

Therapeutic Potential of Tralokinumab in the Treatment of Atopic Dermatitis: A Review on the Emerging Clinical Data

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Abstract: Atopic dermatitis (AD) is a chronic inflammatory skin disease that greatly impacts patient quality of life. Type 2 cytokine interleukin (IL)-13 is integral to the pathogenesis of AD. Tralokinumab is a fully human IgG4 monoclonal antibody that specifically targets IL-13, preventing downstream signaling of inflammatory pathways that may contribute to AD. Tralokinumab was US Food and Drug administration (FDA) recently approved for the treatment of moderate to severe AD on December 28, 2021. In our review, we will explore the efficacy and adverse effects (AEs) of tralokinumab for the treatment of patients with moderate to severe AD. A PubMed search for key articles on the emerging clinical data of tralokinumab was performed. Six randomized controlled trials of tralokinumab identified improvements in disease severity measures, including Investigator's Global Assessment (IGA) scores and Eczema Area Severity Index 75 (EASI75) scores. Four of these studies demonstrated improvements in quality of life measures with tralokinumab, including pruritus scores, sleep interference scores, Dermatology Life Quality Index, SCORing Atopic Dermatitis (SCORAD), Patient Oriented Eczema Measure, and The Short Form 36 Health Survey (SF-36v2) scores. One study identified a similar immune response in patients taking tralokinumab to those taking the Tdap and meningococcal vaccines. Upper respiratory infection, conjunctivitis, and headaches were the most common adverse events. The varying criteria to assess changes in AD disease severity across different studies is a limitation of this review. Tralokinumab is another promising biologic option for the treatment of moderate to severe AD, which may reduce disease burden and improve patient quality of life.

Keywords: biosimilar, biologic, non-medical switching, real-world data

Introduction

Atopic dermatitis (AD) is a chronic inflammatory skin disorder with an estimated prevalence of 2.1–4.9% of adults in North America.¹ AD is associated with pain, sleep disruption, anxiety, and depression and may contribute to a substantial disease burden among patients.² New treatments for AD target the inflammatory pathways driving its pathogenesis, improving the physical and mental well-being of patients.²

The type 2 cytokine, interleukin (IL)-13, is a key factor in the pathogenesis of AD and is implicated in skin barrier disruption, inflammation, increased risk of skin infections, itch signaling, and epidermal hyperplasia.¹ Elevated IL-13 levels are associated with greater AD severity; reductions in IL-13 levels correlate with treatment response and improved clinical outcomes.³ Tralokinumab is a fully human IgG4 monoclonal antibody that binds specifically to IL-13 and blocks downstream IL-13 signaling.¹ Tralokinumab was US Food and Drug administration (FDA) approved for the treatment of moderate to severe AD on December 28, 2021.⁴ In this article, we review the efficacy and safety of tralokinumab for the treatment of moderate to severe AD.

Methods

PubMed and Google Scholar searches were performed using the key words tralokinumab, tralokinumab and atopic dermatitis, tralokinumab dermatology, tralokinumab efficacy, and tralokinumab adverse effects. Articles published between 2017 and 2022 were considered if they included efficacy or safety data related to tralokinumab for the treatment of AD. The authors prescreened abstracts from the search return to determine relevance to the topic. Additional articles were identified by reviewing reference lists from key articles.

Results

We identified seven randomized controlled trials assessing the efficacy and AEs associated with tralokinumab for the treatment of moderate to severe AD.^{1–3,5–8}

Efficacy

Tralokinumab is effective in reducing the disease burden of patients with moderate to severe AD. In two 52-week, randomized, double-blind, placebo-controlled, Phase III trials (ECZema TRAlokinumab Trial No. 1 (ECZTRA 1) and ECZema TRAlokinumab Trial No. 2 (ECZTRA 2)), patients with moderate-to-severe AD were randomized to either subcutaneous tralokinumab 300 mg every two weeks or placebo.¹ In ECZTRA 1 and ECZTRA 2, more patients who received tralokinumab compared to placebo achieved an IGA score of 0 or 1 at week 16 (15.8% vs 7.1%, $P=0.002$ in ECZTRA 1; 22.2% vs 10.9%, $P<0.001$ in ECZTRA 2); and more patients on tralokinumab attained Eczema Area Severity Index 75 (EASI 75) compared to placebo, in both trials (25.0% vs 12.7%, $P<0.001$ ECZTRA 1 and 33.2% vs 11.4%, $P<0.001$ ECZTRA 2).¹

