Coronary Artery Spasm Occurring twice the Patient Received General Anesthesia

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The possibility of coronary artery spasm during general anesthesia becoming life threatening events is very high. In the present case report, we present a case in which elevation of the ST-segment was revealed on the electrocardiogram, suggestive of coronary artery spasm, and was successfully treated both times the patient received general anesthesia.

Case Report

Patient was a 63-year-old male, height 150 cm and body weight 55 kg. The patient developed dysuria one year ago.

Complete examination resulted in a diagnosis of prostate cancer, and he was scheduled for total prostatectomy.

His family history was unremarkable. He had a past history of hypertension without symptoms of angina pectoris. No specific treatment for hypertension had been given.

Preoperatively, blood pressure was 162/76 mmHg and pulse rate was 96 beats per minute (bpm), and no abnormalities were found on the chest X-ray, electrocardiograms (single Master and double Master) and blood biochemistry tests. Pulmonary function tests revealed a slight mixed disturbance of restrictive and obstructive patterns.

Atropine 0.5 mg, hydroxyzine 50 mg and buprenorphine 0.2 mg were administered i.m. 1 hour prior to the start of operation as premedication. Monitorings during anesthesia were blood pressure and electrocardiogram (lead II) alone. Blood pressure was 182/99 mmHg, pulse rate was 99 bpm and no arrhythmia was present on the electrocardiogram at the time of patient's entrance to the operating room. An epidural catheter was inserted at L_3-L_4 interspace for intraoperative and postoperative analgesia. Following an initial 3 ml "test dose", 1% mepivacaine was injected in 10 ml incremental doses to establish a sensory block to about the Th10 dermatome. Diltiazem 5 mg i.v. was administered to treat hypertension that was present prior to induction of anesthesia and to suppress elevation of blood pressure during tracheal intubation. Anesthesia was started when blood pressure reached 158/100 mmHg.

Induction of anesthesia was accomplished by thiamylal 300 mg after precurarization with pancuronium 1 mg. Endotracheal intubation was facilitated by succinylcholine 80 mg. After en-

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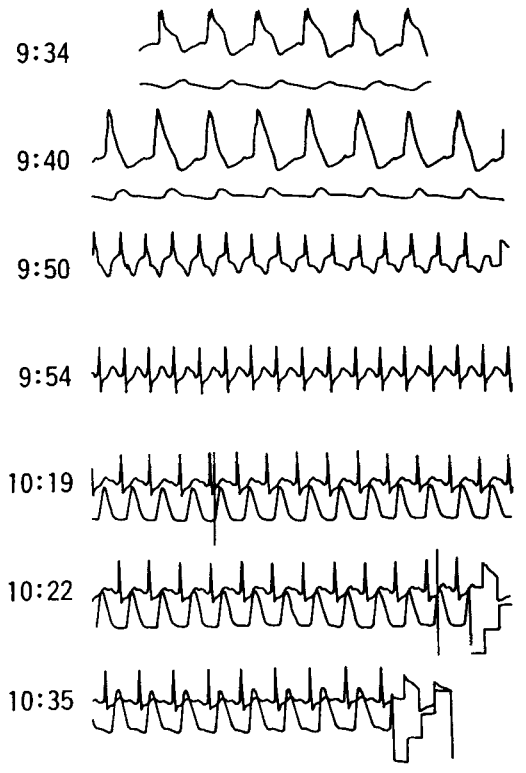

Fig. 1. The changes in ECG (lead II) and systemic blood pressure (radial artery) during coronary spasm.

dotracheal intubation, anesthesia was maintained with 1.0–1.5% sevoflurane in nitrous oxide and oxygen. Pancuronium 3 mg was used for muscle relaxation.

