Anesthetic Management of a Patient With Takayasu Arteritis

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Takayasu arteritis is a rare chronic progressive panendarteritis involving the aorta and its main branches. Anesthesia in patients with this disease can be complicated by severe uncontrolled hypertension, end-organ dysfunction, and stenosis of major blood vessels. In this case, general anesthesia was induced with sevoflurane and remifentanyl without complications. To prevent intraoperative complications, we conducted intubation with a rigid video laryngoscope with careful consideration of the concentrations of analgesics and sedatives used. This case demonstrates the importance of anesthetic techniques for maintaining adequate tissue perfusion without hemodynamic changes in the anesthetic management of patients with Takayasu arteritis.

Key Words: Takayasu arteritis; Anesthetic management; General anesthesia; Dentistry.

Takayasu arteritis is an idiopathic and chronic inflammatory disease characterized by the formation of stenoses or abnormal aneurysms in large vessels, resulting in life-threatening ischemia in major organs. Takayasu arteritis predominantly affects young females under 40. The etiology of this disease has not been defined.^{1,2}

Some reports have emphasized problems in the anesthetic management of a patient with Takayasu arteritis.³⁻⁶ However, limited information is available. We present a case of general anesthesia in a patient with Takayasu arteritis and discuss specific anesthetic management and considerations required in such cases.

CASE REPORT

A 22-year-old female patient (weight, 44 kg; height, 136 cm) diagnosed with Takayasu arteritis was electively

scheduled for mandibular third molar teeth extraction under general anesthesia at our institution.

At preoperative evaluation, the patient's blood pressure was 121/81 mm Hg in the right upper limb, 121/61 mm Hg in the left upper limb, 135/73 mm Hg in the right lower limb, and 137/78 mm Hg in the left lower limb. Her left brachial artery was palpable. However, pulses of the right brachial artery and dorsal arteries of both feet were absent.

Chest radiography demonstrated a scalloped aorta and enlargement of the cardiac shadow. Twelve-lead electrocardiography revealed left ventricular hypertrophy and negative T waves in the precordial leads.

The patient had a history of aortic valve replacement for aortic valve insufficiency. Transthoracic echocardiography revealed trivial mitral regurgitation and an ejection fraction of 86.3%.

Contrast angiography demonstrated stenosis of the right common carotid artery and internal carotid artery and revealed obstruction of the middle cerebral artery accompanied by focal cerebral infarction. Focal cerebral infarctions had previously caused a number of transient ischemic attacks resulting in dizziness during daily activities and the patient had therefore been treated with long-term anticoagulant/antiplatelet therapy includ-

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ing warfarin, potassium, aspirin, and clopidogrel. The prothrombin time–international normalized ratio was controlled at 2.2 (standard international normalized ratio for aortic valve replacement in Japan is 2–3 because of greater risk for warfarin-related intracranial hemorrhage in Japanese). Anticoagulant therapy was continued until the day of surgery.

The patient had been taking prednisolone (9.5 mg/d) and azathioprine (50 mg/d) for 11 years and was found to have cushingoid features including moon facies.

No premedication was given. Noninvasive blood pressure was measured on both upper limbs in the operating room. Electrocardiogram (leads II and V5), body temperature, and peripheral artery oxygen saturation were monitored throughout anesthesia. Baseline heart rate (69 bpm), blood pressure (116/66 mm Hg), body temperature (36.5°C), and peripheral artery oxygen saturation (100%) were recorded before the induction of anesthesia. A 22-gauge cannula was inserted into a vein on the dorsum of the left hand; infusion of Ringer lactate solution was initiated and prednisolone 25 mg was administered. Anesthesia was induced using midazolam 10 mg followed by continuous administration of remifentanyl, 0.5 µg/kg/min, over 4 minutes intravenously. After confirmation of loss of consciousness, rocuronium (25 mg) was administered intravenously and oral intubation was performed using an airway scope (AWS-S100; Pentax). The lungs were ventilated with oxygen (2 L/min) and air (2 L/min) and anesthesia was maintained with sevoflurane 1.5% and remifentanyl, 0.25 µg/kg/min. We planned to maintain systolic blood pressure at approximately 120 mm Hg, the preoperative value, and end-tidal carbon dioxide pressure between 35 and 40 mm Hg during anesthesia. Hemodynamics and other vital parameters were stable and the duration of the surgery was 68 minutes. The patient was extubated after recovery of neuromuscular blockade and adequate spontaneous breathing. The patient was admitted into the recovery room with stable vital signs and was discharged from the hospital without any complications on postoperative day 2.

DISCUSSION

At preoperative evaluation, the blood pressure was not abnormally elevated and the discrepancy between blood pressures in upper and lower limbs was small. Although transthoracic echocardiography revealed mitral regurgitation, regurgitation was trivial and the ejection fraction was 86.3%. Therefore, we determined the circulatory function of the patient was adequately maintained at this time. However, pulses of the right brachial artery and dorsal arteries of both feet were absent and angiography

demonstrated stenosis and obstruction of major arteries. Therefore, we assumed angiostenosis had likely developed in other areas of the body as well.

