

A COMPREHENSIVE RESPIRATORY PHYSIOTHERAPY IN MYASTHENIA GRAVIS: AN OBSERVATIONAL CASE REPORT

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ABSTRACT

Background: Myasthenia gravis (MG) is a chronic autoimmune neuromuscular junction disorder characterized by fluctuating weakness and fatigability of voluntary muscles. While ocular and bulbar symptoms are common, respiratory muscle involvement, though less frequent as an isolated presentation, can lead to life-threatening hypoventilation and respiratory failure. **Objective:** To document the short-term effects of breathing exercises on respiratory function in a patient with MG presenting with isolated respiratory distress. **Case Description:** A 42-year-old male, diagnosed with Myasthenia Gravis 3 years ago and on cholinesterase inhibitor drug for two years, presented to a Tertiary Care Centre with fever, cough and progressive dyspnea. He was admitted to the Intensive Therapy Unit (ITU) and required supplemental oxygen via nasal prongs and mask. **Outcome Measures:** a structured physiotherapy protocol consisting of pursed-lip breathing and box breathing performed every 4 hours. Respiratory function was monitored daily for 5 days using the Single Breath Count Test (SBCT), respiratory rate and oxygen saturation. Results: SBCT improved from 14 (Day 1) to 23 (Day 5). The patient was weaned off oxygen mask by Day 3, with marked reduction in labored breathing and normalization of breathing pattern. **Conclusion:** This case highlights that targeted breathing exercises are a safe, effective and low-cost adjunct to medical management for respiratory distress in MG. SBCT proved to be a simple, reliable tool for monitoring respiratory muscle endurance in resource-limited settings.

KEYWORDS

Myasthenia Gravis, Breathing Exercises, Single Breath Count Test, Respiratory Physiotherapy

INTRODUCTION

Myasthenia gravis (MG) is a chronic autoimmune disorder mediated by autoantibodies against nicotinic acetylcholine receptors at the postsynaptic neuromuscular junction, resulting in impaired neuromuscular transmission (Kim et al., 2010). Although ocular, bulbar and limb muscles are commonly affected, respiratory muscle weakness is a serious complication that may lead to hypoventilation, ineffective airway clearance, and respiratory failure (Dishnica et al., 2023; Barros Delmondes et al., 2024). Isolated respiratory failure without prominent ocular, bulbar or limb weakness is uncommon and may present a diagnostic challenge (Kim et al., 2010).

Early recognition and serial monitoring of respiratory function are therefore essential in patients with MG. The Single-Breath Counting Test (SBCT) is a simple bedside measure that has demonstrated a moderate association with forced vital capacity (FVC) and may be useful when formal pulmonary function testing is unavailable or difficult to perform (Dishnica et al., 2023; Barros Delmondes et al., 2024). Respiratory physiotherapy may support breathing efficiency and respiratory muscle function in appropriately selected patients with MG. Evidence suggests that structured respiratory training incorporating diaphragmatic and pursed-lip breathing can improve respiratory muscle strength, endurance and breathing pattern (Corrado et al., 2020; Khan et al., 2023; Gilhus, 2021). However, evidence regarding short-term breathing interventions in patients presenting with isolated respiratory distress remains limited. This case report describes the short-term response to a structured respiratory physiotherapy programme in a patient with MG with isolated respiratory distress, monitored using respiratory rate, oxygen saturation, and SBCT.

Case Presentation

A 42-year-old male patient, a known case of myasthenia gravis (MG) diagnosed 3 years ago, presented to a Tertiary Care Centre with a 5-day history of fever, productive cough and progressively worsening dyspnoea. He had been receiving cholinesterase inhibitor drug for the past two years. There was no history of recent thymectomy, bulbar symptoms, dysphagia or exacerbation of limb weakness. On admission to the Intensive Therapy Unit (ITU), the patient was alert and oriented and was afebrile. Neurological examination revealed

intact higher mental functions and sensory function. Respiratory examination revealed marked respiratory distress with use of accessory muscles and an elevated respiratory rate of 28 breaths/min. He required supplemental oxygen at 4 L/min through nasal prongs and a face mask. The patient was referred to Physiotherapy department (PMRD) of the Tertiary Care Centre for respiratory physiotherapy management.

Respiratory muscle strength: Clinical manual assessment indicated respiratory muscle weakness at baseline (Grade 2), with improvement to Grade 4 by Day 5.

Clinical Investigations

Arterial Blood Gas (ABG) Analysis (Day 1): pH - 7.32 (acidosis), PaCO₂ - 54.4 mmHg (hypercapnia), PaO₂ - 94.3 mmHg, SpO₂ - 96% - suggestive of mild respiratory acidosis with alveolar hypoventilation, secondary to respiratory muscle fatigue.

Intervention

The patient received a structured physiotherapy protocol performed every 4 hours over 5 days. The protocol included diaphragmatic breathing, box breathing (4-4-4-4 pattern), pursed-lip breathing and upper extremity range of motion exercises.

