Omalizumab In Severe Allergic Asthma with Neurologic-Like Presentation in A Resource-Limited Setting: A Case Report

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***Abstract*—Background. Severe allergic asthma remains a major cause of morbidity despite optimized inhaled therapy. Biologic agents such as omalizumab have demonstrated efficacy in reducing exacerbations and improving asthma control; however, access remains limited in many low- and middle-income countries like to Philippines.**

Case Presentation. We report the case of a 62-year-old Filipino woman with long-standing moderate-to-severe persistent asthma, recurrent exacerbations, frequent systemic corticosteroid bursts, and poor asthma control despite maximal inhaled therapy. Her symptoms were frequently triggered by cigarette smoke exposure, infections, and stress, and were initially accompanied by neurologic-like complaints including body weakness and extremity numbness, leading to referral from neurology. Serial spirometry over more than a decade demonstrated progressive airflow limitation with persistent small airway disease. Laboratory evaluation revealed markedly elevated total serum IgE (488 IU/mL) and peripheral eosinophilia. Following initiation of omalizumab, the patient experienced a marked reduction in exacerbations, improved asthma control test (ACT) scores, and significant improvement in quality of life, without serious adverse events.

Conclusion. This case highlights the effectiveness and safety of omalizumab in severe allergic asthma with atypical presentation and underscores the challenges of biologic access in resource-limited settings. Early phenotyping and multidisciplinary collaboration are essential to optimizing outcomes in severe asthma.

***Index Terms*—omalizumab, anti-IgE therapy, severe allergic asthma, asthma exacerbations, small airway disease.**

I. INTRODUCTION

Asthma is a heterogeneous chronic airway disease characterized by variable airflow obstruction, airway inflammation, and bronchial hyperresponsiveness. Despite advances in inhaled corticosteroid (ICS)–based therapy, a subset of patients continues to experience uncontrolled symptoms, frequent exacerbations, and progressive decline in lung function. Severe asthma accounts for a disproportionate share of healthcare utilization, systemic corticosteroid exposure, and impaired quality of life.

Allergic asthma driven by immunoglobulin E (IgE)–mediated pathways represent a distinct phenotype that may benefit from targeted biologic therapy. Omalizumab, a monoclonal anti-IgE antibody, has been shown to reduce exacerbation rates, improve asthma control, and decrease corticosteroid dependence. However, real-world experience in low- and middle-income countries remains limited due to cost and access barriers.

We present a long-term case of severe allergic asthma with neurologic-like manifestations, recurrent exacerbations, and delayed access to biologic therapy, demonstrating the clinical impact of omalizumab in a resource-constrained setting.

II. CASE PRESENTATION

A 62-year-old Filipino woman, married, a resident of Iloilo City, Philippines and a government employee, has been under pulmonary care since 2009. She is a lifelong non-smoker and non-alcohol drinker. Her occupational history includes laboratory work as a chemist with chemical exposure and environmental exposure to asphalt in her government workplace.

She initially presented with episodic dyspnea, non-productive cough, occasional wheezing, and chest discomfort, frequently triggered by exposure to

cigarette smoke, dust, pollens, upper respiratory tract infections, and emotional stress. These respiratory symptoms were often accompanied by elevated blood pressure, generalized weakness, and numbness of the extremities, prompting initial neurologic evaluation.

Her past medical history was notable for bronchial asthma, previously treated pulmonary tuberculosis, hypertensive cardiovascular disease, lacunar stroke involving the subcortical area, hyperthyroidism, cervical and lumbosacral radiculopathy, and peripheral neuropathy. A family history of autoimmune disease (systemic lupus erythematosus) was present. There was no history of chronic kidney disease, malignancy, or organ transplantation.

Baseline spirometry performed in December 2009 demonstrated a moderate obstructive ventilatory defect with evidence of small airway disease (FEV_1 65% predicted, FVC 82%, FEV_1/FVC 63%, FEF 25–75% 28%). Chest radiography revealed hyperaerated lungs, while chest computed tomography showed granulomatous changes in both upper lobes.

She was managed as a case of moderate persistent asthma, initially treated with salmeterol–fluticasone combination therapy and montelukast. From 2009 to 2019, she experienced 2–5 asthma exacerbations annually, requiring repeated short courses of systemic corticosteroids. Triggers included house dust mite exposure, smoke, and crustaceans.

Repeat spirometry in November 2019 showed decline in lung function with moderate obstruction and bronchodilator reversibility of 19%, along with persistent small airway disease (FEV_1 60%, FEF 25–75% 23%). During the same year, she experienced five exacerbations requiring systemic steroids. Her inhaler regimen was escalated to beclomethasone–formoterol (100/6 µg) and leukotriene receptor antagonist therapy.

