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Case report

Myasthenia gravis with acute respiratory failure in the emergency department

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ABSTRACT

Acute respiratory failure (ARF) is defined as a sudden malfunction in the ability of respiratory system to maintain adequate gas exchange. Acute hypercapnic respiratory failure develops as a result of ventilation deficiency and it is defined as an increase of $PaCO_2$ above 45 mmHg. Myasthenia Gravis (MG) is a sporadically developing auto-immune deficiency where the neuro-muscular transmission is affected and it is one of the important reasons for neurologically-induced respiratory distress. Here, we report a case of a 75-year-old male patient previously undiagnosed MG, who presented with ARF. MG is not a common entity that we encounter daily. Patients on occasions may present to the emergency department because of acute exacerbation. Though most of them were known cases, we should be aware of some unrecognized cases and should consider MG as a differential diagnosis for patients with acute respiratory failure.

1. Introduction

ARF, which is defined as a sudden malfunction in the ability of the respiratory system to maintain adequate gas exchange, can be collected under two titles, namely acute hypoxemic respiratory failure characterized by disruption in the primary oxygenation condition (Type 1), and hypercapnic respiratory failure defined as a sudden increase in the carbon dioxide pressure. Type 2 respiratory failure develops as a result of ventilation deficiency, which is defined as $PaCO_2$ increasing above 45 mmHg and accompanying hypercapnia. Normal pH ($\geq$7.35) and bicarbonate level being high in spite of hypercapnia indicate that respiratory failure is chronic in nature. The reason for this is generally outside of the lungs and it could be brain stem respiratory center depression, upper motor neuron, anterior horn cell, neuromuscular intersection, respiratory muscles, respiratory nerve diseases, rib cage deformities or upper respiratory tract obstruction.[1–4] MG is a sporadically developing auto-immune deficiency where neuromuscular transmission is affected and it is one of the important reasons for neurologically-induced respiratory distress. In approximately 21% of the cases the age of onset is above 60 and 30% of these develop bulbar or respiratory muscle weakness. Myasthenic Crisis (MC) is observed in approximately 15–20% of MG patients.[5–7] If the initial diagnosis of MG is delayed or prevention of situations in which MC can be observed in patients diagnosed with MG is delayed, these patients may present with acute respiratory failure causing hypercapnia requiring intubation. Here we present a case of previously undiagnosed MG patient who presented with acute respiratory failure.

2. Case report

A 75-year-old male patient, whose general condition had quickly deteriorated despite oral medical treatment, had first presented to a center with complaints of high fever, cough and sore throat and was diagnosed with upper respiratory tract infection. He was later brought to the emergency department with dyspnea and mental fog. On physical examination, the general condition of the patient was found to be moderate-poor, his blood pressure was 140/100 mm Hg, his pulse was 109/min and his temperature was measured as 38.4 C°, and his mental situation was drowsiness. PA chest x-ray and Thorax CT of the patient performed for the definitive diagnosis revealed normal findings. Arterial blood gas (ABG) analysis demonstrated PaO_2: 30 mmHg; $PaCO_2$: 60 mmHg and pH: 7.27 with a FiO_2 of 40%. Rapid-sequence intubation was started with an 8-mm endotracheal tube in the emergency department. He was transferred to the respiratory intensive care unit (ICU) for

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mechanical ventilation. Mechanical ventilation was started on assist control (AC) mode of 16 breaths/minute with a tidal volume of 600 mL (predicted body weight 60 kg), with a 100% FiO_2, trigger; 0.2 lit/min and a PEEP of 5 mmHg. The patient, responded to the administered antibiotic treatment begun due to high levels of fever, leukocytosis of 23000/μL (4000–10000) and CRP: 50 mg/L (0–5 mg/L) detected during his follow-up. On the first day of ICU his blood gases improved, so the ventilator mode was changed to synchronized intermittent mandatory ventilation (SIMV) and pressure support (PS) (SIMV + PS) in following initial setting; tidal volume 550 mL, respiratory rate: 10/min, FiO_2: 0.4–0.6. PEEP: 5 mmHg, PS: 15 mmHg and trigger: 2 lit/min. Later on, PS and respiratory rate were gradually decreased for the next two days and finally ventilator mode was changed to pressure support ventilation (PSV) with a 8 mmHg PS. On the third day of ICU his blood gases had reached normal limits, hence he was first disconnected from the mechanical ventilator and then extubated with a simple weaning and put on non-invasive ventilation (NIV). A progressive increase was observed in the $PaCO_2$ values on the follow-up of ABG and hence the patient was placed on mechanical ventilator support after having been intubated again. The patient was evaluated and a neurology consultation required to research the possible neurological reasons that may cause hypoventilation, because the anamnesis, physical examination and the laboratory findings were not compatible with Obstructive Pulmonary Disease (COPD). The conscious patient was intubated and connected to the mechanical ventilator, and there was no spontaneous respiratory activity and the mechanical ventilator was producing controlled inspiration. Neurological examination findings were normal except for bilateral hemiptosis, and minimal restriction in the eye movements in all four directions. It was learnt from the anamnesis obtained that the patient had complaints of weakness, inability, easy exhaustibility, occasional diplopia and chewing difficulty, and had presented to hospitals many times but given symptomatic treatments. He had also been diagnosed with COPD after presenting with complaints of dyspnea and its treatment discontinued 5 months ago after being told he didn't have COPD. For the diagnosis of MG, 0.5 mg Neostigmine Methylsulphate was administered intramuscularly to the patient, who was suspected to have MG from the anamnesis and examination findings. Spontaneous respiratory activity was observed after 15 min and the mechanical ventilator begun performing assisted inspiration. Although the arranged pressure support of the ventilator was the same, the tidal volumes of the patient increased from approximately 200 mL/m to 330 mL/m. After about 45 min, spontaneous respiratory activity stopped and the mechanical ventilator begun performing controlled inspiration again. Motor and sensory nerve conductions and muscle responses obtained with repetitive excitations were determined to be normal on the electromyoneurography performed at the bedside. The level of acetylcholine receptor antibody (AChR Ab) level obtained from the patient was determined as 205 nmol/L (>0.40 positive). With the diagnosis of MG, pyridostigmine bromide 180 mg/day and 0.4 mg/kg/day intravenous immunoglobulin (IVIG) were administered to the patient for 5 days. Serial blood gas analysis control was performed for the patient and the weaning process was performed successfully. At the end of the 5th day treatment with pyridostigmine bromide 180 mg/day and azathioprine 100 mg/day was arranged for the patient whose complaints had disappeared almost completely and discharged for outpatient follow-up.

