The Journal of Rheumatology 2023;50:433–7
doi:10.3899/jrheum.220313
First Release November 1 2022

The Journal of Rheumatology

Management of Nail Disease in Patients With Psoriatic Arthritis: An Updated Literature Review Informing the 2021 GRAPPA Treatment Recommendations

Dhruvkumar Laheru[1], Anna Antony[2], Sueli Carneiro[3], Vito Di Lernia[4], Amit Garg[5], Thorvardur Jon Love[6], Karla del Rocio Macias Garcia[7], José Alexandre Mendonça[8], Sandeep Mukherjee[9], Rodica Olteanu[10], Lourdes Perez-Chada[11], Cheryl F. Rosen[12], Rachel Tannenbaum[13], and Michel Alexandre Yazbek[14]

ABSTRACT. ***Objective.*** Nail psoriasis is common, impairs fine motor finger functioning, affects cosmesis, and is associated with a lower quality of life. This review updates the previous Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) treatment recommendations for nail psoriasis.

Methods. This systematic literature review of the PubMed, MEDLINE, Embase, and Cochrane databases examined the updated evidence since the last GRAPPA nail psoriasis treatment recommendations published in 2014. Recommendations are based on preformed PICO (Patient/Population - Intervention - Comparison/Comparator - Outcome) questions formulated by an international group of dermatologists, rheumatologists, and patient panel members. Data from this literature review were evaluated in line with Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology.

Results. Overall, there is insufficient evidence to make any recommendation for the use of topical corticosteroids, topical calcipotriol, topical tazarotene, topical cyclosporine, dimethyl fumarates/fumaric acid esters, phototherapy, and alitretinoin. There is a low strength of evidence to support the use of calcipotriol and corticosteroid preparations, topical tacrolimus, oral cyclosporine, oral methotrexate, intralesional corticosteroids, pulsed dye laser, acitretin, Janus kinase inhibitors, and apremilast.

Conclusion. The highest strength of supporting evidence is for the recommendation of biologic agents including tumor necrosis factor inhibitors, and interleukin 12/23, 17, and 23 inhibitors.

Key Indexing Terms: GRAPPA, psoriatic arthritis, psoriasis

[1]D. Laheru, MBBS, Royal Berkshire Hospitals NHS Foundation Trust, Reading, UK; [2]A. Antony, MBBS, Monash University, Melbourne, Australia; [3]S. Carneiro, MD, PhD, Federal University of Rio de Janeiro and State University of Rio de Janeiro, Rio de Janeiro, Brazil; [4]V. Di Lernia, MD, Dermatology Unit, Arcispedale Santa Maria Nuova, Azienda USL-IRCCS di Reggio Emilia, Reggio Emilia, Italy; [5]A. Garg, MD, Department of Dermatology, Donald and Barbara Zucker School of Medicine at Hofstra/ Northwell, Hempstead, New York, USA; [6]T.J. Love, MD, PhD, Faculty of Medicine, University of Iceland and Landspitali University Hospital, Reykjavik, Iceland; [7]K. del Rocio Macias Garcia, MD, CINEA Investigation Center, Hospital Country 2000, Guadalajara, Jalisco, Mexico; [8]J.A. Mendonça, PhD, Pontifical Catholic University of Campinas, Campinas, São Paulo, Brazil; [9]S. Mukherjee, MA (Med Ed), Rheumatology Department, University Hospitals Dorset NHS Foundation Trust, Dorset, UK; [10]R. Olteanu, MD, PhD, Dermatology, Colentina Clinical Hospital, Bucharest, Romania; [11]L. Perez-Chada, MD, MMSc, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts, USA; [12]C.F. Rosen, MD, Division of Dermatology, Toronto Western Hospital, University of Toronto, Toronto, Canada; [13]R. Tannenbaum, MD, Northwell Health Department of Dermatology, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, Hempstead, New York, USA; [14]M.A. Yazbek, MD, PhD, State University of Campinas, Campinas, Brazil.

