

Management of Emergency Surgery on a Home Oxygen Therapy Patient Presenting with Hemorrhagic Shock : A Case Report

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Introduction

As patients on a home oxygen therapy are increasing in number, there are many chances for perioperative management of those patients who often develop pulmonary and cardiac problems. Now, we report an anesthetic and post-operative management of a home oxygen therapy (HOT) patient who presented with severe pulmonary dysfunction and hemorrhagic shock due to the rupture of an iliac arterial aneurysm.

Key word : home oxygen therapy, severe pulmonary dysfunction, hemorrhagic shock, intensive care

Case report

The patient was a 79-year-old female, (height; 155cm, weight; 40kg.) who showed dyspnea since 1995. Respiratory function tests revealed, FEV_{1.0} 550 ml (47%) and vital capacity 1,160 ml (52%). Her arterial blood gas data showed pH 7.381, PaCO₂ 55 mmHg, PaO₂ 48 mmHg, and base excess (BE) +1.5 mEq · l⁻¹. She was followed up as an outpatient. Her condition began to deteriorate in 1997 and a HOT was started. The oxygen flow was needed 1 l · min⁻¹ at rest and 3 l · min⁻¹ during exercise. The patient had

hypothyroidism since 1995 for which thyroxine 75 μg · day⁻¹ was orally administered. Chest x-ray revealed typical emphysema accentuated radiolucency of the lung field, drop heart, and low and flattened diaphragm. On June 30 th, 2000, she developed tremor and subsequently lost consciousness. She regained consciousness and was admitted to the hospital because of abdominal pain. Rupture of an aneurysm of the left iliac artery was diagnosed by abdominal echo and CT examinations. In the hospital, the patient became shock with blood pressure of 50/30 mmHg. Her trachea was intubated and she was underwent emergency surgery.

Anesthetic management

In the operating room, her state became worse: systolic blood pressure was 30 mmHg and pulse rate was 180 beats · min⁻¹. Blood pressure was restored to 65/45 mmHg by rapid infusion of acetate Ringer's solution, continuous infusion of dopamine 5 μg · kg⁻¹ · min⁻¹ and a single bolus injection of epinephrine 0.5 mg. Surgery was started after fentanyl 0.3 mg IV and thereafter, propofol 4mg · kg⁻¹ · hr⁻¹ was continuously administered. Blood pressure was stabilized 140/60 mmHg by rapid infusion of 5% albumin and dopamine 3 μg · kg⁻¹ · min⁻¹, and surgery was completed without any major complications.

Mechanical ventilation was conducted using Fio₂ 0.5, respiratory rate 14 · min⁻¹, TV 400 ml, PEEP 3 cmH₂O, and the peak inspiratory pressure was kept

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under 20 cmH₂O. The arterial blood gas analysis during surgery showed pH 7.305, PaCO₂ 55 mmHg, PaO₂ 220 mmHg, and BE +1.7 mEq·ℓ⁻¹. A Y-shaped artificial vessel replacement of the abdominal aorta was performed during 245 minutes. The anesthesia time was 280 minutes. Blood loss during surgery was 1,400 ml. The transfused volume including autotransfusion, was 5,760 ml. The infused fluid volume was 3,700 ml, and the urinary output during surgery was 250 ml. After surgery the patient was transferred to the intensive care unit (ICU) and mechanical ventilation was continued.

Management in ICU

Mechanical ventilation was conducted with FiO₂ 0.5, SIMV 10·min⁻¹, TV 450 ml, PEEP 5 cmH₂O, and pressure support 5 cmH₂O, and the peak inspiratory pressure was maintained below 20 cmH₂O. Arterial blood gas analysis showed pH 7.302, PaCO₂ 51 mmHg, PaO₂ 246 mmHg, and BE -1.7 mEq·ℓ⁻¹.

For the decreased urinary output during surgery, dopamine 2.5 μg·min⁻¹·kg⁻¹ and human atrial natriuretic peptide (hANP) 0.05 μg·min⁻¹·kg⁻¹ were continuously infused in the ICU. These resulted in urinary output of 100-300 ml·hr⁻¹ without renal failure.

The patient recovered well from anesthesia, and was weaned from the ventilator on the second postoperative day. The SpO₂ was controlled at 90~93%, which was critical for the respiratory management of this patient. Arterial blood gas analysis under one liter of oxygen via a nasal cannula on the second postoperative day revealed pH 7.440, PaO₂ 70 mmHg, PaCO₂ 45 mmHg, and BE +8.6 mEq·ℓ⁻¹. At this time, 1200 kcal·day⁻¹ of intravenous hyperalimentation was initiated. Sputum elimination was good and pulmonary oxygenation was also uncomplicated. The patient was transferred to the ward on the third postoperative day.

Discussion

Problems associated with mechanical ventilation on HOT patients include mechanical ventilation dependence, barotrauma, and the prevention of CO₂ narcosis¹⁾. Rapid reduction of PaCO₂ by hyperventilation may cause hypocalcemia due to alkalosis and, in

addition, may lead to arrhythmias or hypotension on HOT patients^{2,3)}. There is also a risk of impaired consciousness or convulsion due to reduced oxygen supply to the brain and cerebral hypoxia due to the left shift of hemoglobin on the oxygen dissociation curve and cerebral vasoconstriction. It is important to keep higher levels of PaCO₂ at 50~60 mmHg according to the recommended management of permissive hypercapnia patients^{4~6)}.

The COPD patients often have underlying cardiac failure or malnutrition due to pulmonary hypertension or increased pulmonary vascular resistance⁷⁾. They cause respiratory muscular strength reduction and respiratory muscular fatigue in turn, which makes it difficult to wean the patient from the mechanical ventilation. Accordingly, intravenous hyperalimentation was performed to improve malnutrition to provide sufficient energy for exercise loading of weaning^{8,9)}. The administration of a diuretic or inotropic drug is sometimes needed to treat cardiac failure, hANP and dopamine are preferred drugs which have both diuretic and inotropic actions. In abdominal surgery, breathing movement disorders due to postoperative pain can become problem. In the case of our patient, there was an overlapping risk of shock which may require immediate surgery. However, the patient could be weaned from mechanical ventilation satisfactorily. In addition, during emergency surgery while the patient was in shock, her hemodynamics could be stabilized by a combination of suitable infusion and transfusion and inotropic drugs. The postoperative condition was good in the ICU.

We conclude that the anesthesia and post-operative managements for to a patient on HOT who developed hypovolemic shock and severe pulmonary dysfunction were adequate, and which resulted in an early weaning from the ventilator and discharge from the ICU.

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