Management of tracheal compression that’s caused by an innominate artery aneurysm

— A case report —

Department of Anesthesiology and Pain Medicine, School of Medicine, The Catholic University of Korea, Seoul, Korea

Hyun Ju Jung, Jong Bun Kim, Kyong Shil Im, Duk Ja Kim, and Jae Myeong Lee

An aneurysm of the innominate artery could compress the tracheal lumen, and this requires special care. Intubation without intensive monitoring and antihypertensive agents could aggravate the hypercapnia and completely rupture the aneurysm. There are few reports on the airway management of tracheal compression that’s caused by an innominate artery aneurysm. We report here on a patient who had a severe hypercapnia after endotracheal intubation above the stenotic area of the tracheal compression, which was caused by an artery aneurysm. Permissive hypercapnia was inadvertently enforced without our knowledge, but the patient recovered without any neurologic problems.

(Korean J Anesthesiol 2009; 57: 762 ∼ 764)

Key Words: Hypercapnia, Innominate artery aneurysm, Tracheal compression.

An aneurysm of the innominate artery could compress the tracheal lumen and airway management needs special care. Endotracheal intubation may not resolve the dyspnea and rather be dangerous. So intensive monitoring for the rupture of aneurysm and advanced knowledge about the airway management are required. There are few reports about the airway compression caused by an artery aneurysm. We report a patient who had a severe hypercapnia after endotracheal intubation in tracheal compression caused by an artery aneurysm, but recovered without neurologic sequelae.

CASE REPORT

A 50-year-old man, 170 cm tall and weighing 69 kg, presented with severe dyspnea. He had been treated unsuccessfully for asthma for 3 months at another hospital. A computed tomographic (CT) scan of the chest showed a 50 mm aneurysm of the innominate artery with a large thrombus from rupture of the medial wall of the proximal innominate artery, causing compression of the trachea (Fig. 1). The left common carotid artery branched from the innominate artery (Fig. 2).

The patient was a chronic alcoholic and heavy smoker. He had a history of a motor vehicle accident 9 years ago and a screw was inserted into the right clavicle for a fracture 18 months ago. He had a successful nasal bone reduction after a fracture under general anesthesia 1 year ago.

In the emergency room, the patient presented with a blood pressure of 122/77 mmHg, heart rate of 108 beats/min, respiratory rate of 26 breaths/min, oxygen saturation of 96%, and arterial blood gas analysis showed a pH 7.472, PaCO₂ 35.7

Fig. 1. Computed tomography depicts the compression of the distal trachea (arrow) by the aneurysm of the innominate artery (T2 level).
mmHg, and PaO\textsubscript{2} 92.8 mmHg in oxygen 3 L/min with the nasal cannula. While waiting for the emergency operation, the respiratory rate increased up to the 30 breaths/min, and dyspnea and chest pain increased as well. Although breathing with an oxygen mask, dyspnea aggravated. By the surgeon, 5 mg midazolam was injected and the patient was intubated with a 7.5 mm tracheal tube above the stenotic area and spontaneous breathing permitted (Fig. 3). Fifteen minutes after intubation, a blood gas analysis showed a pH 7.066, PaCO\textsubscript{2} 90.2 mmHg, and PaO\textsubscript{2} 187.4 mmHg in the FiO\textsubscript{2} of 0.6. After a few minutes, a subsequent blood gas analysis showed a pH 6.692, PaO\textsubscript{2} 343 mmHg, and PaCO\textsubscript{2} -- (not checked). Upper limit of a PaCO\textsubscript{2} is 150 mmHg in our blood gas analyzer.

The patient was transferred to the operating room assisted with self-inflating resuscitation bag (Ambu) and showed drowsy mental state. Initial vital signs showed a blood pressure of 120/80 mmHg and a heart rate of 120 beats/min. After anesthetic induction with 3 mg midazolam, 100 \textmu g fentanyl, and 30 mg rocuronium, it was maintained with target controlled infusion of propofol and remifentanil. Intraoperative monitoring included invasive arterial (right and left radial) pressure, jugular central venous (right internal) pressure, pulse oximetry, 5-lead electrocardiogram, temperature (nasopharyngeal and rectal) and end-tidal carbon dioxide. Pressure controlled ventilation with the airway pressure of 30 cmH\textsubscript{2}O and a respiratory rate 30 breaths/min in the FiO\textsubscript{2} 1.0 showed a tidal volume of 150 ml and considering the lung injury by the barotraumas, the airway pressure was maintained below the 30 cmH\textsubscript{2}O. After thirty minutes, the end-tidal CO\textsubscript{2} was 84 mmHg and arterial blood gas was checked with a pH 6.842, PaCO\textsubscript{2} 170.1 mmHg, and PaO\textsubscript{2} 480.1 mmHg. Cardiopulmonary bypass of the femoral artery and vein decreased the blood CO\textsubscript{2}. A right axillary artery was cannulated and the patient was cooled to 18°C for total circulatory arrest. Innominate artery was incised and the beginning of it from the aorta was clamped. A graft was inserted in the right common carotid artery (RCCA) and antegrade cerebral perfusion was initiated. The graft from the innominate artery to the RCCA and subclavian artery was interposed. The total circulatory arrest time was 10 minutes and the antegrade cerebral perfusion time was 65 minutes. During the antegrade cerebral perfusion, transcranial Doppler was performed and the blood flow was well preserved.

After surgery, a tidal volume of 450 ml and a respiratory rate 16 breaths/min in the FiO\textsubscript{2} 1.0 showed a pH 7.214, PaCO\textsubscript{2} 32.2 mmHg, and PaO\textsubscript{2} 204.1 mmHg. The trachea was expanded in a 3-dimensional chest CT. The dyspnea symptom was improved and postoperative neurological problems or abnormalities in the brain magnetic resonance imaging were not identified.

**DISCUSSION**

Airway management of a patient with tracheal compression caused by a major artery aneurysm is challenging to the anesthesiologist. Fearing muscle fatigue and severe dyspnea, the surgeon intubated the patient with a sedative drug without intensive monitoring, but this is very dangerous. This procedure...