Unusual Freshwater Near-Drowning Syndrome in a Hospitalized Postlobectomy Patient*

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Near-drowning syndrome depends on the duration of submersion, the amount of fluid aspirated, and the severity of hypoxia. We report a case in which a patient developed ARDS shortly after undergoing a left upper lobectomy and a chest wall resection for a lung carcinoma. On further investigation, the ARDS was caused by near-drowning in a basin of freshwater: the patient’s face was submerged by the patient’s companion as part of a cultural tradition of trying to clean his lung. We believe that this case presents the etiology of freshwater near-drowning syndrome due to an ethnogenic practice not previously reported.

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N ear-drowning syndrome depends on the duration of submersion, the amount of fluid aspirated, and the severity of hypoxia. We report a case in which ARDS secondary to freshwater near-drowning syndrome developed in a patient shortly after undergoing a left upper lobectomy and a chest wall resection for a lung carcinoma.

CASE REPORT

A 67-year-old Korean man was admitted to our hospital for resection of a left upper lung carcinoma. His medical history was remarkable for interstitial pulmonary fibrosis, cardiomyopathy, and atrial fibrillation. The preoperative workup showed a left ventricular ejection fraction of 68%. Preoperative pulmonary function testing revealed mild restrictive lung disease, and a ventilation-perfusion scan showed about 50% function in the right and the left lung. The patient underwent a left upper lobectomy and a chest wall resection. He was extubated immediately after the resection and transferred to the regular floor the day after the surgery.

The patient showed no signs of distress until the second postoperative day, when he developed acute respiratory failure requiring intubation and mechanical ventilation. At that time, the patient was febrile to 39.2°C, with a heart rate of 132 beats/min. The chest radiograph showed left-side postsurgical changes with new diffuse bilateral infiltrates (Fig 1). The WBC count was elevated to 18.2 × 10^9/L, with an absolute neutrophil count of 14.4 × 10^9/L. The serum electrolytes and renal function findings were normal. The arterial blood gas measures were as follows: pH, 7.51; PaO_2, 38 mm Hg; PaCO_2, 41 mm Hg; and oxygen saturation on 70% oxygen, 81%. The alveolar-arterial oxygen pressure gradient was 50 mm Hg. There was no evidence of hemolologic abnormalities. The patient was intubated, administered mechanical ventilation, and transferred to the ICU.

The initial differential diagnosis included nosocomial pneumonia, pulmonary embolism, exacerbation of the underlying lung disease, congestive heart failure, pulmonary hemorrhage, and postpneumonectomy pulmonary edema. The diagnostic workup included cultures, bronchoscopy, bilateral lower extremities ultrasound, and a computed axial tomography scan of the chest. This workup showed no evidence of infection, pulmonary embolus, pulmonary hemorrhage or postpneumonectomy pulmonary edema. The bronchoscopy showed copious clear secretions without mucus plugs or evidence of purulence. The echocardiogram at that time showed bilateral atrial enlargement with no significant gradient across the mitral valve, thus ruling out pulmonary edema secondary to postoperative fluid shift, uncompensated cardiomyopathy, and atrial fibrillation. The patient was treated with imipenem and gentamicin, corticosteroids, and active diuresis.

The next day, the patient markedly improved. His inspired oxygen requirement was 40%, and his ventilator mode was changed from controlled mechanical ventilation to synchronized intermittent mandatory ventilation. Four days following intubation, the patient tolerated continuous positive airway pressure and was successfully extubated. The chest radiograph showed minimal abnormalities (Fig 2).

The day after extubation, the nurse noticed that the patient’s companion was attempting to submerge the patient’s face into a basin filled with water. On questioning, the patient indicated that he was aspirating water to clean sinuses and lungs and explained that this was a daily routine for cleaning airways in his family. He also recalled that on postoperative day 1, while performing this ritual, he had a severe coughing and choking spell while his face was submerged in tap water. The patient spontaneously took a couple of breaths while his face was underwater. The patient’s companion confirmed this. This “technique” was witnessed by the housestaff but reported only under direct questioning. An empathic nonscientific poll of Korean and Korean-American doctors and nurses revealed that all of them knew someone who had practiced this method of clearing sinuses and lungs, although it failed to identify any person who actually practices this technique. We believe our patient had a freshwater near-drowning syndrome as a cause of the postsurgical complication.

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DISCUSSION

The course of victims of near-drowning syndrome depends on the duration of submersion, the amount of fluid aspirated, and the severity of hypoxia. It is hard to estimate how much aspirated fluid is required to cause near-drowning, but Modell et al. reported that in dogs, aspiration of as little as 2.2 mL/kg of body weight produces a decrease in PaO₂ to approximately 60 mm Hg within 3 min. Pearn showed that aspiration of 2.5 mL/kg increases the intrapulmonary shunt from 10% to as much as 75%. The hypotonic nature of freshwater affects surface tension properties of pulmonary surfactant and makes the alveoli unstable. Complete or partial alveolar collapse causes loss of ventilation in the face of preserved perfusion, resulting in intrapulmonary shunting and hypoxemia. Also, the presence of water in the alveoli damages type II pneumocytes and prevents the production of new surfactant. The combination of these insults may damage the alveolar capillaries and interstitium and lead to ARDS. ARDS develops within 48 h in approximately 40% of near-drowning victims. Recovery from this syndrome occurs in approximately 50% of cases as happened with our patient. The only effective treatment is reversal of hypoxemia with mechanical ventilatory support. Use of antibiotics and steroids could be detrimental, and use of surfactant should be considered experimental.

CONCLUSION

Looking back at our case, an unusual conclusion emerges. Cultural diversity is a reality, and no matter how unusual some of the beliefs, rituals, and sociologic patterns may be to an outsider, the physician cannot ignore the patient’s background. A complete history and physical examination should now include questions regarding culturally specific practices.

REFERENCES


FIGURE 1. Chest radiograph reveals postsurgical changes with new diffuse infiltrates.

FIGURE 2. Minimal abnormalities shown on chest radiograph 4 days after intubation.