Myasthenia Gravis in a Patient With a First Presentation of Acute Hypercapnic Respiratory Failure

SHOU-WU LEE\(^1\), BOR-JEN LEE\(^1\), YI CHUNG LEE\(^2\), TAI-CHENG HOU\(^3\)

Myasthenia gravis (MG) is a neuromuscular disease characterized by fluctuating weakness in the skeletal muscles, such as the ocular, bulbar, limb and respiratory muscles. Hypercapnic respiratory failure is an uncommon first presentation of MG. A 30 year-old woman was admitted to our hospital due to exacerbated consciousness disturbance, and hypercapnic respiratory failure was found. MG was diagnosed by neurological examination, high anti-AchR antibodies and typical electromyography findings. Chest CT evaluation showed a possible thymoma, and she was treated with oral pyridostigmine, plasmapheresis and surgical thymectomy. The clinical status improved, and she was extubated successfully. We conclude that MG should be considered in the differential diagnosis of unexplained respiratory failure. It is important to recognize this disorder, as it can progress rapidly and has a poor prognosis if not treated promptly.

Key words: hypercapnic respiratory failure, myasthenia gravis, thymoma

Introduction

Myasthenia gravis (MG) is one of the most common neuromuscular diseases, and one of the best understood autoimmune disorders. It is characterized by fluctuating weakness in the skeletal muscles, such as the ocular, bulbar, limb and respiratory muscles. However, hypercapnic respiratory failure is an uncommon first presentation of MG. It is important to recognize MG, as it can progress rapidly and has a poor prognosis if not treated promptly. We report a case of MG in a 30 year-old woman with hypercapnic respiratory failure as the initial finding. She had an excellent outcome due to correct diagnosis and early treatment. We also review cases of MG presenting with hypercapnic respiratory failure in the literature.

Case Report

A 30 year-old woman was admitted to our hospital due to progressive consciousness disturbance. She had been in good health until one week previously, when she presented with progressive sore throat and dysphagia. There was no fever, chills, dyspnea, dysarthria, hemoptysis, neck weakness or muscle weakness. The pattern of dysphagia had no diurnal change, and she had no history of choking. She went to a local clinic twice, where acute tonsillitis was diagnosed. She started to experience dyspnea after dinner the day before hospitalization, and had problems remaining conscious upon arrival at the hospital.

On the initial physical examination, her Glasgow coma score was E2V1M5. Her body tem-
Temperature was 36°C, heart rate 90 beats per minute, blood pressure 158/93mmHg, respiratory rate 18 breaths per minute and oxygen saturation 98 percent. Arterial blood gases revealed hypercapnic respiratory failure (PH 7.2, PCO₂ 85mmHg, PO₂ 157mmHg, HCO₃ 28mmol/L). She was immediately intubated and mechanically ventilated. Her consciousness and hemodynamic measures improved after intubation. Further evaluation revealed normal chest radiography and laboratory data demonstrated a white cell count of 21.5×10⁶/μL (normal, 4 to 11×10⁶/μL), hemoglobin 13.1g/dL (normal, 11.3 to 15.3g/dL), platelet count of 325×10⁴/μL (normal, 120 to 320×10⁴/μL), blood urea nitrogen 14mg/dL (normal, 8 to 20mg/dL), creatinine 0.7mg/dL (normal, 0.6 to 1.2mg/dL), alanine aminotransferase (ALT) 22U/L (normal, 4 to 44U/L), alkaline phosphatase (ALP) 48U/L (normal, 50 to 190U/L), lactate dehydrogenase (LDH) 237U/L (normal, 120 to 240U/L), albumin 4.7g/dL (normal, 3.5 to 5.0g/dL), and C-reactive protein 1.5mg/dL (normal, <0.5mg/dL). Examination of the larynx found enlarged tonsils without upper airway obstruction. Systemic augmentin was added to her antibiotics regimen, but there was no fever during this hospitalization course. Follow-up arterial blood gases reverted to the normal range, but repeated attempts at extubation failed. A detailed neurological examination on the 5th day of hospitalization showed facial diplegia, and weakness of the proximal limb muscles and she could not lift her neck. There was no limited eye movement (EOM), ptosis, diplopia, loss of reflex or impairment of sensation.

Brain computed tomography (CT) and cerebrospinal fluid data showed normal findings, but electromyography studies showed a post-synaptic neuromuscular junction disorder, consistent with MG. Anti-AchR antibodies detected in the serum were high (14.2nmole/l, normal <0.5). The diagnosis of MG was established on the 7th day of hospitalization by these typical examination findings. She was treated with oral prednisolone, and pyridostigmine, and she underwent plasmapheresis a total 6 times during this hospitalization, starting immediately after the diagnosis was confirmed. Chest CT evaluation showed a possible thymoma (Fig. 1), and she underwent a thymectomy on the 14th day of hospitalization due to persistent difficulty in weaning from the ventilator. The histological findings confirmed a diagnosis of thymoma with microinvasion, World Health Organization (WHO) classification type B3 (Fig. 2, 3). Her muscle

![Fig. 1 Chest CT shows a well-defined soft tissue mass in the anterior mediastinum (arrows)](image-url)
Fig. 2  The pathological findings in the thymus show a multi-lobulated tumor composed of predominantly epithelial cells, admixed with lymphocytes, with capsular invasion and extension into the adjacent adipose tissue (arrow).