DL received fees from AbbVie, Almirall, Leo Pharma, and UCB Pharma for delivering and attending educational meetings, talks, and conferences. AA is supported by an Australian Rheumatology Association-Arthritis Australia fellowship. VDL received consultant fees from AbbVie and Novartis and has been principal investigator for studies sponsored by Eli Lilly and Janssen. AG has been an advisor for AbbVie, Anaptys Bio, BI, BMS, Incyte, InflaRx, Janssen, Novartis, Pfizer, UCB, and Viela Biosciences; and received honoraria and research grants from AbbVie, UCB, and the National Psoriasis Foundation. KdRMG received fees from AbbVie, Eli Lilly, Novartis, Janssen, UCB Pharma, Leo Pharma, Celgene, and Pfizer for attending educational meetings and conferences and being on advisory boards. JAM received speaker fees for lectures from, and has attended educational meetings and conferences sponsored by, Janssen, UCB, BMS and Novartis. SM received fees for being on the advisory board from AbbVie; and sponsorships from UCB, AbbVie, Janssen-Cilag, Novartis, Celgene, and Pfizer for attending educational meetings and conferences. CFR has been a consultant for Eli Lilly, Novartis, Amgen, AbbVie, BMS, Janssen, and Bausch. MAY received lecture fees from AbbVie, Janssen, and Novartis and advisory board fees from Amgen, Janssen, and Novartis. The remaining authors declare no conflicts of interest relevant to this article.

Address correspondence to Dr. D. Laheru, Dermatology Department, Royal Berkshire NHS Foundation Trust, Royal Berkshire Hospital, Craven Road, Reading, RG1 5AN, UK. Email: d.laheru@nhs.net.

Accepted for publication August 2, 2022.

Nail psoriasis is common, impairs fine motor finger functioning, affects cosmesis, and is associated with a lower quality of life.[1] The scope of this manuscript is to provide an update and support the overall Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) nail psoriasis treatment recommendations, previously published in 2014, to assist clinicians in planning treatment for patients affected with nail psoriasis.[2]

METHODS

An international working group consisting of 13 dermatologists and rheumatologists and 2 patient panel members was formed and consensus was reached on a literature review of agreed PICO (Patient/Population - Intervention, Comparison/Comparator - Outcome) questions. The search terms "nail," "psoriasis," and "PICO treatment" were used. A systematic literature review of the PubMed, MEDLINE, Embase, and Cochrane databases was performed.

Full-text articles published in the English language between January 1, 2013 (briefly overlapping with the previous GRAPPA nail psoriasis recommendations), and August 31, 2020, were eligible. The inclusion criteria were (1) studies with > 5 adult patients with psoriasis or psoriatic arthritis (PsA) and any degree of nail psoriasis; and (2) observational studies, case series, and clinical trials.

The data extracted for each PICO question were evaluated for quality of evidence, in line with GRADE criteria by individual reviewers, and then used to formulate a treatment recommendation by the respective reviewer and lead author (DL).[3] Treatment success was judged according to each publication's narrative and heterogenous measures of outcome. A holistic overall view was extrapolated, taking into account the data showing improvement in the patients' symptoms, signs, and/or adverse events.

For the purposes of this review, the definition of nail psoriasis was taken as any degree of clinical involvement, be it more or less than 3 nails affected and with or without associated PsA.[4]

Ethics and consent. Ethics and consent approvals were not necessary for the conduction and preparation of this review article and manuscript, which involved the extraction and review of already published, ethically approved, and consented data.

RESULTS

Literature review. A total of 50 published articles met the review criteria across all posed PICO questions. The strength of recommendation ratings, and the respective symbols used, are summarized in Table 1 to assist with the subsequent narrative. Table 2 shows a summary of each treatment agent category cross-referenced with its strength of recommendation.

Overall, there is insufficient evidence to make any recommendation for the use of topical corticosteroids, topical calcipotriol, topical tazarotene, topical cyclosporine, dimethyl fumarates/fumaric acid esters, phototherapy, and alitretinoin. The majority of these treatments have singular studies with low numbers of patients or no eligible studies from which to extract data.

There is a conditional strength of recommendation to support the use of calcipotriol and corticosteroid preparations, topical tacrolimus, oral cyclosporine, oral methotrexate (MTX), intralesional corticosteroids, pulsed dye laser, acitretin, Janus kinase inhibitors (JAKi), and apremilast. With the exception of pulsed dye laser, oral cyclosporine, and oral MTX, all the other aforementioned agents again had singular studies to extract data from, with low numbers of patients.

