Acute Respiratory Failure in Multiple Sclerosis*

Ichiro Kuwahira, M.D.; Tetsu Kondo, M.D.; Yasuyu Ohta, M.D., F.C.C.P. and Hajime Yamabayashi, M.D.

A 23-year-old woman developed acute respiratory failure in the course of multiple sclerosis. The lack of bulbar dysfunction, the presence of quadriplegia, and the bilateral diaphragmatic weakness indicated the presence of spinal cord lesions involving pyramidal tracts bilaterally. Magnetic resonance imaging revealed a cervical demyelinating lesion between C1 and C3. (Chest 1990; 97:246-48)

Respiratory failure is a condition rarely associated with multiple sclerosis (MS). However, in some instances, it may lead rapidly to death. In the literature, the lesions relevant to respiratory failure were only estimated by clinical features or proved by the autopsy findings. We present a case in which the lesion leading to respiratory failure was identified by magnetic resonance imaging (MRI).

CASE REPORT

A 23-year-old woman was admitted to the hospital on Nov 20, 1986. Six months earlier, she had suddenly developed visual disturbance. She rapidly improved and was asymptomatic after two months. In September 1986, she experienced visual disturbance again, followed by painful tonic seizure and quadriplegia. Her symptoms progressed, and she developed a respiratory arrest.

On admission, the neurologic examination showed clear consciousness, atrophy of the optic nerves, quadriplegia, and hyperreflexia, with positive bilateral Babinski's sign. There were no bulbar or sensory abnormalities.

A CSF examination result was normal. Serum antimyeline antibody was positive. A chest x-ray film showed elevation of the diaphragms bilaterally and plate-like atelecstasy at the lung bases. The CT findings of the skull and spine were negative. MRI in the T2-weighted spin-echo image demonstrated a lesion with high signal intensity in the cervical

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Acute Respiratory Failure in MS (Kuwahira et al)
muscules of respiration with tidal breathing. Paradoxical excursion of the abdomen and chest wall was also seen. The chest x-ray films taken at deep inspiration and expiration showed that her diaphragms were almost fixed at the 6th intercostal space. The pulmonary function study was done through the tracheostomy tube in the supine position and showed a VC of 0.78 L (25 percent of predicted), an FEV₁ of 0.72 L, and a peak flow rate of 2.11 L/s. Arterial blood gases on room air were: \( P_{o_2} \), 83.1 mm Hg; \( P_{co_2} \), 40.0 mm Hg; and pH, 7.428. We monitored the thoracoabdominal movement with inductive plethysmography and the pressures in esophagus and stomach (Fig 2). They showed that the excursions of her rib cage and abdominal wall were in opposite directions during quiet breathing and maximal inspiration. They also showed that the transdiaphragmatic pressure (Pdi) was less than 5 cm H₂O at maximal inspiration, indicating the weakness of her diaphragm.

Although paradoxical excursion of the abdomen and chest wall was still seen, her weakness improved steadily, and she was discharged six months later.

**Discussion**

Clinical diagnosis of MS in this patient was made by typical exacerbations and remissions of her illness associated with a great variety of her symptoms. The development of respiratory failure, which is rarely associated with MS, suggests the presence of lesions involving either medullary respiratory center or spinal cord. The lack of bulbar dysfunction, the presence of quadriplegia and the bilateral diaphragmatic weakness in our case strongly indicated the presence of demyelinating lesion in the pyramidal tracts bilaterally. This clinical impression was proved by MRI, which revealed a lesion between C1 and C3. In the literature, the presence of the lesions relevant to respiratory failure has been either clinically estimated or proved by the autopsy findings. We emphasize the clinical usefulness of MRI in searching for lesion relevant to the development of respiratory failure in the course of MS.

**Figure 1.** The T2-weighted spin-echo sagittal image of MRI demonstrated the high signal intensity lesion in the cervical spinal cord between C1 and C3 (arrow), which suggested the MS plaque as a responsible lesion.

**Figure 2.** Movements of the rib cage (RIB) and abdominal wall (ABD) monitored with the inductive plethysmography, and changes in pleural pressure (Ppl), gastric pressure (Pg), and transdiaphragmatic pressure (Pdi) recorded with balloon-tipped catheters in the esophagus and stomach.
Right Upper Lobectomy Twenty Years After Left Pneumonectomy

Preoperative Evaluation and Follow-up

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Quantitative perfusion lung scanning coupled with spirometry and balloon occlusion of the pulmonary artery supplying the lung to be resected have been used to predict the potential operability of patients being considered for pneumonectomy. These techniques were adapted for the lobar level prior to performing a right upper lobectomy in a 59-year-old man who had undergone a left pneumonectomy 20 years previously. This case demonstrates how physiologic reserve can be predicted in patients who require sequential pulmonary resection. (Chest 1990; 97:245-50)

Approximately 1 to 4 percent of all patients with lung cancer will demonstrate multiple primary lesions (either synchronously or metachronously). Those whose initial lung carcinoma was cured by resectional surgery have an approximately 5 to 10 percent chance of developing a second or even a third primary tumor. In addition, carcinoma of the lung may occur in patients with a previous lung resection for nonmalignant disease. The decision to proceed with surgical resection in such patients is an extremely difficult one; without surgery, they will succumb to their malignancy, while with surgery they are at high risk of dying from respiratory failure and/or pulmonary hypertension. Several preoperative tests have been suggested to predict the functional integrity of the lung after resection. Among these, quantitative perfusion lung scanning coupled with spirometry has been shown to accurately predict postoperative pulmonary function, and balloon occlusion of the pulmonary artery supplying the lung to be resected has been used successfully to quantitate the expected postoperative pulmonary pressures in patients considered for pneumonectomy. We present a patient with a previous left pneumonectomy in whom these techniques were adapted for the lobar level preoperatively before completing a right upper lobectomy.

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Table 1—Pulmonary Function Testing Results

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<td>Dco (mL/min·mm Hg⁻¹)</td>
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*Intermountain Thoracic Society standards.