

Assessment of Management Lines of Nail Psoriasis: Review Article

Magda Mokhtar Tweer*, Amany Abdulrahman Nassar, Fathia Mohammed Khattab

Department of Dermatology, Venereology & Andrology, Faculty of Medicine, Zagazig University, Egypt

*Corresponding author: Magda Mokhtar Tweer, Mobile: (+20) 01217143808, E-Mail: almagida421@gmail.com

ABSTRACT

Background: In cases when only the nails are affected by psoriasis, treatment has proven extremely difficult. Psoriatic nail alterations may begin as a Koebner isomorphic reaction to mechanical damage, just as with cutaneous psoriasis. Clinicians should advise patients to take the required safety measures to reduce the risk of the Koebner phenomenon. Gloves and hand lotions can protect hands from harm and encourage short nails.

Objective: Review of literature about assessment of management lines of nail psoriasis

Methods: We searched PubMed, Google Scholar, and Science Direct for relevant articles on nail psoriasis and management. However, only the most recent or thorough study was taken into account between January 2012 and March 2022. The authors also evaluated the value of resources culled from other works in the same genre. Therefore, documents written in languages other than English have been ignored due to a lack of translation funds. Unpublished works, oral presentations, conference abstracts, and dissertations were generally agreed upon not to qualify as scientific research.

Conclusion: In cases when only the nails are affected by psoriasis, treatment has proven extremely difficult. The major causes of this problem are the sluggish growth rate of the nails and the low penetration of topical drugs. Treatment options such as etanercept, intralesional corticosteroids, ustekinumab, acitretin, methotrexate sodium, and adalimumab are suggested for patients with severe nail disease that has not responded to topical medication. Ustekinumab, adalimumab as well as etanercept, are highly advised for people with severe skin and nail disorders. Also, methotrexate, acitretin, infliximab, and apremilast are suggested.

Keywords: Nail psoriasis, Koebner phenomenon, Management.

INTRODUCTION

Patient's quality of life is negatively impacted by psoriasis since it is a chronic, inflammatory skin condition mediated by T-cells that imposes a heavy emotional and social load on sufferers. It occurs more frequently in high-income countries and places with ageing populations than in other places ⁽¹⁾. Anyone of any age can develop psoriasis. However, there appears to be a bimodal distribution of disease onset, with peaks around the ages of 20–30 and 50–60. This illness seems to run in families. About 30% of people have a first-degree relative with psoriasis, and the risk of developing psoriasis rises in proportion to the number of affected family members ⁽²⁾.

Psoriasis is characterized by widespread skin inflammation, and nails can be affected anywhere from 47.4% to 78.3% of the time. Clinical symptoms of nail bed and nail matrix psoriasis include pitting, onycholysis, subungual hyperkeratosis, and discolouration of the nail plate. There can be serious consequences for a patient's quality of life when they suffer from severe nail disease and functional impairment ⁽³⁾.

Fingernails and toenails are encased in a system called the nail. The nail structure shields the fingertips from harm and improves the fingers' dexterity when handling little objects. The psychological, cosmetic, physical, and financial burdens of nail psoriasis can be substantial, despite the relatively tiny, afflicted area. However, due to the nail's unique anatomy and protracted growth cycle, treating nail psoriasis can be challenging ⁽⁴⁾.

Nail psoriasis therapies sometimes fail because they cannot get through the hydrophilic gel structure of the nail plate (which is extensively keratinized) ⁽³⁾.

There is a broad range in reported rates of nail psoriasis prevalence, from 6.4% to 81.8% ⁽⁵⁾. Psoriasis with severe nail involvement tends to be more persistent and last longer than psoriasis with less severe nail involvement. However, some estimates suggest that as many as 40% of patients with moderate psoriasis also experience nail psoriasis ⁽⁶⁾.

A 6% prevalence has been found by Pasch ⁽⁷⁾. The most common clinical manifestation of nail psoriasis is pitting, which primarily affects male patients. Early onset of cutaneous psoriasis is also linked to this subtype.

Management of nail psoriasis

Psoriatic nail alterations may begin as a Koebner isomorphic reaction to mechanical damage, just as with cutaneous psoriasis. Clinicians should advise patients to take the required safety measures to reduce the risk of the Koebner phenomenon. Nail damage can be avoided and maintenance of short nails aided by the use of gloves and emollient creams. Bad habits like biting or tearing at one's nails, especially when one is young, need to be overcome. Applying and removing nail polish, over-manicuring, and wearing shoes that are too tight are all things that might exacerbate the symptoms of nail psoriasis. In order to increase patient adherence, it is important to stress the need for long-term treatment due to the nail's slow growth rate (3–4 mm per month, or 5-7 months from the nail matrix to the distal fingertip) ⁽⁴⁾.