In December 2019, she developed chronic cough with sputum production; TB-LAMP testing was positive, and she completed anti-tuberculosis treatment for about 6 months. Despite optimization of inhaled therapy, the patient continued to have poor asthma control in 2020, with approximately five exacerbations per year, leading to frequent work absences. IgE testing was initially deferred due to the COVID-19 pandemic.

Spirometry in May 2021 showed partial improvement to mild obstructive ventilatory defect (FEV_1 71%, FEF 25–75% 34%); however, she remained symptomatic, experiencing six exacerbations within six months. Laboratory workup revealed peripheral eosinophilia (423 cells/µL) and a markedly elevated total serum IgE level of 488 IU/mL, the highest recorded among patients in our practice.

Given persistent symptoms, frequent exacerbations, high corticosteroid burden, and elevated IgE levels, biologic therapy was discussed. After extensive counseling and addressing cost-related concerns, the patient consented to omalizumab therapy.

Omalizumab was initiated on December 29, 2021. Based on her weight (60 kg) and IgE level, the recommended dose was three 150-mg vials; however, due to financial limitations, she received two vials per dosing cycle. Pre-treatment evaluation included blood eosinophil count and COVID-19 testing. The patient opted for outpatient administration with extended observation. She tolerated the first dose without immediate adverse reactions.

Following initiation of omalizumab, she reported significant symptomatic improvement, reduced nighttime awakenings, and improved ACT scores. She experienced a single episode of mild upper-extremity skin rash in January 2022, which was resolved with a short course of oral corticosteroids. She subsequently received COVID-19 booster vaccination without complications.

A second dose of omalizumab was administered on March 9, 2022, which was well tolerated. By 2022, the patient had only one mild asthma exacerbation, with no emergency visits, no hospitalizations, and marked improvement in quality of life. She remains clinically stable on follow-up.

III. DISCUSSION

This case illustrates several important aspects of severe allergic asthma management. First, it highlights the heterogeneity of asthma presentation, including atypical neurologic-like symptoms such as weakness and paresthesia, which may be secondary to hypoxemia, autonomic response, or comorbid neurologic disease, contributing to diagnostic delay. Second, despite long-term adherence to guideline-directed inhaled therapy, the patient experienced frequent exacerbations and progressive airflow limitation, fulfilling criteria for severe asthma. Serial spirometry demonstrated persistent small airway involvement, a known predictor of poor asthma

control and frequent exacerbations. Third, phenotyping played a crucial role in therapeutic decision-making. The markedly elevated IgE level and peripheral eosinophilia supported an allergic asthma phenotype amenable to anti-IgE therapy. Following omalizumab initiation, the patient experienced a dramatic reduction in exacerbations, steroid exposure, and symptom burden, consistent with outcomes reported in clinical trials and real-world studies. Importantly, this case underscores the barriers to biologic therapy in resource-limited settings. High cost, lack of insurance coverage, and limited availability of diagnostic testing such as IgE measurement significantly delayed initiation of appropriate therapy. Trust in the physician–patient relationship and multidisciplinary collaboration were pivotal in overcoming these barriers. Finally, the patient's favorable safety profile, including tolerance of COVID-19 vaccination while on omalizumab, reinforces the real-world safety of biologic therapy in appropriately selected patients.

Asthma Heterogeneity and Atypical Presentation.

The fact that asthma is a diverse illness with a range of phenotypes and endotypes is becoming more widely acknowledged. Severe asthma should be differentiated from difficult-to-treat asthma, which is defined as uncontrolled despite optimal therapy and good adherence or controlled only with high-intensity treatment, according to the Global Initiative for Asthma (GINA 2024). The patient's neurologic-like symptoms (weaknesses, paresthesia) in this instance complicated the clinical picture and resulted in the initial referral to neurology. Such symptoms may indicate hypoxemia, autonomic dysregulation, or comorbid neurologic disease, even though they are not typical of asthma. As stated in the ERS/ATS guidelines, which advocate for the systematic exclusion of alternative diagnoses prior to classifying asthma as severe, this emphasizes the significance of multidisciplinary evaluation.

Disease Progression and Small Airway Involvement.

Over ten years of serial spirometry revealed persistent small airway disease, as evidenced by a decreased FEF25–75%. It is becoming more widely acknowledged that frequent exacerbations and inadequate asthma control are caused by small airway dysfunction. The prognostic significance of small airway involvement is emphasized by ERS guidelines, which also highlight its correlation with corticosteroid resistance and accelerated decline in lung function. The limitations of traditional therapy in advanced disease are demonstrated by this patient's progressive obstruction in spite of adherence to long-acting beta-agonists and inhaled corticosteroids.