Patients treated with tralokinumab also had improvements in pruritus, sleep interference, Dermatology Life Quality Index (DLQI), SCORing Atopic Dermatitis (SCORAD) and Patient-Oriented Eczema Measure (POEM) scores, and response was maintained until week 52 without any rescue medication (Table 1).¹

In a phase IIb study, 204 healthy adults were randomized 1:1:1:1 to receive 45, 150, or 300 mg of subcutaneous tralokinumab, or placebo, every two weeks for 12 weeks with concomitant topical corticosteroids (TCS).³ At week 12, the 300 mg tralokinumab group had a greater change from baseline in EASI score (-8.76 to -1.13 ; $P = 0.01$), a greater percentage of patients achieving an IGA score of 0/1 (26.7% vs 11.8%, $P = 0.06$), as well as greater improvements in SCORAD (-15.91 to -3.77 ; $P = 0.002$), DLQI (-6.00 to -1.02 ; $P = 0.006$), and Pruritus Numeric Rating Scale scores (NRS) (-1.88 to -0.41 ; $P = 0.002$), compared to placebo, respectively (Table 1).³

In a multicenter, parallel, randomized, double-blind, placebo-controlled, phase III trial, 277 European patients with severe AD were randomized 1:1 to subcutaneous tralokinumab 300 mg or placebo every two weeks, plus TCS as needed for 26 weeks.⁵ At week 16, more patients treated with tralokinumab plus TCS vs placebo plus TCS achieved EASI 75 (64.2% vs 50.5%, $P = 0.018$), including patients who had previously failed conventional therapy (57% vs 41%), and this further increased up to week 26.⁵ Patients treated with tralokinumab plus TCS also reported greater improvements in DLQI (-11.2 vs -9.6 ; $P = 0.009$), POEM score, pruritus (45.5% vs 35.6%, $P = 0.106$) and sleep interference, compared to those treated with placebo plus TCS (Table 1).⁵

Tralokinumab improved symptom severity at both early and extended time points. In a double-blind, randomized, placebo-controlled phase III trial, patients were randomized 2:1 to subcutaneous tralokinumab 300 mg or placebo every two weeks, with TCS as needed, over 16 weeks.⁶ More patients treated with tralokinumab achieved an IGA score of 0 or 1 (38.9% vs 26.2%, $P = 0.015$) and EASI 75 (56.0% vs 35.7%, $P < 0.001$) at week 16, compared to placebo.⁶ Among patients treated with tralokinumab twice weekly who responded at week 16, 89.6% maintained an IGA of 0/1 and 92.5% maintained an EASI 75 until week 32.⁶ Among responders who were treated four times weekly with tralokinumab, 77.6% and 90.8% maintained an IGA score of 0/1 and an EASI 75 response at week 32, respectively.⁶ Even among patients who did not achieve these changes in IGA and EASI 75 at week 16, 30.5% and 55.8% achieved these endpoints, respectively, at week 32 (Table 1).⁶

Patients treated with tralokinumab also reported improvements in multiple aspects of their quality of life. In a phase IIb, randomized, double-blind, placebo-controlled, dose-ranging study in 204 adults with moderate-to-severe AD,

Table I Efficacy and Safety of Tralokinumab for the Treatment of Moderate to Severe Atopic Dermatitis