The strongest recommendation based on the quality of the supporting evidence is for the use of biologic agents including tumor necrosis factor inhibitors (TNFi) and interleukin (IL)-12/23, 17, and 23 inhibitors. This was supported by multiple international studies, with larger numbers of participants, consistently, for each treatment category.

All eligible studies demonstrated considerable heterogeneity in terms of disease threshold entry criteria, treatment regimes, objective and quantified disease measurement and methodology, duration of treatment, and follow-up. Extrapolation of the data for metaanalytical purposes was not possible.

Revised PICO questions. Twelve PICO questions were rephrased and recommendations ratings given (see Table 1 for rating definitions), as shown below. This is to be used in conjunction with the GRAPPA nail psoriasis review published in 2014.[2]

1. (a) In patients with nail psoriasis, there is insufficient evidence (X) to make a recommendation for the use of topical corticosteroid (no eligible literature to comment on or reference).
(b) In patients with nail psoriasis, there is insufficient evidence (X) to make a recommendation for the use of topical calcipotriol (no eligible literature to comment on or reference).
(c) In patients with nail psoriasis, there is an additional and cumulative conditional strength recommendation (*) for the use of topical combination calcipotriol/betamethasone dipropionate.[5,6]
(d) In patients with nail psoriasis, there is an additional and cumulative conditional strength recommendation (*) for the use of topical tacrolimus.[7]

Table 1. Strength of recommendation ratings, symbols used in subsequent statements, and their corresponding definitions.

Strength of Recommendation	Symbol	Definition
Strong	**	High-quality body of evidence from robust, large, well-conducted trials, where benefits of treatment outweigh risks and adverse effects.
Conditional	*	Low-quality body of evidence from smaller studies and risks of bias where benefits of treatment, risks, and adverse effects are closely matched.
No recommendation	X	Insufficient evidence.
Against	Negative	Sufficient body of evidence where risks of treatment outweigh benefits.

Table 2. Recommendations for treatments of nail psoriasis.

Treatment/Agent	Strength of Recommendation		
	Insufficient (X)	Conditional (*)	Strong (**)
Topical agents	Corticosteroids Calcipotriol Tazarotene Cyclosporine	Combination calcipotriol/ betamethasone dipropionate Tacrolimus	
Procedural treatment	Phototherapy	Intralesional corticosteroids Pulsed dye laser	
Oral agents	Alitretinoin Dimethyl fumarates/fumaric acid esters	JAKi Apremilast Acitretin MTX Cyclosporine	
Biologic agents			IL-12/23i IL-17i IL-23i TNFi

IL-12/23i: interleukin 12/23 inhibitors; JAKi: Janus kinase inhibitors; MTX: methotrexate; TNFi: tumor necrosis factor inhibitors.

(e) In patients with nail psoriasis, there is insufficient additional evidence (X) to make a recommendation for the use of topical cyclosporine (no eligible literature to comment on or reference).
(f) In patients with nail psoriasis, there is insufficient additional evidence (X) to make a recommendation for the use of topical tazarotene.[8]

2. (a) In patients with nail psoriasis, there is a conditional strength recommendation (*) for the use of intralesional corticosteroids.[9]
(b) In patients with nail psoriasis, there is an additional and cumulative conditional strength recommendation (*) for the use of pulsed dye laser.[6,8,10-12]

3. In patients with nail psoriasis, there is an additional and cumulative conditional strength recommendation (*) for the use of oral MTX and cyclosporine (as monotherapies).[4,13-16]

4. In patients with nail psoriasis, there is insufficient evidence (X) to make a recommendation for the use of oral dimethyl fumarate/fumaric acid esters.[17]

5. In patients with nail psoriasis, there is insufficient evidence (X) to make a recommendation for the use of phototherapy (including ultraviolet A and B with psoralens).[16]

6. (a) In patients with nail psoriasis, there is insufficient evidence (X) to make a recommendation for the use of alitretinoin.[18]
(b) In patients with nail psoriasis, there is a conditional strength recommendation (*) for the use of acitretin.[4,19]

7. In patients with nail psoriasis, there is an additional and cumulative strong strength recommendation (**) for the use of TNFi.[20-24]

8. In patients with nail psoriasis, there is strong strength recommendation (**) for the use of IL-12/23 inhibitors.[25-27]

9. In patients with nail psoriasis, there is strong strength recommendation (**) for the use of IL-23 inhibitors.[28-34]

10. In patients with nail psoriasis, there is strong strength recommendation (**) for the use of IL-17 inhibitors.[35-38]