In cases when only the nails are affected by psoriasis, treatment has proven extremely difficult. The major causes of this problem are the sluggish growth rate of the nails and the low penetration of topical drugs. Patients with severe nail disease who have not responded to topical treatment might consider etanercept, intralesional corticosteroids, acitretin, ustekinumab, adalimumab, and methotrexate sodium⁽⁸⁾. The treatment of cutaneous and nail psoriasis has been transformed by the development of highly effective drugs with long-lasting effects. Considerations for treatment and upkeep include the severity of nail damage, the presence of cutaneous or joint disease, the presence of comorbidities, and the effect on the patient's quality of life. In general, patients should be advised to avoid anything that could cause irritation, including long fingernails, manicures, biting their nails, and working without gloves⁽⁹⁾.

Management options consisted of⁽⁹⁾:

- (1) Vitamin D derivatives, corticosteroids, fluorouracil, calcineurin inhibitors, dithranol, and tazarotene are all used topically.
- (2) Intralesional corticosteroids.
- (3) Systemic therapy including retinoids, methotrexate, cyclosporine and apremilast.
- (4) Laser therapies, phototherapy and radiotherapy.
- (5) Biologic therapies including infliximab, adalimumab, etanercept, ustekinumab, secukinumab, ixekizumab, brodalumab, guselkumab and risankizumab.

(1) Topical treatment:

1. Corticosteroids: When it comes to treating nail psoriasis with topical corticosteroids, there are no set guidelines. However, in practice, high-potency corticosteroids are typically given under occlusion for extended durations. Psoriasis that affects the nail matrix seems to have a better prognosis than when it affects the nail bed. The most widely advocated topical therapy is clobetasol propionate in a 0.05% cream or gel carrier. However, you should think about the possibility of distal phalanx atrophy and finger loss as a result of persistent use⁽¹⁰⁾.

2. Vitamin D derivatives (calcitriol, tacalcitol & calcipotriol): Vitamin D derivatives are beneficial when used alone or in combination with topical corticosteroids because they suppress T-cell activity and cytokine production and inhibit keratinocyte proliferation and differentiation. It would suggest that they are more successful in protecting the nail bed from harm than the matrix. Their negative consequences include redness, itching, and burning around the periungual area⁽¹¹⁾.

3. Fluorouracil: The thymidylate synthase is an enzyme that is inhibited by fluorouracil, a pyrimidine analogue. Nail psoriasis has been treated with topical 5-

fluorouracil (5-FU) at 1% and 5 % concentrations, although the outcomes have been inconsistent. Side effects including discomfort, infection, hyperpigmentation, nail loss, onycholysis, and skin irritation have limited its usage in treating psoriatic nails⁽¹²⁾.

4. Calcineurin inhibitors (tacrolimus): Psoriasis of the nail bed or nail matrix can be effectively treated with tacrolimus. The immunosuppressive effects of tacrolimus in ointments of 0.1% and 0.03 % have been shown to be beneficial in the treatment of nail psoriasis. The initial course of treatment will be brief in order to gauge how well it works. If it works, it might be implemented permanently (6-12 months). Twice a day, apply a thin coating of ointment to the affected area(s) and rub it in gently and completely⁽¹¹⁾.

5. Dithranol: Dithranol, a derivative of the carcinogen anthracene, suppresses inflammation and inhibits cell proliferation. Sixteen out of twenty patients showed improvement after using anthralin ointment with a concentration of 0.4% to 2%, most notably with onycholysis and subungual hyperkeratosis. For five months, the ointment was administered for thirty minutes each day. Nail inflammation and discoloration were reported as side effects⁽¹³⁾.

6. Tazarotene: In occlusion, tazarotene shows promise in treating nail bed disease, but side effects such as erythema, scaling, irritation, and paronychia may restrict its usefulness⁽¹⁴⁾.