3. Discussion

MG is an autoimmune disease of the neuromuscular junction, which results from presence of postsynaptic acetylcholine receptor antibody (IgG). It is characterized by skeletal muscle weakness and easy fatigability and has a chronic course with remission and exacerbation. The skeletal muscle weakness including a single group of muscle may be asymmetric or generalized. It typically decreases with relaxation and increases with effort. MC is one of the important and common complications in the natural history of myasthenia gravis. MC may be defined as respiratory failure or delayed postoperative extubation for more than 24 h resulting from myasthenic weakness. MC results from weakness of the upper airway muscles leading to obstruction and aspiration, weakness of respiratory muscles leading to reduced tidal volumes or from weakness of both muscle groups. MC is observed frequently within the first two years following the onset of the disease. One fifth of the patients may experience MC episodes during the first years following onset.[8] MC may be seen in 12–16% of the patients in their life time. It has been reported commonly in patients with generalized MG. The occurrence of respiratory insufficiency without generalized weakness in patients is rare.[9] The common precipitating factors for MC include respiratory infections, aspiration, sepsis, surgical procedures, rapid tapering of immune modulation agents, starting corticosteroids treatment, exposure to drugs [antibiotics (aminoglycosides, erythromycin and azithromycin), cardiac drugs (beta-blockers, procainamide, and quinidine), and magnesium] that may increase myasthenic weakness and pregnancy. Furthermore, MC can occur spontaneously as part of the natural history of MG itself.

In the present case, there was no evidence of a hypoxemic respiratory failure including definite infiltrations, edema, effusion or pneumothorax on chest X-ray. In addition, we did not observe any finding of pulmonary thromboembolism on the thoracic CT scan and intra-cardiac shunting or congestive heart failure on the echocardiography. We excluded the drugs and trauma that could cause respiratory failure. The electrolyte levels were normal. Considering a neuromuscular disorder clinically particular MG, unless there are other neurological symptoms such as ocular or bulbar symptoms, its diagnosis is very difficult. MC must be considered in patients who need ventilator support with ARF, and tests required for MG diagnosis must be performed. These patients should be evaluated in terms of edrophonium or pyridostigmine tests, AChR Ab levels, and additional electrophysiological studies. Based on these results, we investigated the possibility of a neuromuscular disease, especially MG. In our case, the spontaneous respiration response and the increase in tidal volume response are contributed to the pyridostigmine injection administered under intensive care conditions. The AChR Ab level was found to be too high. Today, in modern intensive care conditions, the death rate from MC is less than 5%.[10]

This case report raises many interesting points. It highlights the importance of considering neuromuscular disorders in cases of unexplained respiratory failure in an acute setting. MG is not a common entity that we encounter daily. Patients, on occasions, may present to the emergency department because of acute exacerbation. Moreover, infection is a common cause for exacerbation of MG as in our patient. As in our case, cases of delayed MG diagnosis may present with MC. In patients admitted to the emergency department with ARF, respiratory failure may be the first symptoms of MG. MG and MC must be considered especially in patients who are diagnosed with Type 2 respiratory failure, who need ventilator support, whose duration of stay on the ventilator is prolonged despite suitable treatment and/or who cannot be separated from the ventilator. With a detailed anamnesis, by suspecting MG and MC and with suitable medical approach, the definitive diagnosis can be made for the patients and this potentially fatal situation can be treated successfully.

Conflicts of interest

No conflict of interest was declared by the authors.

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