11. In patients with nail psoriasis, there is a conditional strength recommendation (*) for the use of JAKi.[39-46]

12. In patients with nail psoriasis, there is a conditional strength recommendation (*) for the use of apremilast.[47-54]

DISCUSSION

This GRAPPA systemic literature review strongly supports the use of biologic agents in the treatment of nail psoriasis. Another recent systematic review has also produced similar results with respect to systemic agents.[55] All other reviewed interventions had conditional or insufficient evidence for efficacy. It was out of the scope of this guideline to assess the effect of interventions on other associated conditions such as PsA.

Treatment of psoriatic nail disease is challenging, and despite the scarcity of evidence for many of the nonbiologic therapeutic options for psoriatic nail disease, these therapies continue to feature prominently in the armamentarium of clinicians. This may be driven by the extrapolation of anecdotal evidence or historical therapeutic algorithms and the perceived risk-benefit profile of these therapies. The existing evidence base for these therapies has been potentially hamstrung by publication and research bias, and large well-designed studies are needed to further evaluate the efficacy and safety of these agents.

Cost and access are also important considerations. While the evidence base for biologic agents is strong, it is important to recognize that some patients with nail psoriasis may not be able to access such agents. Even in state-funded healthcare systems across the world, access to these agents is typically governed by the body surface area affected, severity of symptoms, disability, or the coexistence of disease activity in other domains of psoriatic disease. Some patients affected by nail psoriasis may not qualify for such agents despite this study's recommendations.

There are a number of limitations in this review. Our search strategy focused on updating the evidence gathered in the

preceding GRAPPA literature review, and articles preceding 2013 were not reassessed. This may have led to some loss of historical data, particularly for conventional therapies. This may be one of the reasons that biologic agents are more favorably reported on in our study. A further loss of data may have occurred with the limitation of the literature review to full-text English-language articles.

The key aim of this review was to provide an easily interpreted account of the current literature for use in the clinical setting when making decisions about patients' treatment. All contributing authors followed the GRADE methodology, in which rigid, nonlinear, categorical recommendations are derived from the analysis of a body of evidence. Such categorization, although necessary to translate data into clinical recommendations, does not lend itself to a freely flowing narrative that highlights subtle differences in efficacy and adverse events between agents that have been placed in the same category of recommendation. Importantly, however, the significance of such differences is in itself difficult to adjudicate given the differences in study design and heterogeneity in outcome measures used across studies.

ACKNOWLEDGMENT

We thank Dr. Laura Coates, Dr. Arthur Kavanaugh, Dr. Enrique Soriano, and John Latella for their guidance and patience.