(2) Intralesional therapy:

(a) Intralesional corticosteroids: Nail psoriasis cases with mild to moderate illness are better candidates for intralesional injections. The only intralesional therapy for nail psoriasis that has shown any promise is the injection of corticosteroids directly into the nail matrix or nail bed. A local anaesthetic administered with a 28-30 G needle reduces intra- and post-procedural pain (main adverse effect). A distal injection into the nail bed is favoured when treating the nail matrix, whereas a proximal injection into the dermis of the lateral nail folds is preferred when treating the nail matrix⁽¹⁵⁾.

Psoriatic nails with merely matrix anomalies are often treated with intralesionally injected triamcinolone acetonide (TA) 10 mg/mL for 6-12 sessions at one-month intervals, followed by further sessions at longer (two-month) intervals. The new treatment plan still calls for four periungual injections, but the steroid will be injected more evenly into the nail matrix and nail bed⁽¹⁶⁾.

Srisinlapakig and Juntongjin⁽¹⁷⁾ found that nail psoriasis with minimal or no psoriatic skin lesion, examined the clinical efficacy of intralesional TA injection, and advised it. NAPSI ratings for nail matrix and nail bed lesions decrease after intralesional TA injection, suggesting that this treatment is beneficial.

However, **Pasch** ⁽⁷⁾ reported nail plate loss, reversible nail-fold atrophy, and extensor tendon rupture were reported following intralesional steroid treatments, as were short-term paresthesia, localised discomfort, hematoma development, and nail plate loss (3-7). There is a wide range of clinical efficacy and duration of remission after intralesional TA. **Üstüner et al.** ⁽¹⁸⁾ reported that patients with fingernail psoriasis were studied to determine the efficacy and safety of intralesional injections of triamcinolone acetonide. There was either no change or a worsening in six TA nails, whereas two nails improved nearly or fully. Additionally, 48% (n=15) of patients showed clinical improvement of 50% or more after TA treatment. Involvement of the nail bed is evidenced by subungual hyperkeratosis and onycholysis. Also, they found that corticosteroids alleviate these symptoms. Psoriatic nail symptoms include nail matrix and nail bed involvements that may respond better to triamcinolone. The most significant drawback of intralesional administration is the discomfort felt, especially when injecting into the distal nail fold. This medication is most appropriate for patients whose nail psoriasis is mild to moderate, or who have only a few nails affected ⁽¹⁸⁾.

(b) Intralesional methotrexate: Although intralesional methotrexate has been shown to be beneficial in treating fingernail psoriasis in a single case study involving 30 psoriatic fingernails from four individuals, no research have evaluated the efficacy of intralesional TA and methotrexate ⁽¹⁵⁾.

(c) Intralesional botox:

Botulinum toxin type A (BoNT-A) has numerous medicinal uses. There are skin conditions where botulinum toxin (BTX) is recommended. In the treatment of nail psoriasis, it can be used either independently or as an adjuvant to other medications. Patients were happy after just one dose. Ring-block anaesthetic is used since the process is uncomfortable ⁽¹⁹⁾. BoNT-A has shown promising results in treating inverse psoriasis, the first kind of psoriasis to be treated in this way. The decrease in hyperhidrosis was the primary factor in the positive outcome, but BoNT-efficacy was also documented in cases of chronic plaque psoriasis. Psoriasis flares are triggered by stress in a way that is mediated by major neuromodulators such as substance P (SP), calcitonin gene-related peptide (CGRP), vasoactive intestinal peptide (VIP), and nerve growth factor ⁽²⁰⁾.

Aschenbeck et al. ⁽²¹⁾ examined how Ona-BTX affected persistent plaque psoriasis. Epidermal nerve density and SP/CGRP expression were analysed using immunohistochemistry. Although Ona-BTX injection resulted in a decrease in the abnormal expressions of SP and CGRP in psoriatic skin, the difference was not statistically significant. **González et al.** ⁽²²⁾ reported that BoNT injections have been demonstrated to reduce the

severity of psoriasis plaques in eight patients. Two of the patients said the itching from their lesions had significantly subsided. No one experienced any negative side effects from the BoNT injections, and nobody dropped out of the trial.

BoNT's method of action in psoriatic skin and nails needs more study. Longer-lasting benefits in this difficult group may be achievable thanks to an effect in nails, which has a somewhat longer doubling time in comparison with skin. Further, this may prevent the expense and potential systemic side effects of immunosuppressive therapy medications, which are often reserved for more severe cases with intermediate PASI scores and nail involvement ⁽²⁰⁾.