Concurrently, 1.5% mepivacaine 10 ml was injected into the epidural catheter. Blood pressure and pulse rate were stable at 130/60 mmHg and 82 bpm, respectively, after induction of anesthesia and the operation was started. Until this time, no change occurred on the electrocardiogram. A sudden elevation of the ST-segment occurred (fig. 1) 25 minutes after the start of operation, when nasal suction was performed. Blood pressure decreased from 120/55 mmHg to 80/50 mmHg and pulse rate decreased from 70 bpm to 50 bpm, gradually forming an A-V block. Operative maneuvers were immediately discontinued. The arterial blood gas analysis at this point was not performed. He was given pure oxygen. Atropine 0.5 mg and isoproterenol 0.1 mg i.v. were administered as a bolus injection,and then an intravenous infusion of diltiazem 5–8 $\mu g \cdot kg^{-1} \cdot min^{-1}$ was started. The ST-segment immediately returned to normal. However, tachycardia of approximately 160 bpm developed. Mexiletine 25 mg i.v. was administered and pulse rate and blood pressure stabilized at 90 bpm and 126/52 mmHg, respectively. The operation was discontinued. The endotracheal tube was extubated after the patient sufficiently recovered form anesthesia. No abnormal findings were detected in the 12-lead electrocardiogram recorded immediately after the operation. Furthermore, postoperative laboratory tests did not reveal any abnormalities in enzymes, such as LDH and CPK. To prepare for reoperation, detailed examinations were performed. The only abnormality of the coronary angiogram was a 25% constriction of the right coronary artery (RCA). The patient was scheduled to undergo the same procedure 50 days after the first operation. This time, oral isosorbide dinitrate was prescribed by an internist beginning 30 days before the operation until the day before the operation in order to prevent coronary artery spasms. Scopolamine 0.3 mg and pethidine 100 mg i.m. were administered 1 hour prior to the operation as premedication, and nitroglycerin tape was attached. The epidural catheter was inserted and 1% lidocaine 3 ml injected as a test dose, followed by the initial dose of 10 ml, 1% lidocaine. Eight ml of 1% lidocaine was injected through the catheter every one hour. Anesthesia was induced with droperidol 3 mg, fentanyl 0.2 mg and thiamylal 300 mg i.v.. Endotracheal intubation was facilitated by

succinylcholine 60 mg i.v.. Anesthesia was maintained with nitrous oxide in oxygen with 1.0% sevoflurane and intermittent pancuronium and epidural lidocaine. Bradycardia (less than 40 bpm) and a decrease in blood pressure (90/50 mmHg) suddenly occurred approximately 10 minutes after the start of the operation. These symptoms recovered by atropine 0.2 mg i.v.. However, later on an elevation in ST-segment occurred, as in the previous operation. Continuous intravenous infusion of isosorbide 5 mg/hour was started because the ST-segment elevation was gradually resolved by a bolus injection of isosorbide 10 mg.

The operation was completed without further event, and the patient completely recovered from 5 hours of anesthesia.

Discussion

A coronary artery spasm needs to be treated immediately because it may cause occlusion of the coronary artery within a short time. Many factors may cause coronary artery spasm during anesthesia, such as, (1) alkalosis from hyperventilation, (2) vagal nerve stimulation, and (3) stress (sympathetic nerve stimulation) due to 'light' anesthesia[1]. In this case, coronary artery spasm occurred after bradycardia and a decrease in blood pressure appeared both times the patient received anesthesia. During the first operation, the trigger of the coronary artery spasm was probably vagal nerve stimulation induced by nasal suction and a slight degree of hyperventilation (Pa_{CO_2} 29.3 mmHg).

Complete recovery from the coronary artery spasm by the intravenous infusion of diltiazem alone suggests that Ca-blockers are effective in treating coronary artery spasm. Furthermore, mexiletine was extremely effective in treating tachycardia after recovery from the spasm.

At present, the interval between the coronary artery spasm attack and safe administration of anesthesia is not known. In this case, the second operation was performed on the 50th postoperative day because no abnormalities were present in the laboratory tests after the first operation and hypertention was adequately controlled, and in consideration of the advancement of the prostate cancer. Based on the first experience, isosorbide was orally administered and nitroglycerin tape was attached preoperatively. Anesthesia was maintained using fentanyl, sevoflurane in nitrous oxide and oxygen with epidural analgesia, an anesthetic regimen for A-C bypass surgery, in order to prevent coronary artery spasm. In addition, respiration was controlled with a ventilator to maintain Pa_{CO_2} between 30–35 mmHg. Elevation of ST-segment, suggestive of a coronary artery spasm, suddenly occurred 25 minutes after the start of surgery when maneuvers inside the abdomen were started. However, bradycardia and decrease in blood pressure did not appear. This time, the elevated ST segment was returned to normal levels with isosorbide 10 mg i.v. bolus. Thereafter, the continuous intravenous infusion of isosorbide was performed throughtout the remainder of anesthesia and the operation was completed without any further events.

Many studies suggest that nitroglycerin is also effective in such cases. No report exists in which a coronary artery spasm recurred despite preventive measures. This case indicates the danger and problems inherent in coronary artery spasms during general anesthesia. This case also suggests that Ca-blocker[2] (diltiazem), nitroglycerin and isosorbide are effective in treating coronary artery spasms, and that mexiletine[3] is effective when tachycardia occurs. In summary, careful monitoring should be performed

and a treatment plan established in cases with a past history of coronary spasms, and we should keep in mind that spasm may occur despite preventive measures during general anethesia.

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