Study Design	Methods	Treatment Duration	Efficacy	Safety
Randomized, double-blind, placebo-controlled, phase III trials ¹	Patients with moderate-to-severe AD were randomized to either subcutaneous tralokinumab 300 mg or placebo, Q2 weeks ¹	52 weeks	More patients in the tralokinumab group achieved an IGA score (0/1) at week 16 ($P=0.002$ in ECZTRA 1) ($P<0.001$ in ECZTRA 2). ¹ More patients in the tralokinumab group attained EASI 75 in both trials ($P<0.001$ in both ECZTRA 1 and ECZTRA 2). ¹ Improvements in pruritus, sleep interference, DLQI, SCORAD, and POEM were observed in tralokinumab patients and response was maintained to week 52. ¹	AEs were reported in 76.4% and 61.5% of tralokinumab patients at week 16 compared to 77.0% and 66.0% of patients receiving placebo. ¹ Upper respiratory infection and conjunctivitis occurred more frequently in the tralokinumab group, while dermatitis atopic and skin infection occurred more often in the placebo group ¹
Phase IIb study ³	204 adults were randomized 1:1:1:1 to receive 45, 150, or 300 mg of subcutaneous tralokinumab, or placebo, Q2 weeks with concomitant TCS ³	12 weeks	Patients taking tralokinumab had a greater change from baseline in EASI score ($P=0.01$), a greater percentage of IGA response, improvements in SCORAD, DLQI, and NRS compared to placebo. ³	Upper respiratory infections and headaches were the most common, but the majority of AEs were mild or moderate. ³
A multicenter, parallel, randomized, double-blind, placebo-controlled, phase III trial ⁵	277 severe AD patients were randomized 1:1 to subcutaneous tralokinumab 300 mg or placebo every two weeks plus TCS as needed ⁵	26 weeks	More patients in the tralokinumab group achieved an EASI 75 at week 16 ($P=0.018$) ⁵ Patients treated with tralokinumab reported improvements in DLQI, POEM, pruritus and sleep interference. ⁵	Incidence of AEs was similar between tralokinumab and placebo groups. Most of the AEs were mild or moderate and resolved by the end of the study ⁵
Double-blind, placebo plus TCS controlled phase III trial ⁶	Patients were randomized 2:1 to subcutaneous tralokinumab 300 mg or placebo every two weeks with TCS as needed ⁶	16 weeks	More patients treated with tralokinumab achieved IGA (0/1) ($P=0.015$) and EASI 75 ($P<0.001$) at week 16 compared. ⁶ At week 16, 89.6% of those treated with tralokinumab Q2 weeks maintained an IGA of 0/1, and 92.5% maintained an EASI 75 until week 32. ⁶ Of patients treated four times weekly with tralokinumab, 77.6% and 90.8% maintained an IGA 0/1 and EASI 75 response at week 32, respectively. ⁶ Of patients who did not achieve changes in IGA to 0/1 and EASI 75 at week 16, 30.5% and 55.8% achieved these endpoints, respectively, at week 32. ⁶	Upper respiratory tract infection, conjunctivitis, headache, and injection-site reaction were reported more often in the tralokinumab group than placebo group. Most of the AEs were mild or moderate and resolved by the end of the study ⁶

(Continued)

Table 1 (Continued).

Study Design	Methods	Treatment Duration	Efficacy	Safety
Phasellb, randomized, double-blind, placebo-controlled, dose-ranging study ²	204 adults with moderate-to-severe AD received subcutaneous tralokinumab or placebo (1:1:1:1, 45 mg, n = 50; 150 mg, n = 51; 300 mg, n = 52) every two weeks along with a class three TCS cream or ointment at least once daily ²	12 weeks	Patients treated with tralokinumab 300 mg had improved DLQI scores at week 12 versus baseline. ² The MCS, PCS, and all eight domains of the SF-36v2 were improved in patients treated with tralokinumab. ² ^6666 Among all doses of tralokinumab, sleep interference was improved at week 12. ²	Not reported
Phase II, double-blind, randomized, placebo-controlled trial ⁷	215 adults were randomized 1:1, tralokinumab 300 mg and placebo every two weeks ⁷	16 weeks	Tralokinumab treated patients produced a similar immune response to Tdap (91.9% vs 96.1%) and meningococcal (86.0% vs 84.2%) vaccines compared to placebo at week 16 ⁷	The rate of AEs was lower in the tralokinumab group than the placebo group. Most AEs were mild or moderate in severity ⁷

Abbreviations: AD, atopic dermatitis; AEs, adverse effects; DLQI, Dermatology Life Quality Index; Eczema Area Severity Index 75, EASI 75; ECZTRA 1, ECZema TRAlokinumab Trial No. 1; ECZTRA 2, ECZema TRAlokinumab Trial No. 2; IGA, Investigator's Global Assessment; MCS, Mental Component Summary; NRS, Numeric Rating Scale; PCS, Physical Component Summary; POEM, Patient-Oriented Eczema Measure; Q2 weeks, every two weeks; SCORAD, SCORing Atopic Dermatitis; SF-36v2, Short Form 36 Health Survey; TCS, topical corticosteroids; Tdap, Tetanus/diphtheria/pertussis.

patients received subcutaneous tralokinumab or placebo (1:1:1:1, 45 mg, n = 50; 150 mg, n = 51; 300 mg, n = 52) every two weeks for 12 weeks, along with a class three TCS cream or ointment at least once daily.² Patients treated with tralokinumab 300 mg had greater improved DLQI scores at week 12 compared to placebo (−6.00 to −1.02).² The Mental Component Summary (MCS), Physical Component Summary (PCS), and all eight domains of the Short Form 36 Health Survey (SF-36v2) also improved in patients treated with tralokinumab 300 mg compared to placebo. Sleep interference improved at week 12 compared to placebo among all doses of tralokinumab (Table 1).²