(3) Systemic therapy:

Patients with widespread nail psoriasis or those with nail psoriasis in addition to cutaneous or joint symptoms are best served by systemic therapies. Systemic treatment is normally reserved for patients with more than three damaged nails, those who do not improve with topical treatment, or those whose quality of life has been seriously impaired by the disease. This is especially true for patients who also suffer from skin manifestations and arthritic symptoms ⁽²³⁾.

1. Retinoids: Retinoids are mimics of vitamin A that modulate the immune system and influence epidermal differentiation and proliferation. Psoriasis treatment options include etretinate and acitretin. Since retinoids can cause birth defects, they should only be used in extreme cases where other treatments have failed ⁽¹²⁾.

It has been found that retinoids had a moderate effect on nail psoriasis, leading to a 40%-50% improvement in the NAPSI. When compared to the usual doses indicated for cutaneous psoriasis (0.3-0.6 mg/kg per day), these are much more manageable. Although the effects of retinoids take time to show, they can be taken repeatedly for extended periods of time without risk. Cheilitis and scaling are two common undesirable side effects ⁽²⁴⁾.

2. Methotrexate: It appears that methotrexate is the most effective treatment for psoriasis of the nail matrix. Results on the NAPSI are mixed, at best showing a 40% to 50% increase in effectiveness. When treating cutaneous psoriasis, the same dosages are applied. Compared to biologic medicines, methotrexate has a lower efficacy ⁽²⁵⁾.

3. Cyclosporine: Both psoriasis of the nail bed and psoriasis of the nail matrix respond well to cyclosporine treatment. It works well on its own, but when taken with calcipotriol, the effects are magnified. Due to the potential of kidney damage, its use is restricted to around a year at most ⁽²⁶⁾.

4. Apremilast: The NAPSI score improved by 60% after 52 weeks of treatment with apremilast, proving

effective against psoriasis of the nail matrix and nail bed⁽²⁷⁾.

Rich *et al.*⁽²⁸⁾ demonstrated a substantial improvement in nail psoriasis symptoms with apremilast, as measured by a higher NAPS150 response compared to placebo from week 16 to week 52.

(4) Laser therapies, phototherapy and radiotherapy:

Nail psoriasis has been treated with a wide variety of non-pharmaceutical methods, such as phototherapy, photodynamic therapy, superficial radiation, Grenz raytherapy, and laser therapy. Due to the wide variation in outcomes, routine clinical use of these medicines is not suggested⁽²⁹⁾.

Nail psoriasis does not respond particularly well to narrow-band UVB phototherapy or photochemotherapy with UVA + oral psoralen (PUVA). Rarely used treatments for nail psoriasis include electron beam therapy, Grenz rays, and superficial radiation⁽¹²⁾.

Nail psoriasis has been treated using photodynamic therapy (PDT) and pulsed dye laser (PDL) in recent years, because of their efficacy in treating plaque psoriasis. Matrix and nail bed lesions of psoriatic nails showed significant recovery with decreased NAPS1 scores after PDL or PDT treatment⁽³⁰⁾.

Nail psoriasis can be treated with intense pulsed light (IPL) by setting the parameters as follows: 550-nm filter, 2.5-4.5 cm spot area, 11.25 cm total area, 20 ms pulse duration, 25 J/cm² fluence. NAPS1 scores were taken before treatment began and again after 6 months of twice-monthly sessions. Assessments were made after 1, 6, and 12 months. It worked, and it didn't hurt⁽³¹⁾.

1. Laser therapy: A growing range of skin and nail problems have been said to respond to laser treatment, making it a promising new alternative in physical therapy. PDL (595 nm) therapy is also an option for those suffering from nail psoriasis. The therapeutic effect of the laser is thought to be attributable to its effect on angiogenesis and vascularity in the psoriatic nail unit⁽²⁸⁾.

Laser therapy has a wide range of reported NAPS1 improvement, from 2% at 6 months to 86% at 1 month. NAPS1 scores have also been observed to drop quickly during the first two months of treatment before rising significantly during the third month of treatment. Several PDL procedures have been proposed for the treatment of nail psoriasis. However, when comparing a 6-ms pulse duration, 9 J/cm² spot size, and a 0.45-ms, 6 J/cm² spot size, no significant differences were found. Some research has looked into using PDL in tandem with photodynamic therapy or tazarotene⁽³²⁾. The NAPS1 results were not affected by the addition of photodynamic therapy with methylaminolevulinic acid or tazarotene. However, after 6 months of treatment, a considerably larger percentage of patients experienced improvement in PGA and SGA scores with topical

tazarotene plus PDL. Pain is the most common adverse reaction to PDL therapy and can linger for up to 24 hours. Additional side effects include the development of petechiae and hyperpigmentation in the nail folds (30% of individuals). When a greater pulse duration is used, not only is pain more severe, but so are petechiae⁽³²⁾.