Table 1 Respiratory Interventions

Intervention	Dosage	Repetition	Frequency
Deep breathing exercises	Slow diaphragmatic inspiration followed by relaxed expiration; performed within patient's comfortable respiratory capacity	5-10 breaths/ session	Every 4 hours
Box breathing	Inspiration 4 sec → hold 4 sec → expiration 4 sec → hold 4 sec	5 cycles/ session	Every 4 hours
Pursed-lip breathing	Inspiration through nose for ~2 sec followed by slow expiration through pursed lips for ~4 sec	5-10 breaths/ session	Every 4 hours
Upper-extremity ROM exercises	Active/active-assisted ROM of shoulder, elbow, wrist and fingers; pain-free range	5-10 repetitions per joint	Every 4 hours

Outcome Measures

1. To evaluate the clinical response to box breathing exercise in a patient with Myasthenia Gravis.
2. To assess changes in respiratory function using the Single Breath Count Test (SBCT) before and following the intervention.

Results

By Day 3, the patient was successfully weaned off the oxygen mask and maintained SpO₂ on room air. Labored breathing reduced, respiratory rate normalized and breathing pattern became more regular and efficient. By Day 5, SBCT improved by 64.2% from baseline (14 to 23), approaching the normal threshold of ≥ 25 .

Table 2 Pre and Post Intervention SBCT Scores

Day	Pre-intervention SBCT	Post-intervention SBCT	Change in SBCT	Clinical Status
Day 1	13	14	+1	On O ₂ mask 4L/min, marked distress, RR 28/min
Day 2	14	16	+2	Reduced use of accessory muscles, mild distress
Day 3	15	20	+5	Weaned off O ₂ mask, breathing rhythm improved
Day 4	16	20	+4	Maintained saturation on room air, reduced fatigue
Day 5	20	23	+3	Significant improvement, minimal dyspnea on exertion

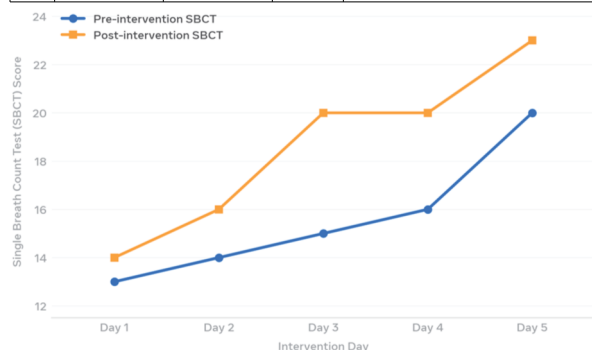


Figure 1 SBCT Scores Over 5 Days (Pre and Post Intervention)

Note: SBCT improved from 14 (Day 1 post) to 23 (Day 5 post), indicating improved respiratory endurance. Normal threshold ≥ 25 .

DISCUSSION

Respiratory muscle involvement in MG can result in ventilatory insufficiency and respiratory failure, although isolated respiratory presentations without prominent ocular, bulbar or limb involvement are uncommon (Dishnica et al., 2023; Kim et al., 2010). The present case was notable for respiratory distress occurring without overt exacerbation of other major muscle groups, highlighting the importance of early respiratory assessment in atypical presentations. Following five days of structured respiratory physiotherapy, the patient demonstrated improvement in SBCT and monitored respiratory parameters. The intervention included diaphragmatic breathing, pursed-lip breathing, box breathing and upper-extremity mobility exercises. Previous evidence suggests that appropriately prescribed respiratory training can improve respiratory muscle strength, endurance and breathing pattern in patients with MG (Corrado et al., 2020; Khan et al., 2023). However, the improvement observed in this case cannot be attributed to any single technique because multiple interventions were provided and there was no control condition.

SBCT provided a practical method for serial bedside monitoring of respiratory performance. Previous systematic reviews have reported a moderate correlation between SBCT and FVC and support its use as an adjunctive assessment tool in MG (Dishnica et al., 2023; Barros Delmondes et al., 2024). The progressive increase in SBCT observed in this patient suggests improved functional respiratory performance during the observation period, although SBCT can be influenced by effort, cooperation and speech-related factors and should not replace formal pulmonary function testing when available. The findings are consistent with the broader rehabilitation studies suggesting that appropriately prescribed respiratory and physical training can benefit

selected patients with MG. Corrado et al. (2020) concluded that rehabilitation interventions may have beneficial effects on functional capacity and quality of life, with more recent evidence indicating that respiratory muscle training may improve respiratory muscle endurance and functional outcomes, although effects on conventional pulmonary function measures are inconsistent (Bi et al., 2025; Fregonezi et al., 2005).

Overall, this case suggests that structured respiratory physiotherapy may be a useful adjunct in MG patients presenting with respiratory compromise. Further controlled studies with larger samples, objective pulmonary function measures, and longer follow-up are required to establish the effectiveness of specific breathing interventions in this population.

CONCLUSION

This case highlights the potential role of structured respiratory physiotherapy in improving functional respiratory performance in a patient with myasthenia gravis presenting with isolated respiratory distress. The observed improvement in Single-Breath Counting Test and respiratory parameters over five days suggests that controlled breathing exercises may be a useful adjunct to medical management. SBCT also provided a simple and practical bedside method for monitoring respiratory function. However, as this was a single-case observation without a control group, the findings should be interpreted cautiously. Further studies with larger samples and objective pulmonary function measures are required to establish the effectiveness of respiratory physiotherapy interventions in patients with myasthenia gravis.

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