

Case Report

A Rare Complication of Trigeminal Nerve Stimulation During Radiofrequency Thermocoagulation

Sudden ST Segment Elevation

*Hülya Bilgin, *Nermin Kelebek, *Gulsen Korfali, †Ahmet Bekar, and *Beklen Kerimoğlu

*Departments of *Anesthesiology and †Neurosurgery, Uludağ University Medical School, Bursa, Turkey*

Summary: Coronary vasospasm resulting from a sudden autonomic response associated with an intracranial procedure was encountered during percutaneous radiofrequency trigeminal rhizotomy. Although it is very rare, careful monitoring and readiness for the occurrence of such a potentially lethal situation with necessary medications may prevent a fatal outcome. **Key Words:** Trigeminal rhizotomy—Coronary vasospasm—Nitroglycerin

Percutaneous radiofrequency (RF) trigeminal rhizotomy is a commonly used, effective treatment for refractory trigeminal neuralgia. The procedure is usually performed on an outpatient basis, with few complications. Mortality from this procedure is rare. The most common complications are facial numbness or dysesthesia, corneal anesthesia, and masseter muscle weakness (1–3). However, there have been a few reports of ventricular fibrillation and coronary vasospasm after the development of ST segment elevation in electrocardiogram (ECG)(4,5). We report a case of transient ST segment elevation that occurred during percutaneous RF trigeminal rhizotomy.

CASE REPORT

A 79-year-old woman presented with a 20-year history of trigeminal neuralgia of the right trigeminal nerve. Radiofrequency trigeminal rhizotomy was performed twice

under local anesthesia, supplemented with sedation, without any complications. Twelve months before presentation, when her systems reappeared, she was subjected to carbamazepine treatment. Because the treatment was ineffective, the patient was scheduled for RF trigeminal rhizotomy.

The patient had no history of angina pectoris, dyspnea on exercise, hypertension, smoking, or hypercholesterolemia, nor was there a family history of heart disease. She was on oral carbamazepine therapy only, 600 mg daily. Her electrocardiogram (ECG) revealed normal sinus rhythm without any sign of coronary artery disease, and her chest radiographs were normal.

Monitoring in the operating room during the procedure included an ECG lead II, noninvasive blood pressure, end-tidal CO₂, and respiratory rate. Oxygen saturation was measured by pulse oximetry. Oxygen was administered via a nasal catheter, 3 L/min. The patient's mean blood pressure and heart rate were 125 mm Hg and 88 beats/min respectively. Intravenous midazolam, 0.03 mg/kg, and 7.5 µg/kg intravenous alfentanil were administered for sedation to the unpremedicated patient, followed by 15

Address correspondence and reprint requests to Hülya Bilgin, M.D., Uludağ University Medical School, Department of Anesthesiology, 16059 Görükle, Bursa. Accepted for publication August 22, 2001.

$\mu\text{g/kg/hr}$ alfentanil infusion. As soon as the cannula was inserted through the right cheek into the foramen ovale, and the free flow of cerebrospinal fluid was obtained, her mean blood pressure decreased suddenly from 129 mm Hg to 108 mm Hg and her heart rate decreased from 85 beats/min to 70 beats/min. Meanwhile, her ECG revealed marked ST segment elevations. There was no change in her mental status and she complained of retrosternal chest pain. Her oxygen saturation (97%) and end-tidal CO_2 (37 mm Hg) values were within normal limits. The procedure was completed rapidly and the cannula was removed. Although 1 mg intravenous nitroglycerine was administered within 5 minutes, followed by a $0.5\text{-}\mu\text{g/kg/min}$ infusion to prevent additional myocardial ischemia in the operating room, her chest pain persisted for approximately 20 minutes, after which her ECG changes returned to normal. The same dose of nitroglycerine was continued in the intensive care unit. Her mean blood pressure was 83 mm Hg and her heart rate was 75 beats/min. Laboratory test results revealed the following levels: hematocrit, 31%; plasma potassium, 3.9 mmol/L; creatine phosphokinase (CK; 75 U/L; normal range, 24 to 200 U/L), creatinine phosphokinase MB-isoenzyme (CK-MB) fraction (CK-MB; 18 U/L; normal range, 0 to 25 U/L). Subsequent ECGs showed ST segment elevations in V_{I-IV} , followed by a Q-wave infarction. Additionally, CK and CK-MB levels increased in serial samples (Table 1). A troponin T test could not be performed because of laboratory conditions. No further changes were noted in serial ECGs or her hemodynamic parameters. Meanwhile, the nitroglycerine infusion rate was decreased progressively and then stopped. The patient was stabilized via isosorbide dinitrate and was discharged from the hospital 7 days after undergoing the procedure.