2. Excimer laser:

The use of an excimer laser to treat psoriasis was first reported in 1997. Ultraviolet B (UVB) full-body treatments were compared to the targeted ultraviolet light of the excimer laser. The improved efficacy of excimer lasers may be explained by the higher intensity of the UVB light they produce. Using a laser with a high energy of 308 nanometers, which has been FDA-approved since 2000, to treat only the skin that is actively affected by moderate to mild psoriasis has become common practice. T cell death induced by excimer laser is accompanied by DNA conformational changes that suppress cytokine production. After determining the minimal erythema dose (MED) on unaffected skin and assessing the severity of nail psoriasis in each hand using an objective score called the Nail Psoriasis Severity Index, treatment can begin for patients with clinically significant changes in the nail (NAPS1). Patients get radiation therapy for up to 12 weeks (24 sessions) at a maximum dosage of 5,000 mJ/cm² with a fluence increase of 200 every session when a suitable dose has been determined⁽³²⁾.

Al-Mutairi *et al.*⁽³⁰⁾ compared the effectiveness of laser Excimer and Pulsed Dye Laser in treating ingrown toe nails in a sample of 42 patients with a total of 304 nail replacements over a 12-week treatment period and a 12-week follow-up. Patients were enrolled if they met the following criteria: they had psoriatic nail disease, characterised by pitting, discoloration, thickening, onycholysis, longitudinal ridging, subungual hyperkeratosis, splinter haemorrhages, oil drops, and salmon patches, and were at least 16 years old and resistant to other topical treatments.

NAPS1 scores were taken at baseline, weeks 4, 8, 12, and 24 to determine the severity of nail disease. Excimer laser treatment was found to be superior to PDL in terms of mean NAPS1 decrease after 3 months of treatment, despite the fact that there was no statistically significant difference in NAPS1 scores between the two groups at baseline. The excimer laser readings started at 29.8 and was reduced to 11.8% by the third month, and then stabilized at 16.3% by the end. Oil drops and splinter haemorrhages had a minor effect, and subungual hyperkeratosis and onycholysis improved the most. The PDL was found to be more effective and take less time than the excimer laser in treating nail psoriasis⁽³⁰⁾. **Abrouk *et al.***⁽³³⁾ reported that excimer laser has been shown to be effective in treating both nail psoriasis and localised plaque psoriasis. Excimer laser therapy for psoriatic nails may offer some benefits, including fewer side effects and better nail modifications.

3. Phototherapy (topical, systemic and photodynamic):

The term "phototherapy" is used to describe a treatment method that makes use of the curative effects of light waves on a variety of diseases. Light of varying wavelengths (UVA, UVB & visible light) is utilised in dermatology, sometimes in conjunction with photosensitizers either topically or taken orally. All of these phototherapeutic approaches have been studied for their potential to treat nail psoriasis. Photodynamic therapy for nail psoriasis has been shown to be ineffective both on its own and in combination with other treatments. Oral or topical psoralens used in conjunction with PUVA phototherapy appear to be effective in treating nail bed and nail matrix diseases ⁽²⁸⁾.

Supplementing PUVA with oral retinoid increased NAPSI improvement from 69 to 85% in a short, retrospective study. Treatment of nail psoriasis using NB-UVB therapy with the Excimer laser appears to be significantly less effective, if any effective at all ⁽²⁸⁾.

The positive effects of UVA and NB-UVB are especially impressive given that only 1.65% of UVA radiation makes it through the average person's fingernails while UVB is completely blocked. One main risk of PUVA therapy is the development of non-melanoma skin cancer in those who undergo it for prolonged periods of time ⁽⁷⁾.

4. Radiotherapy:

Nail psoriasis patients rarely receive radiotherapy as part of standard clinical management. The effectiveness of electron beam therapy, Grenz ray therapy, and surface radiation was verified. Nail psoriasis improvement from these therapies was typically mild and transient, and local hyperpigmentation was a common side effect. Radiotherapy is not advised for the long-term treatment of nail psoriasis due, in part, to safety concerns ⁽⁷⁾.