Despite its ability to control inflammation through regulation of the IL-13 pathway, tralokinumab does not appear to have a clinically meaningful effect on immune response to vaccines. ECZema TRAlokinumab Trial No. 5 (ECZTRA 5) was a phase II, double-blind, randomized, placebo-controlled trial of 215 adults randomized 1:1 to either tralokinumab 300 mg or placebo every two weeks, for 16 weeks.⁷ At week 12, all patients received Tdap (tetanus/diphtheria/pertussis) and meningococcal vaccines.⁷ Tralokinumab treated patients produced a similar immune response to Tdap (91.9% vs 96.1%) and meningococcal (86.0% vs 84.2%) vaccines compared to placebo at week 16 (Table 1).⁷

Adverse Effects

In the ECZTRA 1 and 2 trials, AEs were reported in 76.4% and 61.5% of tralokinumab patients at week 16, respectively, compared to 77.0% and 66.0% of patients receiving placebo.¹ Among the AEs reported in ≥ 5% in any treatment group, upper respiratory infection and conjunctivitis occurred more frequently in the tralokinumab groups, while dermatitis and skin infection occurred more often in the placebo groups.¹ Conjunctivitis occurred in ≤ 10% of patients treated with tralokinumab in the initial treatment periods and in < 9% of those in the maintenance periods.¹ Most of the cases of conjunctivitis were mild or moderate, and only one case led to patient withdrawal (Table 1).¹

Similarly, in a meta-analysis of five randomized, placebo-controlled trials of tralokinumab in adult patients with moderate-to-severe AD, the incidence of conjunctivitis was also higher with tralokinumab compared to placebo (7.5% vs 3.2%).⁸ Most events were mild or moderate in severity and resolved during the trial in both treatment and placebo groups.⁸ Two events led to discontinuation of tralokinumab.⁸ An increased incidence of conjunctivitis was associated with more severe AD, a history of

allergic conjunctivitis/atopic keratoconjunctivitis, and a number of atopic comorbidities regardless of treatment group.⁶ Conjunctivitis has been observed in other studies of IL-4 or IL-13 inhibitors, but its etiology is still unknown.¹

In another study, the safety profile of tralokinumab in patients with AD was similar to that of asthma patients treated with tralokinumab.³ Upper respiratory infections and headaches were the most common AEs; however, the majority of AEs were mild or moderate (Table 1).³

Discussion

Tralokinumab has an acceptable efficacy and safety profile and provides early and sustained improvements in disease severity among patients with moderate-to-severe AD.³ Clinical efficacy was greatest in participants treated with 300 mg of tralokinumab.³ Tralokinumab presents another biologic option for the treatment of moderate to severe AD that, similar to dupilumab, exhibits improvements in EASI, SCORAD, pruritus, NRS, POEM, DLQI, and IGA and also targets the IL-13 proinflammatory pathway in adults (Table 2) (Figure 1). There are currently limited studies comparing tralokinumab to other systemic AD treatments, but the current data suggest tralokinumab improves subjective and objective measures of disease severity in AD patients.^{1–3,9}

Tralokinumab has the additional benefits of decreasing *S. aureus* colonization, reducing the need for systemic treatment of skin infections, and decreasing the frequency of eczema herpeticum.¹ These added benefits may be due to tralokinumab's ability to improve skin barrier integrity or its regulation of IL-13 leading to increased expression of antimicrobial genes.¹

Tralokinumab IGA and EASI responses were maintained over 36 weeks without active maintenance treatment or TCS, in the ECZTRA 1 and 2 trials, suggesting tralokinumab may induce remission of AD for some patients.¹ Some patients initially treated four times a week were able to maintain good disease control after stopping treatment, suggesting the possibility of less frequent maintenance dosing in some patients initially treated with a higher dose.¹

The objective improvements seen with tralokinumab treatment are clinically meaningful; patients treated with 300 mg tralokinumab two times a week had greater improvements in all 6 subscales of DLQI compared with placebo.² Among

Table 2 Mean Difference in Eczema Area and Severity Index, Patient-Oriented Eczema Measure, and Dermatology Life Quality Index for Systemic Treatments for Atopic Dermatitis