REFERENCES

1. Hadeler E, Mosca M, Hong J, Brownstone N, Bhutani T, Liao W. Nail psoriasis: a review of effective therapies and recommendations for management. Dermatol Ther 2021;11:799-831.
2. Armstrong AW, Tuong W, Love TJ, et al. Treatments for nail psoriasis: a systematic review by the GRAPPA nail psoriasis work group. J Rheumatol 2014;41:2306-14.
3. Balshem H, Helfand M, Schünemann HJ, et al. GRADE guidelines: 3. Rating the quality of evidence. J Clin Epidemiol 2011;64:401-6.
4. Rigopoulos D, Baran R, Chiheb S, et al. Recommendations for the definition, evaluation, and treatment of nail psoriasis in adult patients with no or mild skin psoriasis: a dermatologist and nail expert group consensus. J Amer Acad Dermatol 2019;81:228-40.
5. Tan ES, Oon HH. Effective treatment of severe nail psoriasis using topical calcipotriol with betamethasone dipropionate gel. Indian J Dermatol Venereol Leprol 2016;82:345-7.
6. Gregoriou S, Sidiropoulou P, Tsimpidakis A, et al. Treatment of nail psoriasis with calcipotriol/betamethasone dipropionate foam versus pulse dye laser: an unblinded, intra-patient, left-to-right prospective study. J Eur Acad Dermatol Venereol 2020;34:e519-20.
7. de Simone C, Maiorino A, Tassone F, D'Agostino M, Caldarola G. Tacrolimus 0.1% ointment in nail psoriasis: a randomized controlled open-label study. J Euro Acad Dermatol Venereol 2013;27:1003-6.
8. Huang YC, Chou CL, Chiang YY. Efficacy of pulsed dye laser plus topical tazarotene versus topical tazarotene alone in psoriatic nail disease: a single-blind, intrapatient left-to-right controlled study. Lasers Surg Med 2013;45:102-7.
9. Nantel-Battista M, Richer V, Marcil I, Benohanian A. Treatment of nail psoriasis with intralesional triamcinolone acetonide using a needle-free jet injector: a prospective trial. J Cutan Med Surg 2014;18:38-42.
10. Al-Mutairi N, Noor T, Al-Haddad A. Single blinded left-to-right comparison study of excimer laser versus pulsed dye laser for the treatment of nail psoriasis. Dermatol Ther 2014;4:197-205.
11. Arango-Duque LC, Roncero-Riesco M, Usero Bárcena T, Palacios Álvarez I, Fernández López E. Treatment of nail psoriasis with pulse dye laser plus calcipotriol betametasona gel vs. Nd:YAG plus calcipotriol betamethasone gel: an intrapatient left-to-right controlled study. Actas Dermosifiliogr 2017;108:140-4.
12. Goldust M, Raghifar R. Clinical trial study in the treatment of nail psoriasis with pulsed dye laser. J Cosmetic Laser Ther 2013 Oct 16 (Epub ahead of print).
13. Murdan S. Nail disorders in older people, and aspects of their pharmaceutical treatment. Int J Pharmaceut 2016;512:405-11.
14. Bardazzi F, Starace M, Bruni F, Magnano M, Piraccini BM, Alessandrini A. Nail psoriasis: an updated review and expert opinion on available treatments, including biologics. Acta Derm Venereol 2019;99:516-23.
15. Ventura A, Mazzeo M, Gaziano R, Galluzzo M, Bianchi L, Campione E. New insight into the pathogenesis of nail psoriasis and overview of treatment strategies. Drug Des Dev Ther 2017; 11:2527-35.
16. Demirsoy EO, Kıran R, Salman S, et al. Effectiveness of systemic treatment agents on psoriatic nails: a comparative study. J Drugs Dermatol 2013;12:1039-43.
17. Sticherling M, Mrowietz U, Augustin M, et al. Secukinumab is superior to fumaric acid esters in treating patients with moderate-to-severe plaque psoriasis who are naive to systemic treatments: results from the randomized controlled PRIME trial. Br J Dermatol 2017;177:1024-32.
18. Reich K, Graff O, Mehta N. Oral alitretinoin treatment in patients with palmoplantar pustulosis inadequately responding to standard topical treatment: a randomized phase II study. Br J Dermatol 2016;174:1277-81.
19. Haneke E. Nail psoriasis: clinical features, pathogenesis, differential diagnoses, and management. Psoriasis 2017;7:51-63.
20. Elewski BE, Okun MM, Papp K, et al. Adalimumab for nail psoriasis: efficacy and safety from the first 26 weeks of a phase 3, randomized, placebo-controlled trial. J Amer Acad Dermatol 2018;78:90-9.e1.
21. Mease PJ, Gladman DD, Collier DH, et al. Etanercept and methotrexate as monotherapy or in combination for psoriatic arthritis: primary results from a randomized, controlled phase 3 trial. Arthritis Rheumatol 2019;71:1112-24.
22. Mease PJ, Fleischmann R, Deodhar AA, et al. Effect of certolizumab pegol on signs and symptoms in patients with psoriatic arthritis: 24-week results of a phase 3 double-blind randomised placebo-controlled study (RAPID-PsA). Ann Rheum Dis 2014;73:48-55.
23. Vieira-Sousa E, Alves P, Rodrigues AM, et al. GO-DACT: a phase 3b randomised, double-blind, placebo-controlled trial of GOlimumab plus methotrexate (MTX) versus placebo plus MTX in improving DACTylitis in MTX-naive patients with psoriatic arthritis. Ann Rheum Dis 2020;79:490-8.
24. Elewski B, Rich P, Lain E, Soung J, Lewitt GM, Jacobson A. Efficacy of brodalumab in the treatment of scalp and nail psoriasis: results from three phase 3 trials. J Dermatol Treat 2022;33:261-265.
25. Rich P, Bourcier M, Sofen H, et al. Ustekinumab improves nail disease in patients with moderate-to-severe psoriasis: results from PHOENIX 1. Br J Dermatol 2014;170:398-407.
26. Bardazzi F, Lambertini M, Chessa MA, Magnano M, Patrizi A, Piraccini BM. Nail involvement as a negative prognostic factor in biological therapy for psoriasis: a retrospective study. J Euro Acad Dermatol Venereol 2017;31:843-6.
27. Szebényi J, Gede N, Hegyi P, et al. Efficacy of biologics targeting tumour necrosis factor-alpha, interleukin-17 -12/23, -23 and small molecules targeting JAK and PDE4 in the treatment of nail psoriasis: a network meta-analysis. Acta Dermato Venereol 2020;100:adv00318.