Biologic therapies:

In nail psoriasis, many biologic medicines have been shown to generate primary and secondary responses. Visible improvements are often noted beginning around week 12, which is noticeably later than the response time for cutaneous psoriasis. Nails on the fingers tend to grow more quickly, therefore they tend to improve before toe nails. Patients with better reactions in the skin and joints also have better responses in the nails. However, it has not been shown that the presence or absence of PsA is unrelated to the degree to which nail psoriasis improves after treatment with a biologic medication ⁽²⁷⁾.

CONCLUSION

In cases when only the nails are affected by psoriasis, treatment has proven extremely difficult. The major causes of this problem are the sluggish growth rate of

the nails and the low penetration of topical drugs. Treatment options such as etanercept, intralesional corticosteroids, ustekinumab, acitretin, methotrexate sodium and adalimumab are suggested for patients with severe nail disease that has not responded to topical medication. Ustekinumab and adalimumab as well as etanercept are highly advised for people with severe skin and nail disorders. Also, methotrexate, acitretin, infliximab, and apremilast are suggested.

Supporting and sponsoring financially: Nil.

Competing interests: Nil.

REFERENCES

1. **El Dein M, Asmaa H, Magda K et al. (2021):** Valosincontaining protein in psoriasis: a clinical and immunohistochemical study. *Applied Immunohistochemistry and Molecular Morphology*, 29 (8): 68-72.
2. **Fernández-Armenteros J, Gómez-Arbonés X, Buti-Solé M et al. (2019):** Epidemiology of psoriasis: A population-based study. *Actas Dermo-Sifiligráficas (English Edition)*, 110 (5): 385-392.
3. **Rachakonda T, Schupp C, Armstrong A (2014):** Psoriasis prevalence among adults in the United States. *J Am Acad Dermatol.*, 70: 512-6.
4. **Zhou X, Zhang J, Chen K (2022):** Nail psoriasis: Treatment options and management strategies in special patient populations. *Int J Dermatol Venereol.*, 5 (1): 32-39.
5. **Gregory A, Denniss A (2018):** An introduction to writing narrative and systematic reviews--tasks, tips and traps for aspiring authors. *Heart Lung Circ.*, 27: 893-8.
6. **Hallaji Z, Babaeijandaghi F, Akbarzadeh M et al. (2012):** A significant association exists between the severity of nail and skin involvement in psoriasis. *J Am Acad Dermatol.*, 66: 12-13.
7. **Pasch M (2016):** Nail psoriasis: A review of treatment options. *Drugs*, 76: 675-705.
8. **Crowley J, Weinberg J, Wu J et al. (2015):** Treatment of nail psoriasis: best practice recommendations from the Medical Board of the National Psoriasis Foundation. *JAMA Dermatol.*, 151: 87-94.
9. **Reich K, Sullivan J, Arenberger P et al. (2021):** Secukinumab shows high and sustained efficacy in nail psoriasis: 2.5-year results from the randomized placebo-controlled TRANSFIGURE study. *Br J Dermatol.*, 184: 425-36.
10. **Kole L, Cantrell W, Elewski B (2014):** A randomized, double-blinded trial evaluating the efficacy and tolerability of veticointment (calcitriol 3 mcg/g ointment) when compared to betamethasone disproportionate ointment (64 mg/g) in patients with nail psoriasis. *J Drugs Dermatol.*, 13: 912-15.
11. **De Simone C, Maiorino A, Tassone F et al. (2013):** Tacrolimus 0.1% ointment in nail psoriasis: a randomized controlled open-label study. *J Eur Acad Dermatol Venereol.*, 27: 1003-1006.
12. **Oram Y, Akkaya A (2013):** Treatment of Nail Psoriasis: Common Concepts and New Trends. *Dermatol Res Pract.*, 13: 180496. doi: 10.1155/2013/180496

