

Success of Omalizumab as Monotherapy in Adult Atopic Dermatitis: Case Report and Discussion of the High-Affinity Immunoglobulin E Receptor, FcεRI

Seth B. Forman, MD; Algin B. Garrett, MD

We report a case of a 41-year-old black man who presented with chronic severe atopic dermatitis that only responded to oral corticosteroids. Failed treatments for this patient included topical corticosteroids, topical pimecrolimus, oral prednisone, oral antihistamines, azathioprine, and narrowband UV light therapy. Only oral corticosteroids provided significant relief. The patient had an immunoglobulin E (IgE) level of 7340 IU/mL (reference range, 0–100 IU/mL). He responded to a 12-week course of omalizumab, a humanized monoclonal anti-IgE antibody currently indicated for patients 12 years and older with moderate to severe persistent asthma. Our patient experienced no adverse events throughout the course of treatment. We suggest that omalizumab may have a role in the treatment of isolated atopic dermatitis in the adult population.

Cutis. 2007;80:38-40.

Case Report

A 41-year-old black man presented with chronic severe atopic dermatitis and an immunoglobulin E (IgE) level of 7340 IU/mL (reference range, 0–100 IU/mL) (Figures 1 and 2). He had no history of asthma or allergic rhinitis. Treatments for this patient included topical corticosteroids, topical pimecrolimus, oral prednisone, oral antihistamines, azathioprine, and

narrowband UV light therapy. Only oral corticosteroids provided significant relief.

Omalizumab is a humanized monoclonal anti-IgE antibody. We considered it for therapy because of its side-effect profile and efficacy in treating asthma, also an IgE-mediated disease. The patient was treated every other week with 375 mg of omalizumab injected subcutaneously. After 2 treatments (4 weeks), the patient noted an improvement in severe pruritus, his most debilitating symptom. The improvement in pruritus led to a decrease in the itch-scratch cycle. Additionally, the patient discontinued topical corticosteroids, oral prednisone, and oral antihistamines. After 8 weeks, there was a 4-week hiatus from therapy because of the patient's scheduling conflicts. Approximately 3 weeks into the hiatus, the patient noted a return of the severe pruritus and began using topical triamcinolone acetonide cream 0.1% twice daily for relief. The symptoms were no worse than the patient's usual symptoms of atopic dermatitis. Once omalizumab therapy was restarted, the patient noted relief within 96 hours of reinitiating therapy, and the patient discontinued the topical treatments for 4 more weeks.

The patient experienced no adverse events throughout the treatment course. Objectively, the chronic skin changes, such as lichenification, depigmentation, and flexural epidermal atrophy, did not improve during the 6-dose course over 16 weeks. He has discontinued therapy due to cost.

Comment

Atopic dermatitis is a disease that is partially mediated by IgE.¹ Omalizumab is a humanized monoclonal anti-IgE antibody that binds IgE at the same site as the high-affinity receptor, FcεRI, thereby inactivating soluble IgE. It is approved by the US Food and Drug Administration for patients 12 years and older

Accepted for publication July 31, 2006.

From the Medical College of Virginia Hospitals, Virginia Commonwealth University Health System, Richmond.

The authors report no conflict of interest.

Reprints not available from the authors.



Figure 1. Flexural lower extremities with hypertrophic scarlike lichenification from chronic pruritus and excoriation and areas of depigmentation and atrophy.



Figure 2. The dorsal aspect of the feet with varying areas of lichenification, depigmentation, and atrophy.

with moderate to severe persistent asthma.^{2,3} The dosing recommendations are based on IgE levels up to 700 IU/mL. The maximum recommended dosage (375 mg subcutaneously every other week) was chosen because the patient's IgE level exceeded 700 IU/mL. Our patient experienced no adverse events. Reported adverse events include injection site reactions, urticaria, viral infections, upper respiratory tract infections, sinusitis, headache, and pharyngitis.²⁻⁶

Scheinfeld⁷ discussed the possible use of omalizumab for atopic dermatitis in a review of the drug's mechanism of action. Most recently, Lane et al⁸ described a series of pediatric patients, aged 10 to 13 years, who responded to a course of omalizumab in combination with topical therapies and antihistamines. One of 3 patients had an atopic comorbidity—severe asthma. A case series by Krathen and Hsu⁹ described the failure of omalizumab in the treatment of atopic dermatitis. These patients had substantial atopic comorbidities in

addition to severe atopic dermatitis. One patient had all 3 diseases of the atopic triad: asthma, allergic rhinitis, and atopic dermatitis. The other 2 patients had either asthma or allergic rhinitis in addition to atopic dermatitis.⁹ All 6 patients in these 2 case series had serum IgE levels that far exceeded the standards for maximal dosing.^{8,9} Hayek et al¹⁰ similarly reported the failure of omalizumab in the treatment of atopic dermatitis in a series of 20 patients.