28. Reich K, Armstrong AW, Foley P, et al. Efficacy and safety of guselkumab, an anti-interleukin-23 monoclonal antibody, compared with adalimumab for the treatment of patients with moderate to severe psoriasis with randomized withdrawal and retreatment: results from the phase III, double-blind, placebo- and active comparator-controlled VOYAGE 2 trial. J Amer Acad Dermatol 2017;76:418-31.
29. Papp KA, Blauvelt A, Bukhalo M0, et al. Risankizumab versus ustekinumab for moderate-to-severe plaque psoriasis. N Engl J Med 2017;376:1551-60.
30. Orbai AM, Chakravarty SD, You Y, Kafka S, Karyekar CS, Merola JF. Efficacy of guselkumab in psoriasis patients with self-reported psoriatic arthritis with involvement of the scalp, nails, hands, and feet: a pooled analysis from 2 pivotal phase 3 psoriasis studies [abstract]. Arthritis Rheumatol 2018;70 Suppl 10.
31. Ohtsuki M, Kubo H, Morishima H, Goto R, Zheng R, Nakagawa H. Guselkumab, an anti-interleukin-23 monoclonal antibody, for the treatment of moderate to severe plaque-type psoriasis in Japanese patients: Efficacy and safety results from a phase 3, randomized, double-blind, placebo-controlled study. J Dermatol 2018; 45:1053-62.
32. Foley P, Gordon K, Griffiths CEM, et al. Efficacy of guselkumab compared with adalimumab and placebo for psoriasis in specific body regions: a secondary analysis of 2 randomized clinical trials. JAMA Dermatol 2018;154:676-83.
33. Blauvelt A, Papp K, Gottlieb A, et al. A head-to-head comparison of ixekizumab vs. guselkumab in patients with moderate-to-severe plaque psoriasis: 12-week efficacy, safety and speed of response from a randomized, double-blinded trial. Brit J Dermatol 2020; 182:1348-58.
34. Blauvelt A, Papp KA, Griffiths CEM, et al. Efficacy and safety of guselkumab, an anti-interleukin-23 monoclonal antibody, compared with adalimumab for the continuous treatment of patients with moderate to severe psoriasis: results from the phase III, double-blinded, placebo- and active comparator-controlled VOYAGE 1 trial. J Amer Acad Dermatol 2017;76:405-17.
35. Mease PJ, Smolen JS, Behrens F, et al. A head-to-head comparison of the efficacy and safety of ixekizumab and adalimumab in biological-naïve patients with active psoriatic arthritis: 24-week results of a randomised, open-label, blinded-assessor trial. Ann Rheum Dis 2020;79:123-31.
36. Kavanaugh A, Marzo-Ortega H, Vender R, et al. Ixekizumab improves patient-reported outcomes in patients with active psoriatic arthritis and inadequate response to tumour necrosis factor inhibitors: SPIRIT-P2 results to 52 weeks. Clin Exper Rheumatol 2019;37:566-74.
37. van der Heijde D, Gladman DD, Kishimoto M, et al. Efficacy and safety of ixekizumab in patients with active psoriatic arthritis: 52-week results from a phase III study (SPIRIT-P1). J Rheumatol 2018;45:367-77.
38. Genovese MC, Combe B, Kremer JM, et al. Safety and efficacy of ixekizumab in patients with PsA and previous inadequate response to TNF inhibitors: week 52 results from SPIRIT-P2. Rheumatol 2018;57:2001-11.
39. Mease P, Coates LC, Helliwell PS, et al. Efficacy and safety of filgotinib, a selective Janus kinase 1 inhibitor, in patients with active psoriatic arthritis (EQUATOR): results from a randomised, placebo-controlled, phase 2 trial. Lancet 2018;392:2367-77.
40. Asahina A, Etoh T, Igarashi A, et al. Oral tofacitinib efficacy, safety and tolerability in Japanese patients with moderate to severe plaque psoriasis and psoriatic arthritis: a randomized, double-blind, phase 3 study. J Dermatol 2016;43:869-80.