13. **Tan E, Chong W, Tey H (2012):** Nail psoriasis: a review. *Am J Clin Dermatol.*, 13 (6): 375-88.
14. **Fischer-Levancini C, Sánchez-Regaña M, Llambí F et al. (2012):** Nail psoriasis: treatment with tazarotene 0.1% hydrophilic ointment. *Actas Dermosifiliogr.*, 103: 725-8.
15. **Grover C, Bansal S (2018):** A compendium of intralesional therapies in nail disorders. *Indian Dermatol Online J.*, 9: 373-82.
16. **Rigopoulos D, Baran R, Chiheb S et al. (2019):** Recommendations for the definition, evaluation, and treatment of nail psoriasis in adult patients with noor mild skin psoriasis: a dermatologist and nail expert group consensus. *J Am Acad Dermatol.*, 81: 228-40.
17. **Srisinlapakig S, Juntongjin P (2022):** Intralesional triamcinolone acetonide injection and topical betamethasone/calcipotriol treatment in nail psoriasis. *Proceedings of RSU International Research Conference*, Pp: 1-7. <https://rsucon.rsu.ac.th/files/proceedings/RUSUSCI2022/IN22-007.pdf>
18. **Üstüner P, Balevi A, Ozdemir M (2018):** The comparison of the efficacy and safety of intralesional triamcinolone acetonide and methotrexate injections for the treatment of fingernail psoriasis. *Journal of Ankara University Faculty of Medicine*, 71 (2): 145-151.
19. **Lewandowski M, Świerczewska Z, Barańska-Rybak W (2022):** Off-Label Use of Botulinum Toxin in Dermatology-Current State of the Art. *Molecules (Basel, Switzerland)*, 27 (10): 3143. doi: 10.3390/molecules27103143.
20. **Botsali A, Erbil H (2021).** Management of nail psoriasis with a single injection of abobotulinum toxin. *Journal of Cosmetic Dermatology*, 20 (5): 1418-1420.
21. **Aschenbeck K, Hordinsky M, Kennedy W et al. (2018):** Neuromodulatory treatment of recalcitrant plaque psoriasis with onabotulinumtoxin A. *Journal of the American Academy of Dermatology*, 79 (6): 1156-1159.
22. **González C, Franco M, Londoño A et al. (2020).** Breaking paradigms in the treatment of psoriasis: Use of botulinum toxin for the treatment of plaque psoriasis. *Dermatologic Therapy*, 33 (6): e14319. doi: 10.1111/dth.14319.
23. **Canal-Garcia E, Bosch-Amate X, Belinchon I et al. (2022):** Nail psoriasis. *ACTAS Dermo-Sifiliograficas*, 113: 481-490.
24. **Fenton L, Dawe R (2016):** Six years' experience of grenz ray therapy for the treatment of inflammatory skin conditions. *Clin Exp Dermatol.*, 41: 864-70.
25. **Ricceri F, Pescitelli L, Tripo L et al. (2013):** Treatment of severe nail psoriasis with acitretin: an impressive therapeutic result. *Dermatol Ther.*, 26: 77-8.
26. **Papp K, Reich K, Leonardi C et al. (2015):** 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.*, 73: 37-49.
27. **Lanna C, Cesaroni G, Mazzilli S et al. (2022):** Apremilast as a target therapy for nail psoriasis: areal-life observational study proving its efficacy in restoring the nail unit. *J Dermatolog Treat.*, 33 (2): 1097-1101.
28. **Rich P, Gooderham M, Bachelez H et al. (2016):** Apremilast, an oral phosphodiesterase 4 inhibitor, in patients with difficult-to-treat nail and scalp psoriasis: results of 2 phase III randomized, controlled trials (ESTEEM 1 and ESTEEM 2). *J Am Acad Dermatol.*, 74 (1): 134-42.
29. **Maranda E, Nguyen A, Lim V et al. (2016):** Laser and light therapies for the treatment of nail psoriasis. *J Eur Acad Dermatol Venereol.*, 30: 1278-84.
30. **Al-Mutairi N, Noor T, Al-Haddad A (2014):** Single Blinded Left-to-Right Comparison Study of Excimer Laser Versus Pulsed Dye Laser for the Treatment of Nail Psoriasis. *Dermatol Ther.*, 4: 197-205.
31. **Tawfik A (2014):** Novel treatment of nail psoriasis using the intense pulsed light: a one-year follow-up study. *Dermatologic Surgery*, 40 (7): 763-768.
32. **Thaci D, Unnebrink K, Sundaram M et al. (2015):** Adalimumab for the treatment of moderate to severe psoriasis: subanalysis of effects on scalp and nails in the BELIEVE study. *J Eur Acad Dermatol Venereol.*, 29 (2): 353-60.
33. **Abrouk M, Levin E, Brodsky M et al. (2016):** Excimer laser for the treatment of psoriasis: safety, efficacy, and patient acceptability. *Psoriasis (Auckl)*, 6: 165-173.