Phenotyping and Biologic Selection.

A key component of managing severe asthma in the modern era is phenotyping. Omalizumab is prescribed for allergic asthma characterized by elevated IgE and sensitization to perennial allergens, and GINA 2024 advises biomarker-driven therapy. An allergic phenotype was supported by the patient's eosinophilia and significantly elevated IgE (488 IU/mL). Omalizumab is recommended as the first-line biologic in IgE-mediated asthma that is not responsive to optimal inhaled therapy, according to ERS/ATS guidelines, which also highlight the importance of biomarkers (IgE, eosinophils, and FeNO) in guiding biologic choice.

Clinical Impact of Omalizumab.

The patient's quality of life, ACT scores, and exacerbations all significantly improved after starting omalizumab. These results are consistent with real-world studies and pivotal trials (like INNOVATE), which show improved patient-reported outcomes, lower corticosteroid dependence, and lower exacerbation rates. Crucially, the patient safely received the COVID-19 vaccine while undergoing treatment and tolerated omalizumab well, exhibiting only a mild rash. The ERS/ATS safety guidelines, which state that omalizumab has good tolerability profiles and no vaccination contraindications, are in line with this.

Barriers in Resource-Limited Settings.

Biologic therapy is still out of reach for many patients in low- and middle-income nations, despite its effectiveness. Appropriate therapy initiation is delayed by cost, insurance coverage issues, and the scarcity of diagnostic tests (such as IgE assays). Inequities in biologic access are specifically acknowledged by GINA 2024, which also urges advocacy to increase availability and affordability. These obstacles are best illustrated by this case: despite financial limitations, the patient received a

lower dose of omalizumab and still experienced clinical benefit. Such practical approaches, such as dose optimization, patient support programs, and government-sponsored access, are necessary in situations with limited resources.

Multidisciplinary Collaboration.

The patient's journey emphasizes how crucial multidisciplinary care is. Atypical symptoms necessitated the initial input of neurology, while pulmonology directed the long-term management of asthma. Multidisciplinary severe asthma clinics, which combine pulmonologists, allergists, and other specialists to maximize phenotyping and treatment selection, are highlighted as best practices in ERS/ATS guidelines. Strong physician-patient trust and interdisciplinary collaboration are essential for overcoming obstacles and guaranteeing adherence in settings with limited resources.

Key Learning Points

- Severe asthma may present atypical or neurologic-like symptoms, leading to diagnostic delay.
- Persistent small airway disease and frequent exacerbations despite optimized therapy warrant biologic evaluation.
- Omalizumab can significantly improve outcomes even after long disease duration.
- Cost and access remain major barriers to biologic therapy in resource-limited settings.

IV. CONCLUSION

This case demonstrates the transformative potential of omalizumab in severe allergic asthma, resulting in marked improvement in asthma control, reduction in exacerbations, and enhanced quality of life after more than a decade of uncontrolled disease. After more than a decade of uncontrolled asthma marked by frequent exacerbations, progressive airflow limitation, and heavy reliance on systemic corticosteroids, the introduction of omalizumab resulted in a dramatic improvement in clinical outcomes, quality of life, and healthcare utilization.

First, it highlights the importance of early and accurate phenotyping. Identifying biomarkers such as elevated IgE and eosinophilia allowed for targeted therapy that directly addressed the underlying immunologic pathway. Second, the case illustrates the real-world safety and efficacy of omalizumab, even in complex patients with multiple comorbidities, prior tuberculosis, and neurologic conditions. Third, the case draws attention to the major barriers to biologic therapy in low- and middle-income countries. This highlights the urgent need for health policy amendments, government support, and innovative financing models to ensure fair access to biologics. Fourth, the case underscores the value of multidisciplinary care. ERS/ATS guidelines advocate for multidisciplinary severe asthma clinics, and this case demonstrates their importance even in resource-limited settings.

In summary, omalizumab proved to be a safe and effective intervention in this patient with severe allergic asthma, leading to sustained improvement in asthma control, reduced exacerbations, and enhanced quality of life. This case emphasizes the importance of guideline-directed phenotyping, multidisciplinary collaboration, and fair access to biologic therapies. It calls for urgent action to address systemic barriers in low- and middle-income countries, ensuring that the benefits of modern asthma care are not restricted to high-income countries but extended to all patients who stand to gain. By integrating updated GINA 2024 and ERS/ATS recommendations, this report underscores the need for precision medicine, health fairness, and global collaboration in the fight against severe asthma.

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