A comparative study of combined microneedling and latanoprost versus microneedling alone in the treatment of vitiliginous facial lesions

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Received: 31 May 2024
Accepted: 17 September 2024

Background: Latanoprost has been recently shown to have promising effect on skin repigmentation and the treatment of vitiligo. This study aims to evaluate the efficacy of micro-needling combined with latanoprost compared to micro-needling alone.

Methods: This prospective clinical trial was conducted on 30 lesions from 15 patients presenting with stable facial vitiligo. In each patient, one lesion was treated with latanoprost 0.005% solution, applied daily for 3 months, while both lesions underwent microneedling (3 sessions at 4-week intervals). Clinical outcomes were assessed 6 months after treatment initiation by two independent dermatologists.

Results: Clinical improvement was observed in most patients in both groups of facial lesions. However, this improvement was significantly more pronounced in lesions treated with microneedling combined with latanoprost compared to those treated microneedling alone ($P = 0.009$).

Conclusion: We suggest that combining skin microneedling with latanoprost is an effective and safe therapeutic option for treating facial vitiligo lesions.

Keywords: microneedling, latanoprost, vitiligo, combination therapy, facial lesions

Iran J Dermatol 2025; 28: 233-237

DOI: 10.22034/ijd.2024.460451.1851

Please cite this article as: Ehsani A, Ghabel S, Balighi K, Nourmohammadpour P, Nasimi M, Azizpour A, Ehsani A, Homayouni M, Aryanian Z, Hatami P. A comparative study of combined microneedling and latanoprost versus microneedling alone in the treatment of vitiliginous facial lesions. Iran J Dermatol. 2025; 28(4): 233-237.

What is already known on the subject?

- Latanoprost is an analogue of prostaglandin F2 alpha (PGF2α).
- It has been recently used for treatment of vitiligo, especially depigmented eyelid lesions.

The study's main messages:

- We compared the efficacy of micro-needling plus latanoprost in comparison with micro-needling alone in facial lesions.
- We found that the improvement was significantly more prominent in lesions treated by micronnedling plus latanoprost in comparison with those underwent microneedling alone.

INTRODUCTION

Vitiligo is a prevalent autoimmune cutaneous disorder characterized by the destruction of melanocytes, resulting in progressive appearance of depigmented macules across the skin [1].

Despite the emergence of various treatment modalities, complete clearance of vitiligo lesions remains challenging and often requires combination therapy for many patients. Some medications that cause hyperpigmentation as a side effect, such as 5-fluorouracil (5-FU) and latanoprost, have been tried for treating vitiligo [2-4].

Latanoprost is an analogue of prostaglandin F2 alpha (PGF2α) initially used as a topical medication for glaucoma [2], with a potential adverse effect of hyperpigmentation of the iris, eyelashes, and periocular skin [4]. Consequently, it has recently been employed for the treatment of vitiligo, particularly depigmented eyelid lesions [4]. The efficacy of latanoprost in promoting cutaneous repigmentation has been investigated both as a monotherapy and in combination with other modalities such as NB-UVB phototherapy, CO2 fractional laser, and microneedling, although results have been inconsistent [3,5-7]. In this study, we aimed to evaluate the efficacy of microneedling combined with latanoprost compared to microneedling alone in the treatment of facial vitiliginous lesions.

METHODS

We designed a prospective clinical trial involving patients with a confirmed diagnosis of vitiligo who visited the dermatology outpatient clinic at a tertiary care hospital from August 2022 to May 2023. Inclusion criteria included patients aged 16 to 65 years, having at least two depigmented patches on the face, and stable vitiligo disease for at least three months. Patients with segmental vitiligo, those who had received any treatment for vitiligo in the previous three months, pregnant or breastfeeding women and individuals with any systemic disease were excluded.

The study protocol was approved by the TUMS Research Ethics Committee (IR.TUMS.MEDICINE.REC.1400.1455), and informed consent was obtained from all patients prior to their participation in the study.

After the initial visit by a dermatologist, two facial depigmented patches, each with a surface area of less than 15 cm^2, were selected and photographed. One of the patches, chosen at random, was treated once daily for three months with a 0.005% solution of latanoprost (Xalatan®). Both patches underwent three microneedling sessions at four-week intervals using Dermapen (Korea MYM Derma Pen Rechargeable with Adapter Power Supply, Model: AU002), with a needle depth ranging from 0.5 to 1 mm, as established in previous studies [6].

High- resolution digital photographs of both groups of patches were taken for before treatment and three months after the final treatment session. The therapeutic outcome was independently assessed by two dermatologists, separately and lesional improvement was scored as follows:

Grade 0: no change (0%), Grade 1: fair (1%-25%), Grade 2: moderate (26%-50%), Grade 3: good (51%-75%), Grade 4: excellent (76%-99%) and Grade 5: complete (100%).

The final score for each lesion was the average of the scores provided by two dermatologists based on their clinical judgment.