Fig. 3  Immunohistochemical study of the thymoma reveals positive staining with AE1/AE3 and CD20, and focal positive staining with EMA, which is compatible with WHO classification type B3.
power improved gradually, and she was successfully extubated on the 23\textsuperscript{th} day of hospitalization. No pneumonia or atelectasis was found during the weaning period. After discharge from our hospital on the 28\textsuperscript{th} day of hospitalization, she received clinical follow-up and had complete recovery of muscle power and was free of symptoms on medical therapy with oral pyridostigmine.

**Discussion**

Numerous acute or chronic neuromuscular disorders may induce acute respiratory failure, including Duchenne muscular dystrophy, Guillain-Barre disease, MG, polyneuropathy and myopathy\textsuperscript{(1)}. MG is a remarkable disease among these pathologies.

In fact, MG is not rare, with a prevalence of 50-125 cases per million population\textsuperscript{(2,9)}. Clinical features are fatigue and weakness in the skeletal muscles, with reflexes retained. Weakness increases with repeated muscle use and is attenuated by rest and sleep. Cranial muscles are involved early, presenting with diplopia and ptosis. The hypercapnic respiratory failure with which our patient presented is an uncommon presentation of MG. Calcaterra et al. reported only 4 of 147 patients with MG presented with stridor\textsuperscript{(3)}. Gracey et al. described 22 that developed respiratory failure requiring mechanical ventilation in a total of 288 patients\textsuperscript{(4)}. It has been reported that early detection of respiratory muscle involvement can be difficult because patients have normal breathing patterns and because the diaphragmatic and intercostal muscles are sometimes selectively affected\textsuperscript{(5)}. In patients with acute respiratory failure combined with neurological signs, including ptosis, diplopia, facial diplegia, dysarthria, and weakness in the limbs and neck, the possibility of a first episode of MG should be considered, and a neurological consultation should be done as soon as possible.

Myasthenic crisis, or respiratory failure requiring intubation and mechanical ventilation, may be caused by infection, aspiration, physical and emotional stress, or a change in anticholinergic medication\textsuperscript{(6)}. In our case, the symptoms of myasthenia crisis with respiratory failure could have been precipitated by acute tonsillitis. The diagnostic tests for MG included an anticholinesterase test, repetitive nerve stimulation test, and acetylcholine receptor antibody test. Current treatment options for MG include anticholinesterase agents, surgical thymectomy, immune suppression, plasma exchange or intravenous immunoglobulin. Venuta et al. reported experience in the surgical treatment of MG, in which 71\% of all patients had improved clinical status, 18\% had stable disease without clinical modification, and only 5\% showed deterioration\textsuperscript{(7)}. The clinical status of our patient improved after combined treatment with surgical thymectomy, plasma exchange and anticholinergic medication.

In conclusion, MG is an important consideration in patients with unexplained respiratory failure\textsuperscript{(3)}. A typical history, neurological examination, and electromyography study are helpful for confirming the final diagnosis. In patients with acute respiratory failure and neurological signs, the possibility of a first episode of MG should be kept in mind. Infection is a common cause of exacerbated MG, and anticholinesterase agents, surgical thymectomy, immune suppression, plasma exchange and intravenous immunoglobulin are beneficial for improvement of the clinical status.

**References**

Myasthenia gravis with acute hypercapnic respiratory failure


以急性高二氧化碳呼吸衰竭为最初表现的重症肌无力症病例：一病例报告

李少武1 李博仁1 李宜中2 侯泰成3

重症肌无力症的疾病表现特征为波动性骨骼肌无力，而少见以急性高二氧化碳呼吸衰竭为最初的表
现。一位30岁女士因突发性意识障碍来院就诊，抽血检查发现为急性高二氧化碳呼吸衰竭，经过详细理
学检查，肌电图检查以及高anti-AchR抗体值，证实为新诊断的重症肌无力症患者。胸腔电脑断层同时发
现肺部病变。病患接受即时药物治疗、血浆置换以及胸腺肿切除后，症状迅速恢复并顺利脱离呼吸器。本
病例提醒对于不明原因的急性高二氧化碳呼吸衰竭患者，应该将重症肌无力症列入鉴别诊断中，因为诊
断与治疗的延误将导致此类患者预后不佳。

关键词：急性高二氧化碳呼吸衰竭，重症肌无力症，胸腺瘤