Drug Name	Change in EASI Score	Change in POEM Score	Change in DLQI Score
Abrocitinib, 100 mg/d	44.5% vs 10.4% (P<0.001) ¹⁰	-6.72 (P<0.00001) ¹¹	-2.99 (P<0.00001) ¹¹
Baricitinib, 4 mg/d	-5.2 (-10.4 to -0.1) ⁹	-46.1% vs -18.9% (P<0.0001) ¹²	-1.7 (-4.7 to 1.3) ⁹
Dupilumab, 600 mg for 1 dose, then 300 mg every 2 wk	-11.3 (-13.1 to -9.7) ⁹	-7.5 (-8.5 to -6.4) ⁹	-4.8 (-5.8 to -3.7) ⁹
Fevipirant, 450 mg/d	-1.7 (-4.2 to 0.8) ⁹	N/A	N/A
Lebrikizumab, 125 mg for 1 dose	-62.3% [37.3%], P = 0.02 ¹³	N/A	-7.9 vs -5. ¹³
Nemolizumab, 0.1 mg/kg every 4 wk	-68.8% vs -52.1%, P = 0.016 ¹⁴	N/A	DLQI score of 4 or less in 40% vs 22% ¹⁵
Tezepelumab, 280 mg every 2 wk	64.7% vs 48.2%; P = .091 ¹⁶	N/A	N/A
Tralokinumab, 300 mg every 2 wk	-8.76 to -1.13, P = 0.01 ³	45.5% vs 35.6%, P = 0.106 ⁵	-11.7 vs -8.8 P < 0.001 ⁶
Ustekinumab, 45 mg at 0 and 4 wk	38.2% P < 0.94 ¹⁷	N/A	-1.0 (-3.7 to 1.7) ⁹

Abbreviations: DLQI, Dermatology Life Quality Index; EASI, Eczema Area and Severity Index; MD, mean differences; N/A, not applicable; POEM, Patient-Oriented Eczema Measure.

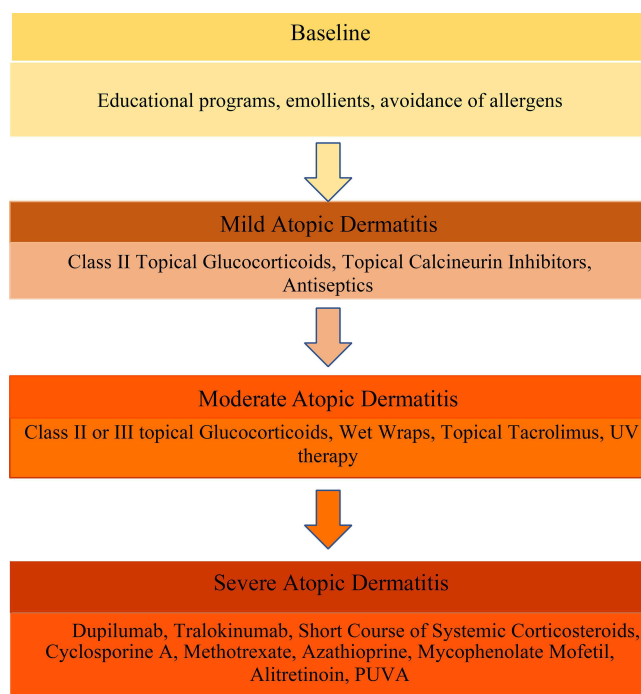


Figure 1 Treatment paradigm of atopic dermatitis modified from consensus based European guidelines for treatment of eczema (atopic dermatitis) in adults and children.

patients treated with tralokinumab 300 mg twice weekly, there were also improvements in both MCS and PCS and in all eight domains of SF-36v2.² Tralokinumab improves many aspects of patients' health-related quality of life.²

Conclusion

Tralokinumab improves IGA, EASI 75, SCORAD, and POEM scores comparable to other systemic AD treatments (Table 2).^{1,3,5,6} These improvements in symptom severity are apparent at both short and extended time points.⁶ Tralokinumab's improvements in objective clinical outcomes is paralleled by improvements in multiple aspects of patients' quality of life.² Tralokinumab exhibits a good safety profile. Upper respiratory infection, conjunctivitis, and headaches are AEs commonly seen in patients treated with tralokinumab, but are usually mild to moderate.^{1,3,8} Tralokinumab presents another promising biologic option for the treatment of AD which may directly target inflammatory pathways, reduce disease burden, and improve patient quality of life.

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