Anesthesia For Whole-lung Lavage In Pulmonary Alveolar Proteinosis

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Citation

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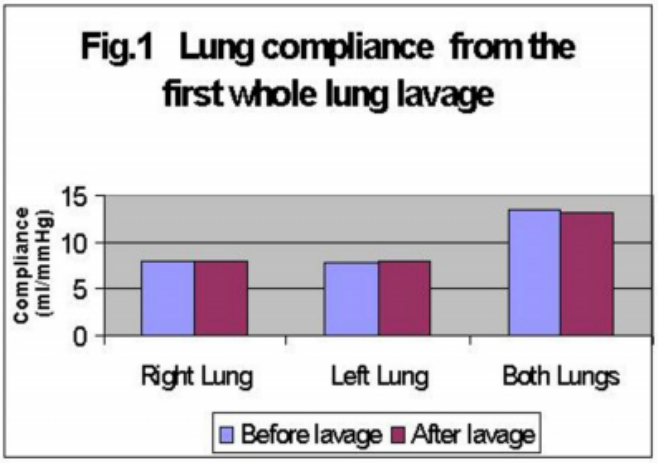
Abstract

Whole-lung lavage is the only effective treatment for pulmonary alveolar proteinosis (PAP). We present a case with PAP who underwent whole-lung lavage under general anesthesia, and a discussion.

CASEREPORT

A 33-year-old man presented with progressive exertional dyspnea and extensive bilateral acinar pulmonary infiltrates. He was afibrile, with an occasional cough. Pulmonary function tests showed a restrictive pattern with impaired gas exchange. Oxygen saturation was 90-92% on room air. His past medical history was noncontributory, and he was a nonsmoker. Bronchial alveolar lavage suggested PAP, which was later confirmed by lung biopsies. To improve symptoms, whole-lung lavage was recommended. Following preoxygenation, anesthesia was induced, and a double-lumen endotracheal tube (ETT) placed. The tube placement was confirmed by auscultation and fiberoptic bronchoscopy. The baseline compliance of each lung was measured (Fig 1). The left lung was then clamped for 5 min to allow oxygen absorption. Then, normal saline (NS) heated to body temperature was infused from a reservoir suspended 50 cm above the carina. The tidal washing volume was 800-1200 ml for each cycle. Vigorous chest percussion was performed during all cycles of instillation and recovery. Sixteen liters of NS was infused and about 500 ml retained. Finally, a Valsava Maneuver was performed for 20 min, and bronchial suction repeated aggressively. Lung compliance was again measured and returned to the baseline (Fig 1). At the end of procedure, the patient was awake, breathing spontaneously, maintaining normal end tidal CO2 and pulse oxygen saturation was 100% with face mask. The patient's trachea was extubated, and the patient was sent to the PACU. The procedure was repeated for the right lung four days later.

Figure 1



DISCUSSION

Pulmonary alveolar proteinosis (PAP) is a rare disease of unknown etiology presenting with dyspnea and acinar pulmonary infiltrates due to lipoprotein-filled airspaces. The severity and natural history of PAP is variable. Bronchoalveolar lavage (BAL) typically reveals an opaque and milky fluid. Whole-lung lavage is the only established treatment ([1]). Although there are no randomized controlled studies, there is good evidence of efficacy with several studies showing improvement in exercise tolerance and symptoms following whole lung lavage. Also, studies have shown objective improvements in pulmonary function, arterial oxygenation, and shunt fraction ([2], [3], [4]). The indications for treatment are dyspnea and/or hypoxia. In one study ([5]), whole-lung lavage was deemed necessary in 54% cases, required only once in 46% of cases and from two to four times in the remainder of patients.

History and physical examination should focus on pulmonary function, specifically ruling out current lung infection. Anesthetic management of whole-lung lavage is similar to other cases utilizing double-lumen endotracheal tubes. The major adverse effect from whole lung lavage is hypoxemia, which can be improved by ventilation with a high inspired oxygen concentration. Because patients with PAP usually have poor gas exchange and hypoxia, preoxygenation takes longer. Arterial oxygenation improves during the filling phase due to the increase in airway pressure and shunting of blood to the contralateral ventilated lung. Emptying of the lung causes a decrease in airway pressure, and perfusion of the surfactant-filled alveoli creates a shunt in the lung and hence a fall in PaO2 (1). Lung compliance should be measured before and after the lavage to confirm the lung compliance in the lavaged lung recovers and returns to baseline. Hemodynamic changes occur with single-lung ventilation, but invasive monitoring is unnecessary in most cases. Because one lung is ventilated while the other is washed, the double-lumen ETT placement is critical. Ventilation , oxygenation and body temperature must be maintained. Input and output of the lavage fluid, and cautious IV fluid management is essential. Tracheal extubation can be done if the patient is awake, residual neuromuscular block reversed and with acceptable ventilation and oxygenation.

References

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