For data analysis, the Chi-square test was used to examine the relationship between two categorical variables with two or more categories, with the Fisher exact test applied when appropriate. The association between a continuous variable and a categorical variable with more than two categories was evaluated using one-way ANOVA. All statistical analyses were performed using SPSS version 26, with a significance level set at 0.05.

RESULTS

In this prospective clinical trial, 15 vitiligo patients with facial lesions, aged 18 years and older. The participants had a mean age of 32.26 ± 15.48 years, ranging up to 49 years Among them, 4 (26.7%) were male and 11 (73.3%) were female. The mean duration of the disease was 19.40 ± 13.26 months.

According to the results, clinical improvement was achieved in most patients in both groups of facial lesions. However, this improvement was significantly more pronounced in lesions treated with microneedling plus latanoprost compared to those treated with microneedling alone (P value: 0.009) (Table 1).

We found no significant correlation between age, gender or disease duration and clinical improvement in lesions treated with microneedling (P values: 0.477, 0.235, and 0.435, respectively) or microneedling combined with latanoprost (P values: 0.611, 0.338, and 0.457, respectively).

None of the patients experienced any serious side effects.

DISCUSSION

Despite vast research on vitiligo treatment, only a limited number of effective medications are available for vitiliginous lesions. Latanoprost has recently been shown to have a promising effect on skin repigmentation [4-9]. Cellular studies have demonstrated that analogues of PGF2α target their specific receptors on melanocytes, leading to increased tyrosinase activity [10].

The authors of this study have previously focused on new treatment modalities for dermatologic disorders [11-20], and have now shifted their attention to immune-based therapies, particularly for vitiligo.

The current study reported good to excellent therapeutic effects with microneedling alone or in combination with latanoprost in 26.7 % and 33.4% of patients, respectively. These results are consistent with those reported by Nienaa *et al.*, who demonstrated the superior efficacy of combination therapy using topical latanoprost 0.005% plus microneedling and NB-UVB phototherapy compared to microneedling and phototherapy alone [6]. However, Stanimirovic *et al* did not observe any positive effect from adding microneedling to latanoprost in the treatment of vitiligo [21] which may be attributed to the specific design of their study, where only one microneedling session was performed with a needle length of 0.5 mm.

The rationale for adding microneedling to latanoprost, as a proven treatment for vitiligo, is to enhance drug penetration through the stratum corneum and strengthen the effect of latanoprost. Moreover, microneedling produces microinjuries that initiate a cascade of cytokine and growth factor production, similar to the wound healing process, which may be beneficial for skin repigmentation [21].

We could not detect any correlation between the degree of clinical improvement and disease duration, which was previously reported [21-23]. This may be explained by the fact that the mean disease duration among our patients was one and a half years, and none had long-lasting lesions. Moreover, we studied only facial lesions, which are suggested to respond better to treatment [9], potentially influencing the results.

Table 1. Clinical improvement after 3 months of treatment with microneedling with or without latanoprost.

Clinical improvement	Microneedling, N (%)	Microneedling + latanoprost, N (%)
No change	0 (0%)	0 (0%)
Fair	10 (66.7%)	3 (20%)
Moderate	1 (6.7%)	7 (46.7%)
Good	3 (20%)	4 (26.7%)
Excellent	1 (6.7%)	1 (6.7%)
Complete clearance	0 (0%)	0 (0%)

CONCLUSION

In conclusion, combining skin microneedling with latanoprost is an effective and safe therapeutic option for treating facial vitiligo lesions.

As a strength of our study, we selected facial lesions to investigate because they have the greatest impact on patients' appearance and are therefore, they are the most important to treat. Moreover, each patient served as their own control, which enhances the reliability of our results. However, our study had some limitations, including a small sample size and the absence of patients with long-lasting disease. We recommend conducting further prospective studies with larger sample sizes and patients with varying disease durations to confirm our findings. Future studies could also be designed to evaluate the efficacy of adding latanoprost to microneedling or ablative fractional laser treatments, as well as

the use of intradermal latanoprost injections in the treatment of vitiligo.

Acknowledgement

The authors would like to thank the Razi Hospital Clinical Research Development Center and the Autoimmune Bullous Diseases Research Center for their technical and editorial assistance.

Authors contributions

P.N., S.G, A.E and A.A. performed the research. Z.A., AH.E. and K.B designed and supervised the research study. P.H. and M.N. wrote the initial draft. M.H wrote the final paper.

All authors have read and approved the final manuscript.

Funding source

Authors received no funding for this research.

Data availability Statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Conflict of interests: None declared.