The reason for efficacy in one patient's atopic disease and lack of efficacy in another patient's atopic disease may be a difference in the expression and structure of the high-affinity receptor for soluble IgE, FcεRI.¹¹ FcεRI is expressed on basophils, mast cells, and dendritic cells. Omalizumab decreases the serum levels of IgE and downregulates the expression of FcεRI on basophils, mast cells, and dendritic cells.¹¹

Beeren et al¹² reported the differences in the expression of FcεRI on basophils, myeloid dendritic cells, and plasmacytoid dendritic cells in patients with either atopic dermatitis or atopic asthma. FcεRI expression was far higher on the myeloid dendritic cells and plasmacytoid dendritic cells in patients with atopic dermatitis.¹²

Additionally, there is variability in the structure of the high-affinity receptor. FcεRI on basophils and mast cells is composed of 4 chains ($\alpha\beta\gamma\gamma$), but FcεRI on dendritic cells lacks the signal-amplifying β chain.¹²

These differences may account for the efficacy of omalizumab in our patient. Beck et al¹³ reported a rapid decrease in basophil FcεRI expression in response to omalizumab but also commented that the decrease in cutaneous mast cells were far slower, which implies a hierarchy in the downregulating of high-affinity receptors. Some receptors on target cells are more high affinity (basophils) than others (cutaneous mast cells).¹³ Furthermore, our patient only had cutaneous disease. Our case of isolated atopic dermatitis suggests that omalizumab may have bypassed the nonetiologic basophils and targeted the presumed etiologic cutaneous mast cells and dendritic cells.

Omalizumab may have a place in the treatment of isolated atopic dermatitis in the adult population. Efficacy has already been described in the pediatric population by Lane et al.⁸ We have described the efficacy of omalizumab in an adult patient. Laboratory analysis of the pathophysiology of omalizumab with respect to FcεRI and clinical trials studying its efficacy in patients with atopic dermatitis are necessary to fully appreciate the potential for the dermatologist.

REFERENCES

1. Laske N, Niggemann B. Does the severity of atopic dermatitis correlate with serum IgE levels? *Pediatr Allergy Immunol.* 2004;15:86-88.
2. Busse W, Corren J, Lanier BQ, et al. Omalizumab, anti-IgE recombinant humanized monoclonal antibody, for the treatment of severe allergic asthma. *J Allergy Clin Immunol.* 2001;108:184-190.
3. Soler M, Matz J, Townley R, et al. The anti-IgE antibody omalizumab reduces exacerbations and steroid requirement in allergic asthmatics. *Eur Respir J.* 2001;18:254-261.
4. Berger W, Gupta N, McAlary M, et al. Evaluation of long-term safety of the IgE antibody, omalizumab, in children with allergic asthma. *Ann Allergy Asthma Immunol.* 2003;91:182-188.
5. Lanier BQ, Corren J, Lumry W, et al. Omalizumab is effective in the long-term control of severe allergic asthma. *Ann Allergy Asthma Immunol.* 2003;91:154-159.
6. Data on file. East Hanover, NJ: Novartis Pharmaceuticals Corporation; 2004.
7. Scheinfeld N. Omalizumab: a recombinant humanized monoclonal IgE-blocking antibody. *Dermatol Online J.* 2005;11:2.
8. Lane JE, Cheyney JM, Lane TN, et al. Treatment of recalcitrant atopic dermatitis with omalizumab. *J Am Acad Dermatol.* 2006;54:68-72.
9. Krathen RA, Hsu S. Failure of omalizumab for the treatment of severe adult atopic dermatitis. *J Am Acad Dermatol.* 2005;53:338-340.
10. Hayek B, Heil PM, Laimer M, et al. Omalizumab-induced downregulation of IgE/FcεRI on dendritic cells in patients with atopic dermatitis [abstract]. Abstract presented at: XXIII EAACI Congress; June 12-16, 2004; Amsterdam, Netherlands.
11. Holgate S, Casale T, Wenzel S, et al. The anti-inflammatory effects of omalizumab confirm the central role of IgE in allergic inflammation. *J Allergy Clin Immunol.* 2005;115:459-465.
12. Beeren IM, De Bruin-Weller MS, Ra C, et al. Expression of Fc(epsilon)RI on dendritic cell subsets in peripheral blood of patients with atopic dermatitis and allergic asthma. *J Allergy Clin Immunol.* 2005;116:228-229.
13. Beck LA, Marcotte GV, MacGlashan D, et al. Omalizumab induced reductions in mast cell FcεRI expression and function. *J Allergy Clin Immunol.* 2004;114:527-530.