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HYPERCAPNIC COMA DUE TO SPONTANEOUS PNEUMOTHORAX: CASE REPORT AND REVIEW OF THE LITERATURE

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□ **Abstract—Background: Hypercapnic coma is a rare differential diagnosis in the unconscious patient. One underlying mechanism may be hypoventilation due to spontaneous pneumothorax. Although hypercapnia is not a typical finding in spontaneous pneumothorax in patients with otherwise healthy lungs, under certain circumstances, hypercapnia may readily develop. Objectives: We report a rare case of profound hypercapnic coma due to spontaneous pneumothorax after contralateral pneumonectomy. In addition, we review other causes of hypercapnic coma and its outcome and discuss the relationship between arterial carbon dioxide partial pressure and level of consciousness. Case Report: An 85-year-old man without evidence of trauma or intoxication presented unconscious to our Emergency Department. The physical examination and X-ray study revealed a left-sided spontaneous pneumothorax. A right-sided pneumonectomy 25 years earlier had promoted the development of profound hypercapnic coma. After insertion of a thoracic drain, the coma rapidly resolved without any neurological deficit. Conclusions: Although severe hypercapnia is usually due to decompensation of chronic lung disease, pneumothorax potentially may cause hypercapnic coma. Review of the literature suggests that there is no close correlation between arterial pCO_2 (partial pressure of CO_2) levels and the degree of impairment of consciousness; however, levels exceeding 80 mm Hg are likely associated with significantly impaired consciousness. Hypercapnic coma usually resolves without neurological deficit as arterial pCO_2 tensions decline.** © 2012 Elsevier Inc.

□ **Keywords—hypercapnia; carbon dioxide; unconscious; coma; pneumothorax; consciousness**

INTRODUCTION

Management of the unconscious patient is one of the most challenging situations in emergency medicine. Possible reasons for impaired consciousness include a variety of conditions such as metabolic, toxicologic, neurologic, traumatologic, or cardiovascular pathology (1). The broad differential diagnosis as well as the inability to obtain anamnestic information from the patient may delay diagnosis and treatment. Nevertheless, rapid treatment is crucial because the underlying condition as well as the unconsciousness itself may be life threatening due to the possible loss of a patent airway and protective upper respiratory tract reflexes.

A rare cause of unconsciousness is hypercapnic coma. Hypercapnic coma has been repeatedly reported as a consequence of respiratory failure due to chronic lung disease (2–6). Although hypercapnia is not a typical finding in spontaneous pneumothorax in patients with otherwise healthy lungs, under certain circumstances, hypercapnia may readily develop. We report a case of a man with severe hypercapnia due to a spontaneous pneumothorax after previous contralateral pneumonectomy, leading to profound hypercapnic coma. We also review

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Table 1. Physical Examination of the Thorax at Admission

	Left Hemithorax	Right Hemithorax
Inspection		
Skin	Normal	Old thoracotomy scar
Chest excursions	Virtually absent	Absent
Chest dimension	Prominent	Normal
Auscultation	Minimal breath sounds	Absent breath sounds
Percussion	Hyper-resonant	Dull

other causes of hypercapnic coma and its outcome and discuss the relationship between arterial carbon dioxide partial pressure and level of consciousness.

CASE REPORT

An 85-year-old man (176 cm, 78 kg) was brought unconscious to our Emergency Department (ED) by the local Emergency Medical Services. On first evaluation by the paramedics before hospital admission, there was no evidence of trauma or intoxication. The patient was cyanotic and unresponsive. He was breathing spontaneously with a respiratory rate of 30 breaths/min and he had a pulse oximetry oxygen saturation of 68% on room air. High flow oxygen (12 l/min) was administered via a non-rebreathing mask and the patient was immediately transported to our ED.

On arrival at the ED, his oxygenation had improved with oxygen administration; pulse oximetry now measured 100%. The patient was still unresponsive, with a Glasgow Coma Scale score of 3. Pupils were equal, round, and reactive to light and accommodation. Other vital signs were as follows: respiratory rate 35 shallow breaths/min, heart rate 130 beats/min, and non-invasive blood pressure 160/80 mm Hg. The 12-lead electrocardiogram showed sinus tachycardia with occasional premature ventricular beats but no signs of acute myocardial ischemia. On physical examination, we observed that thorax excursions were virtually absent and the thorax appeared asymmetric, with a prominent left hemithorax (Table 1). Breath sounds were highly diminished on the left side and completely absent on the right side. Hyper-resonance to percussion was present on the left side and dullness was noted on the right hemithorax. An arterial blood sample and a chest X-ray study were immediately taken. The clinical findings were compatible with a left-sided pneumothorax; the X-ray study showed a large pneumothorax on the left side (Figure 1). The arterial blood sample revealed hypercapnia (pCO_2 [partial pressure of CO_2] 117 mm Hg, see Table 2). We immediately inserted a thoracic drain on the left side. The patient instantly began to breathe normally and a control chest X-ray study showed an appropriate drain positioning and lung tissue expansion (Figure 2). While we were preparing for endotracheal intubation, the patient rapidly improved neurologically so that intubation was postponed. Arterial CO_2 tension declined, as confirmed by subsequent blood gas analyses (Table 2). In parallel, the patient gradually improved neurologically. At the time of the third blood gas analysis, about 1 h after initial pneumothorax drainage, the patient had regained full consciousness (Glasgow Coma Scale score 15). He was transferred to the intensive care unit for further observation, where his condition remained stable with no residual neurological symptoms. The thoracic drain was removed on the third day after admission and the patient was discharged from the hospital in good physical condition 1 day thereafter.

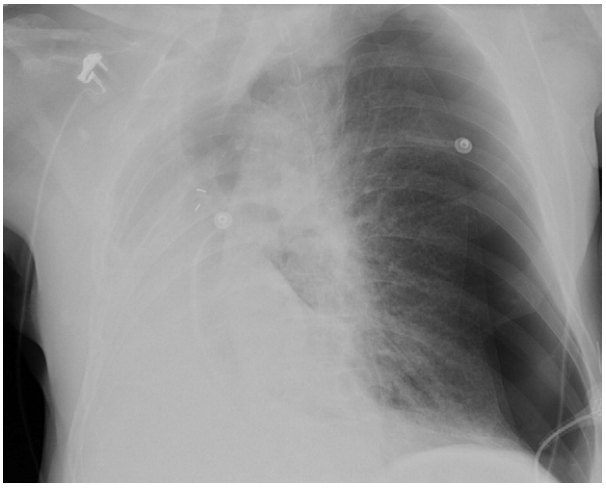

Figure 1. Chest X-ray study (anterior–posterior, patient in supine position) before insertion of the chest tube. The left hemithorax shows a pneumothorax and the right hemithorax a post-pneumonectomy status.

At the time we first clinically evaluated the patient, we were not able to explain the obvious right-sided pathology. We had noted an old thoracotomy scar in the 5th intercostal space on the right side, and the chest X-ray study showed an image compatible with post-pneumonectomy status on that side (Figure 1). The patient's medical history, which became available later, revealed a pneumonectomy on the right side due to a malignant lung tumor 25 years ago. The patient anamnestically had been without any remaining pulmonary disease or respiratory symptoms after surgery and had refrained from smoking since shortly before pneumonectomy. He also had a history of prostate cancer, malignant melanoma, and epilepsy.