girl. Under consultation with a cardiovascular physician, we carefully monitored the patient's vital signs postoperatively, including blood pressure, oxygen saturation, and electrocardiogram, using a bedside monitor. Her postoperative course was uneventful. A 12-lead electrocardiogram the following day revealed no abnormality. In this case, we hypothesize that extubation of the nasotracheal tube or oral/pharyngeal suction might have triggered a vagal reflex that caused type I second-degree atrioventricular block. Our experience indicates that standard cardiovascular monitoring should be used for patients undergoing dental treatment under general anesthesia, even for young, healthy patients, to prevent and detect cardiovascular emergencies.

Key Words: Type I second-degree atrioventricular block; Tooth extraction; General anesthesia.

A wide variety of cardiac arrhythmias and other cardiac conditions have been reported in patients undergoing dental treatment.¹⁻⁴ Ischemic heart disease is the most common cardiac condition encountered in dental practice.⁵

Arrhythmias are variations in normal heart rate due to cardiac rhythm, rate, or contractility disorders.⁶ Most cases of arrhythmia are transient. Occasionally, however, severe arrhythmias, such as multifocal ventricular premature beats and paroxysmal supraventricular tachycardia, do develop.^{7,8} Patients with cardiovascular disease appear to be particularly prone to severe arrhythmias as a result of dental stress or vasopressor-containing local anesthesia.⁹

Atrioventricular (AV) block is a type of bradyarrhythmia. Common causes of AV block include ischemic heart disease, various drugs (eg, digitalis and calcium channel blockers), connective tissue disorders, and rheumatic fever.^{10,11}

Second-degree atrioventricular (AV) block involves partial interruption of impulse transmission from the atria to the ventricles and is rarely seen during dental procedures. We herein present the first known case report of type I second-degree AV block (Wenckebach phenomenon) occurring after extraction of third molars under general anesthesia in a 16-year-old Japanese girl.

CASE REPORT

A 16-year-old Japanese girl, 155 cm (61 inches) tall, weighing 40 kg, visited our dental hospital for bilateral impacted mandibular third molars. Although the patient was young and healthy, her mandibular third molars

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Figure 1. Preoperative 12-lead electrocardiogram performed at our dental hospital.

were deeply impacted and attached to the mandibular canal. Further, since she was extremely apprehensive about dental treatment, we decided to extract these teeth under general anesthesia due to the risk of intraoperative bleeding, paresthesia due to possible postoperative mandibular nerve damage, and dental anxiety. Her preoperative vital signs were essentially normal and physical examination, including airway examination, was unremarkable. Routine preoperative laboratory examinations, including a 12-lead electrocardiogram (ECG), were normal (Figure 1). She had previously been perfectly well, was asymptomatic, and had no difficulties in extension and flexion of her neck. Propofol 80 mg, vecuronium bromide 30 mg, and remifentanyl 0.3 μ g/kg per minute were administered intravenously during anesthesia induction. Her right nasal passage was lubricated with direct application of 3 mL of lidocaine hydrochloride jelly (Astellas Pharma Inc, Tokyo, Japan). Laryngoscopic view of the vocal folds was grade 1 according to the Cormack-Lehane classification.¹² Using

a 6.5-mm nasotracheal tube (Smiths Medical, UK), nasotracheal intubation was performed without difficulty by an experienced dental anesthesiologist. General anesthesia was maintained with sevoflurane 1.5% in 1 L/min of oxygen and 2 L/min of air; in addition, 5 mL of 1.0% lidocaine containing 1:100,000 epinephrine was injected for local anesthesia, and 15 mg of ropivacaine was injected bilaterally for mandibular conduction anesthesia.¹³ Bilateral extraction of the impacted mandibular third molars were performed without difficulty. During the operation, her blood pressure and heart rate were stable around 90/40 mm Hg and 55 bpm, respectively. After completion of the operation, anesthesia was discontinued, and she regained consciousness fairly quickly. Soon after straightforward extubation of the nasotracheal tube, an episode of type I second-degree AV block was observed (Figure 2). Her blood pressure and heart rate were 115–105/55–45 mm Hg and 80–70 bpm, respectively. She was completely conscious and lucid and replied clearly to our questions.

Figure 2. Type I second-degree atrioventricular block that occurred after extraction of impacted third molars under general anesthesia.

Consultation in our dental hospital with a cardiovascular specialist resulted in a diagnosis of type I second-degree AV block due to vagal reflex stimulation. We carefully monitored the patient's vital signs, including ECG, blood pressure, and oxygen saturation, using a bedside monitor. By this time, the frequency of type I second-degree AV block had decreased slightly. Within 6 hours, no cardiac arrhythmias were seen on ECG. The postoperative course was uneventful, and her consciousness level was similar to that observed preoperatively. A 12-lead ECG performed the following day demonstrated no abnormal findings. She was discharged from our dental hospital, which accommodates in-patient stays, the following day without any further incident.

DISCUSSION

Second-degree AV block was first described in 1899 by Karel Frederik Wenckebach by analysis of venous pulsations.¹⁴ After invention of the ECG, second-degree AV block was classified as type I or II by Woldemar Mobitz.¹⁵

Type I second-degree AV block can occur in individuals who have high vagal tone, such as younger persons.¹⁶ The most probable cause of type I second-degree AV block in our patient was vagal reflex triggered by nasotracheal tube stimulation, tooth extraction, or suctioning that stimulated the oral/pharyngeal region. Vasovagal reflex stimulation is the most frequently encountered complication of dental treatment, including tooth extraction.¹⁷ Most cases of vasovagal reflex are associated with a heart rate reduction of 10% to 50%.¹⁸ The vasovagal reflex typically resolves spontaneously without intervention.¹⁹ In our case, however, vasovagal reflex stimulation by extubation of the nasotracheal tube or oral/pharyngeal suctioning with catheter caused type I second-degree AV block. Although this type of AV block is usually not clinically significant, oral and maxillofacial surgeons and dental anesthesiologists should carefully and continuously monitor patients using ECG, measurement of blood pressure, and pulse oximetry, at frequent intervals during and after tooth extraction under general anesthesia. This level of monitoring will enable early detection of potentially deleterious cardiac conditions.

Some of the drugs used for general anesthesia in this operation could also have been a cause of the AV block. Propofol, in conjunction with other drugs, is the most commonly used anesthetic agent. Prolongation of AV conduction is also sometimes observed as a side effect of propofol.²⁰ Remifentanyl depresses sinus node function and most parameters of AV nodal function.²¹ In this case, stability of blood pressure and heart rate and no significant findings to indicate perioperative cardiac ischemia or infarction demonstrates that the drugs used for general anesthesia in this operation had little effect on this occurrence of type I second-degree AV block.

The prognosis and recommended management of type I second-degree AV block in the perioperative period are based on the clinical findings and the presence of related heart disease. Asymptomatic individuals with no heart disease and stable vital signs generally do well without therapy with cardiac rhythm frequently returning to normal. In the hospital setting, cardiac consultation is warranted. In the office-based setting, consultation with the primary care physician regarding urgency of evaluation or emergency department evaluation is prudent, particularly if heart block is sustained. In patients with structural heart disease, the prognosis may be more dependent on the natural history of the heart disease itself rather than the presence of type I second-degree AV block. Patients may require only cardiac monitoring to identify the rare symptomatic presentation or progression to higher-grade AV block, which is unlikely except in cases involving acute myocardial infarction.²²

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