Although the patient had been treated with long-term anticoagulant therapy, the prothrombin time–international normalized ratio was controlled at 2.2. There, anticoagulant therapy was continued according to the guidelines for the management of patients on oral anticoagulants requiring dental surgery.⁷

The patient had also received chronic steroid treatment to suppress vascular inflammation. Therefore, we suspected suppressed adrenal gland function. Patients with Takayasu arteritis occasionally receive long-term administration of steroids. Exogenous steroids suppress normal adrenal gland function. This results in recommendations for additional glucocorticoid supplementation in the management of patients undergoing stressful situations, such as surgery or dentistry.^{8–10} Gibson et al recommended 100 mg of hydrocortisone should be administered while maintaining the usual glucocorticoid medications for dental patients undergoing general anesthesia,¹¹ and Marik et al¹² reported that patients receiving therapeutic doses of corticosteroids who undergo a surgical procedure do not routinely require stress doses of corticosteroids so long as they continue to receive their usual daily dose of corticosteroid. The risks of excess glucocorticoid administration are relatively small.¹³ Hence, we administered prednisolone 25 mg intravenously during the intraoperative period and usual medications were maintained.

Initially, we attempted monitored anesthesia care with local anesthesia alone or with moderate sedation, as the patient in a more conscious state allows some monitoring of cerebral perfusion. However, the third molars were in extremely close proximity to the mandibular canal and the surgeons required patient immobility during the extraction procedure. Additionally, we anticipated local anesthesia would be inadequate as we wished to avoid the use of local anesthetics with epinephrine to prevent hemodynamic changes. Further, we required reliable maintenance of the patent airway in case of injury to the inferior alveolar artery and bleeding. Thus, intubated general anesthesia was selected in this case.

Based on preoperative evaluation, we anticipated the potential occurrence of severe hemodynamic changes, cerebral ischemia, and acute adrenal insufficiency due to chronic steroid treatment during general anesthesia in this case.

Blood pressure control is one of the most important factors in anesthetic management of patients with Takayasu arteritis as these patients may develop rupture of arterial aneurysms and cerebral ischemia due to carotid occlusion. In previous reports, emphasis was been placed on the importance of hemodynamic

monitoring in these patients.⁵ In this case, the discrepancy of blood pressure between upper and lower limbs was less than 20 mm Hg. However, her right brachial artery was not palpable; therefore, noninvasive blood pressure monitoring was performed in the right and left upper limbs and we attempted to maintain the small discrepancy between both limbs.

An increase in blood pressure during general anesthesia is associated with inadequate anesthetic depth. We used remifentanyl as an analgesic supplement with infiltrative administration of 10 mL of 3% mepivacaine to the surgical field to minimize surgically induced hemodynamic changes in this case. Based on a previous report,¹⁴ we set the effect-site concentration of remifentanyl at 6 ng/mL during tracheal intubation and at 2.5 ng/mL during the maintenance of anesthesia with AnestAssist PK/PD (Palma Healthcare Systems LLC). Sedatives were administered with estimation of the level of consciousness using BIS (BIS A-2000; Covidien). We set the value of BIS at 50 to prevent changes in blood pressure due to sedative dosing.

We routinely administer crystalloids to correct hypotension. Further decreases in mean arterial blood pressure are corrected by increasing fluid infusion rates, use of the Trendelenburg position, and intravenous ephedrine in light of a previous report.⁶ However, hypotension did not occur in this case.

Takayasu arteritis is characterized by focal stenosis involving the aorta and the proximal segments of its main branches.¹⁵ In this case, the patient had stenosis of the right common carotid artery and internal carotid artery and obstruction of the middle cerebral artery. We conducted oral intubation with an airway scope (AWS-S100; Pentax) to avoid extension of the neck, as cerebral ischemia can occur with neck extension while the blood pressure is decreased by induction of anesthesia. Laryngoscopy using the airway scope involves less extension of the neck compared with conventional laryngoscopy.¹⁶ Hypocapnea with hyperventilation leads to cerebral vasoconstriction and cerebral ischemia. Therefore, we maintained end-tidal carbon dioxide pressure between 35 and 40 mm Hg to avoid cerebral vasoconstriction and maintenance of blood flow through collateral vessels feeding into the ischemic area during the operative period.

CONCLUSIONS

We report the anesthetic management of a patient with Takayasu arteritis. In this case, we induced general anesthesia in the patient focusing on minimizing hemodynamic changes, preventing cerebral ischemia, and acute adrenal insufficiency following chronic steroid

treatment. These strategies contributed to safe induction and maintenance of general anesthesia. In the anesthetic management of patients with Takayasu arteritis it is important that adequate tissue perfusion be maintained without hemodynamic changes and that anesthetics be used that are appropriate to the condition of the patient.

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