DISCUSSION

Non-Q- and Q-wave myocardial infarction and unstable angina pectoris are acute coronary syndromes (6). Intra-

TABLE 1. Patient's CK and CK-MB fraction levels at different times

Time, hr	CK, U/L	CK-MB, U/L
Baseline	75	18
6	80	23
18	232	35
30	206	33
42	184	28
54	153	24

CK = creatine phosphokinase; CK-MB = creatinine phosphokinase MB-isoenzyme.

operative ischemia can be precipitated by increases in myocardial oxygen demand caused by tachycardia, hypertension, stress, sympathomimetic drugs, or discontinuation of beta blockers. As many as 50% or more of ischemic episodes may be unrelated to the indices of oxygen demand, suggesting decreased oxygen supply as the primary cause. In addition, internal factors such as acute coronary artery thrombosis and spasm may play a role (7). Coronary artery spasm reduces coronary blood flow suddenly as a result of contraction of the coronary artery and oxygen delivery to the myocardium. Coronary artery spasm has been reported to occur during many kinds of operations under general or local anesthesia (4,8–10).

Swerdlow et al. (5) reported hypertension and tachycardia during RF rhizotomy and concluded that increased sympathetic activity could be a possible explanation, but they may be related to the decreased level of anesthesia used to facilitate patient communication with the surgeon to evaluate the intensity and quality of pain and pain relief after the procedure. Dominguez et al. (10) suggested that the sympathoadrenal response induced by the therapeutic compression of the trigeminal ganglion is not modified by the depth of general anesthesia. In contrast, the injection of lidocaine into Meckel's cave before ganglion compression is an effective method for preventing the development of systemic arterial hypertension and tachycardia (11). Kariya et al. (4) recorded hypotension and bradycardia during cranial bone drilling near the trigeminal nerve and suggested that vagal reflex induced by drilling of the cranial bone may have induced coronary vasospasm.

In our patient, an unusual slight decrease in blood pressure and heart rate, and marked ST segment elevation were observed during cannula placement in the foramen ovale. There were no clinical findings of hypotension, hypoxemia, tachycardia, or stress. These ECG alterations may be the result of myocardial ischemia caused by coronary artery spasm. Activation of the vagal tone reflex may have been induced by stimulation of the dura mater during cannula placement. ST segment elevation reflects transmural myocardial ischemia. It occurs suddenly, without an increase in myocardial oxygen consumption. In many cases, right coronary artery spasm produces ST segment elevations localized in leads II and III, and a ventricular fibrillation without any elevations or reciprocal ST segment depressions in lateral precordial leads (12).

Coronary artery spasm-induced ischemia requires rapid intervention of administration of nitroglycerin infusion. Nitrate, β -adrenergic antagonists, calcium channel blockers, antiplatelet, and antithrombotic agents are the primary drugs used to treat acute coronary syndrome. Nitrate func-

tions by dilating the coronary arteries, which are stenotic or not, and decreased preload and afterload. Therefore, it improves spasm reversal or prevention, increases collateral blood flow, and improves regional subendocardial ischemia (7). The injection of a 0.4-mg bolus produces rapid regression of coronary artery spasm. Continuous nitroglycerin infusion at a rate of 0.5 to 1 $\mu\text{g}/\text{kg}/\text{min}$ prevents myocardial ischemia (13).

In conclusion, we present a case of coronary vasospasm and myocardial infarction in a patient who underwent percutaneous trigeminal rhizotomy. This case, in combination with previous reports, suggests that, although rare, coronary spasm may be associated with RF. In addition, this case demonstrates the importance of careful monitoring, knowledge of the complications of RF, and rapid application of appropriate treatment.

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