41. Merola JF, Elewski B, Tatulych S, Lan S, Tallman A, Kaur M. Efficacy of tofacitinib for the treatment of nail psoriasis: two 52-week, randomized, controlled phase 3 studies in patients with moderate-to-severe plaque psoriasis. J Am Acad Dermatol 2017;77:79-87.e1.
42. Merola JF, Qureshi A, Husni ME. Underdiagnosed and undertreated psoriasis: nuances of treating psoriasis affecting the scalp, face, intertriginous areas, genitals, hands, feet, and nails. Dermatol Ther 2018;31:e12589.
43. Papp KA, Menter MA, Abe M, et al. Tofacitinib, an oral Janus kinase inhibitor, for the treatment of chronic plaque psoriasis: results from two randomized, placebo-controlled, phase III trials. Brit J Dermatol 2015;173:949-61.
44. Mease P, Hall S, FitzGerald O, et al. Tofacitinib or adalimumab versus placebo for psoriatic arthritis. N Engl J Med 2017; 377:1537-50.
45. Gladman D, Rigby W, Azevedo VF, et al. Tofacitinib for psoriatic arthritis in patients with an inadequate response to TNF inhibitors. N Engl J Med 2017;377:1525-36.
46. Merola JF, Papp KA, Nash P, et al. Tofacitinib in psoriatic arthritis patients: skin signs and symptoms and health-related quality of life from two randomized phase 3 studies. J Euro Acad Dermatol Venereol 2020;34:2809-20.
47. Oak ASW, Ho-Pham H, Elewski BE. Improvement of 11 patients with nail psoriasis with apremilast: Results of an investigator-initiated open-label study. J Am Acad Dermatol 2020;83:1830-2.
48. Lanna C, Cesaroni GM, Mazzilli S, et al. Apremilast as a target therapy for nail psoriasis: a real-life observational study proving its efficacy in restoring the nail unit. J Dermatol Treat 2020; 32:1097-1101.
49. Papp K, Reich K, Leonardi CL, et al. Apremilast, an oral phosphodiesterase 4 (PDE4) inhibitor, in patients with moderate to severe plaque psoriasis: results of a phase III, randomized, controlled trial (Efficacy and Safety Trial Evaluating the Effects of Apremilast in Psoriasis [ESTEEM] 1). J Am Acad Dermatol 2015;73:37-49.
50. Reich K, Gooderham M, Bewley A, et al. Safety and efficacy of apremilast through 104 weeks in patients with moderate to severe psoriasis who continued on apremilast or switched from etanercept treatment: findings from the LIBERATE study. J Euro Acad Dermatol Venereol 2018;32:397-402.
51. Reich K, Gooderham M, Green L, et al. The efficacy and safety of apremilast, etanercept and placebo in patients with moderate-to-severe plaque psoriasis: 52-week results from a phase IIIb, randomized, placebo-controlled trial (LIBERATE). J Euro Acad Dermatol Venereol 2017;31:507-17.
52. Strober B, Bagel J, Lebwohl M, et al. Efficacy and safety of apremilast in patients with moderate plaque psoriasis with lower BSA: week 16 results from the UNVEIL study. J Drugs Dermatol 2017;16:801-8.
53. Stein Gold L, Bagel J, Lebwohl M, et al. Efficacy and safety of apremilast in systemic- and biologic-naive patients with moderate plaque psoriasis: 52-week results of UNVEIL. J Drugs Dermatol 2018;17:221-8.
54. Paul C, Cather J, Gooderham M, et al. Efficacy and safety of apremilast, an oral phosphodiesterase 4 inhibitor, in patients with moderate-to-severe plaque psoriasis over 52 weeks: a phase III, randomized controlled trial (ESTEEM 2). Br J Dermatol 2015;173:1387-99.
55. Zhang X, Xie B, He Y. Efficacy of systemic treatments of nail psoriasis: a systemic literature review and meta-analysis. Front Med 2021;8:620562.