Inhalation of Nitric Oxide Reduced Pulmonary Hypertension after Cardiac Surgery in a 3.2-kg Infant

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PULMONARY vasospasm with severe pulmonary hypertension is a frequent complication after surgery for congenital heart disease. The condition is difficult to manage therapeutically, and a substantial part of postoperative morbidity and mortality is related to these pulmonary hypertensive crises.1 Efforts to dilate the pulmonary vasculature often result in systemic dilation and hypotension because no vasodilator used currently provides selective pulmonary vasodilation.

The gas nitric oxide (NO) has been identified as endothelium-derived relaxing factor.2 Recently, the addition of low doses (5–80 ppm) of NO to inspired gas has been shown to provide selective pulmonary vasodilatation in awake sheep.3,4 In addition, selective pulmonary vasodilation with inhaled NO was demonstrated in healthy volunteers provoked to pulmonary hypertension by inhalation of a hypoxic gas mixture5 and in patients with established pulmonary hypertension.6–8 Recently, two reports confirmed the encouraging results of NO inhalation in neonates with persistent pulmonary hypertension of the newborn.9,10 The rationale for inhalation of NO in patients is to supply the vasodilator directly to the lung via inspired gas; rapid inactivation of NO by binding to hemoglobin in the blood will protect the systemic vascular bed from vasodilation and unwanted systemic hypotension.5 We report a case of sustained reduction of pulmonary hypertension with inhaled NO after cardiac surgery in a 3.2-kg infant.

Case Report

The patient, a female infant, was born during gestational week 31 with a birth weight of 1.574 kg. Respiratory insufficiency developed soon after birth; chest radiography and ultrasound examinations showed esophageal atresia, annular pancreas, and a ventricular septal defect. After surgical correction of the gastroesophageal malformations, the patient was separated from the ventilator but could not maintain ventilation without an endotracheal tube as a result of severe tracheomalacia. An increasing left-to-right shunt with heart failure that did not respond to pharmacologic treatment necessitated surgical closure of the ventricular septal defect with a patch when the patient was 3 months of age and weighed 3.2 kg. During the operation, a cut epidural catheter (Portex, Kent, England) was passed through a 16-gauge needle through the right ventricular myocardium via the pulmonary artery valve into the main pulmonary artery. This allowed monitoring of pulmonary artery pressure (PAP) but no measurement of pulmonary capillary wedge pressure. A second catheter was placed in the femoral artery for blood sampling and measurement of systemic arterial pressure (SAP). A double-lumen central venous catheter (Hydronav 18 gauge, Viggo-Spectramed, Swindon, UK) was placed via the right internal jugular vein for infusions and measurement of central venous pressure. Vascular pressures were monitored continuously with an invasive pressure module M1006A of a Hewlett Packard M1166A component monitoring system (Böblingen, Germany); the midthoracic level was taken as the zero reference. Samples (0.3 ml) of blood were withdrawn into heparinized syringes and immediately analyzed on an ABL 520 blood gas analyzer (Radiometer, Copenhagen, Denmark). We measured arterial methemoglobin level, pH, arteri al (Pao2) and mixed venous (PvO2) oxygen tension and arterial carbon dioxide tension (Paco2) with the ABL 520, which could also measure
References


Neurologic Deterioration Associated with Airway Management in a Cervical Spine-injured Patient

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CERVICAL spinal injuries pose problems in airway management. Chin lift, jaw thrust, and direct laryngoscopy cause movement in the cervical spine, and other methods of tracheal intubation also could disturb the spine to some degree.1–3 Several authors recommend avoiding direct laryngoscopy in cases of known or suspected cervical spinal injury because they believe that the spinal movement associated with airway management could cause secondary neurologic injury.3–5 However, there have been no reports of new neurologic deficits resulting from airway maneuvers in a cervical spine-injured patient. We describe the case of a man with an unrecognized cervical spinal injury who became quadriplegic after bag-mask ventilation, direct laryngoscopy, and cricothyroidotomy. In addition, we discuss the detection of cervical spinal injuries and the potential effects of these injuries on the airway. Finally, we review the current literature on the risks of sec-

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