REFERENCES

1. Aryanian Z, Shirzadian A, Farzaneh S, et al. Metabolic derangement in patients with vitiligo: a cross-sectional study. J Investig Med. 2022:jim-2021-002062.
2. Liu L, Mao C. Topical latanoprost for eyelid vitiligo: effective repigmentation in two pediatric cases. J Cosmet Dermatol. 2025;24(11):e70549.
3. Mokhtari F, Bostakian A, Shahmoradi Z, et al. Potential emerging treatment in vitiligo using Er:YAG in combination with 5FU and clobetasol. J Cosmet Dermatol. 2018;17(2):165-170.
4. Omar SS, Elmulla KF, Aly RG, et al. A triple combination of latanoprost, fractional CO2 laser, and platelet-rich plasma in localized vitiligo: a clinical and histopathologic study. Photodermatol Photoimmunol Photomed. 2024;40(1):e12944.
5. Nowroozpoor Dailami K, Hosseini A, Rahmatpour Rokni G, et al. Efficacy of topical latanoprost in the treatment of eyelid vitiligo: a randomized, double-blind clinical trial study. Dermatol Ther. 2020;33(1):e13175.
6. Lotti T, Wollina U, Tchernev G, et al. An innovative therapeutic protocol for vitiligo: experience with the use of fraxel herbium laser, topical latanoprost and successive irradiation with UVA - 1 laser. Open Access Maced J Med Sci. 2018;6(1):49-51.
7. Neinaa YME, Lotfy SS, Ghaly NR, et al. A comparative study of combined microneedling and narrowband ultraviolet B phototherapy versus their combination with topical latanoprost in the treatment of vitiligo. Dermatol Ther. 2021;34(2):e14813.
8. Fawzy M, Al-Mokadem S, Alshereef M, et al. Narrowband ultraviolet B phototherapy combined with intralesional injection of either latanoprost or platelet-rich plasma for stable nonsegmental vitiligo. Photodermatol Photoimmunol Photomed. 2024;40(1):e12929.
9. Korobko IV, Lomonosov KM. A pilot comparative study of topical latanoprost and tacrolimus in combination with narrow-band ultraviolet B phototherapy and microneedling for the treatment of nonsegmental vitiligo. Dermatol Ther. 2016;29(6):437-441.
10. Anbar TS, El-Ammawi TS, Abdel-Rahman AT, et al.The effect of latanoprost on vitiligo: a preliminary comparative study. Int J Dermatol 2015: 54: 587–593.
11. Aryanian Z, Shirzadian A, Hatami P, et al. High incidence of metabolic syndrome components in lichen planus patients: a prospective cross-sectional study. Int J Clin Pract. 2022; 2022:7184678.
12. Kalantari Y, Aryanian Z, Mirahmadi SM, et al. A systematic review on COVID-19 vaccination and cosmetic filler reactions: a focus on case studies and original articles. J Cosmet Dermatol. 2022;21(7):10.1111/jocd.15071.
13. Aryanian Z, Shojaee N, Goodarzi A, et al. Influence of narrow-band ultra violet B phototherapy on homocysteine status: a prospective study of patients with different cutaneous disorders. Photobiomodul Photomed Laser Surg. 2021;39(9):607-611.
14. Torkashvand F, Rezaeian M, Sheikh Fathollahi M, et al. A survey on psychiatric disorders in patients improved cutaneous leishmaniasis in the city of Rafsanjan in 2014. JRUMS. 2016; 14 (10) :879-894.
15. Hatami P, Balighi K, Asl HN, et al. Isotretinoin and timing of procedural interventions: clinical implications and practical points. J Cosmet Dermatol. 2023;00:1-4.
16. Aryanian Z, Balighi K, Azizpour A, et al. Coexistence of pemphigus vulgaris and lichen planus following COVID-19 vaccination. Case Rep Dermatol Med. 2022; 2022:2324212.
17. Mohaghegh F, Hatami P, Aryanian Z. Case of atypical disseminated herpes zoster in a patient with COVID-19: a diagnostic challenge in COVID era. Clin Case Rep. 2022;10(2):e05342.
18. Mohaghegh F, Hatami P, Refaghat A, et al. New-onset pemphigus foliaceus following SARS-CoV-2 infection and unmasking multiple sclerosis: a case report. Clin Case Rep. 2022;10(6):e05910.
19. Akhyani M, Hatami P, Yadegarfar Z, et al. Pigmented colloid milium associated with exogenous ochronosis in a farmer with long-term exposure to fertilizers. J Dermatol Case Rep. 2015;9(2):42-5.
20. Aryanian Z, Ehsani A, Razavi Z, et al. The COVID-19 pandemic and its impact on esthetic dermatology. J Cosmet Dermatol. 2022;21(12):6557-6561.
21. Choi YM, Diehl J, Levins PC. Promising alternative clinical uses of prostaglandin F2α analogs: beyond the eyelashes. J Am Acad of Dermatol. 2015; 72(4): 712–716.

22. Stanimirovic A, Kovacevic M, Korobko I, et al. Combined therapy for resistant vitiligo lesions: NB-UVB, microneedling, and topical latanoprost, showed no enhanced efficacy compared to topical latanoprost and NB-UVB. Dermatol Ther. 2016;29(5):312-316.

23. Kapoor R, Phiske MM, Jerajani HR. Evaluation of safety and efficacy of topical prostaglandin E2 in treatment of vitiligo. Br J Dermatol. 2009; 160:861-863.