

Efficacy and Safety of Poly-D,L-lactic Acid Delivered via a Transdermal Needle-free Microjet System for Enlarged Facial Pores

Suk Bae Seo, MD*
 Hugues Cartier, MD†
 Jovian Wan, MBChB‡
 Sebastien Garson, MD§
 Kyu-Ho Yi, MD, PhD*¶||

Summary: Enlarged facial pores are a common cosmetic concern influenced by factors such as age, genetics, and sebum production. Traditional treatments such as topical retinoids, chemical peels, and laser therapies often yield variable results and may involve discomfort or multiple sessions. We report the case of a 41-year-old Korean woman treated for visibly enlarged pores using poly-D,L-lactic acid delivered via a needle-free microjet system. This system uses advanced electromagnetic technology to create high-pressure microjets that penetrate the skin's outer layers, delivering therapeutic agents directly into the dermis. The patient underwent 5 monthly sessions, with significant improvements in pore size and skin texture observed within 4 weeks posttreatment. Clinical assessments showed a reduction in pore size from a baseline score of 6 to 3, sustained through 12 weeks posttreatment. The patient expressed satisfaction with the outcomes, reporting firmer, smoother skin with no adverse effects. Poly-D,L-lactic acid delivered via a microjet system was an effective, noninvasive treatment for enlarged facial pores in the treated patient. Further studies are needed to validate these findings and compare this approach with established therapies. (*Plast Reconstr Surg Glob Open* 2025;13:e6714; doi: 10.1097/GOX.0000000000006714; Published online 16 April 2025.)

Enlarged facial pores are a prevalent cosmetic concern, often linked to factors such as age, genetic predisposition, and increased sebum production. These pores, which serve as the openings of pilosebaceous follicles, tend to become more noticeable with age, particularly on the nose and medial cheeks.^{1,2} Although enlarged pores are not associated with any medical conditions, they can significantly impact a person's appearance and self-esteem, leading many individuals to seek treatment.³

Traditional management strategies for enlarged pores include the use of topical retinoids, chemical peels, and

various laser therapies, all aimed at reducing pore size and improving skin texture. However, these methods often come with limitations, such as discomfort, the need for multiple sessions, and inconsistent efficacy. In response, needle-free drug delivery systems have emerged as innovative alternatives, reducing discomfort and minimizing the risks associated with needle-based procedures.^{4,5} One such system is the Mirajet (JSK Biomed., Korea) needle-free microjet device, which uses electromagnetic technology to propel a high-pressure microjet of therapeutic substances into the skin. This technology allows for the precise delivery of agents such as poly-D,L-lactic acid (PDLLA) into the dermis, known for its collagen-stimulating properties that enhance skin texture.⁶ The control of delivery depth is achieved through "stacking," where multiple pulses are layered to reach the target depth. (See Video [online], which demonstrates the Mirajet needle-free microjet system in action, illustrating the noninvasive delivery of PDLLA for the treatment of enlarged facial pores. The video showcases the device's mechanism of delivering high-pressure microjets, ensuring precise product penetration into the dermis.) Each pulse delivers 4.2 J of

From the *SeoAhSong Dermatologic Clinic, Seoul, Korea; †Centre Médical Saint Jean, Arras, France; ‡Medical Research Inc., Wonju, Korea; §Cabinet Médical, Senlis, France; ¶Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 FOUR Project, Yonsei University College of Dentistry, Seoul, Korea; and ||You and I Clinic, Seoul, Korea.

Received for publication August 12, 2024; accepted February 27, 2025.

Dr. Suk Bae Seo contributed equally as a first author.

Copyright © 2025 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](#), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: 10.1097/GOX.0000000000006714

Disclosure statements are at the end of this article, following the correspondence information.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

energy, penetrating the skin to a depth of approximately 300 μm . This approach ensures consistent depth control, even when tissue resistance varies.

This case report explores the application of PDLA delivered via a needle-free microjet system in the management of enlarged facial pores. The objective is to assess the clinical outcomes and safety of this noninvasive technique.

CASE PRESENTATION

A 41-year-old Korean woman presented with concerns about visibly enlarged pores on her cheeks, primarily in the nasal and medial cheek regions. She had no history of aesthetic treatments, and her medical history was unremarkable. The patient's skin type was classified as Fitzpatrick type III. After discussing various treatment options, including laser therapies and chemical peels, she opted for the needle-free microjet system combined with PDLA due to its noninvasive nature and potential for collagen stimulation.

The treatment protocol consisted of 5 monthly sessions, from January to May 2024. During each session, the patient received 14,000–15,000 pulses of PDLA, with each pulse delivering approximately 0.2–0.3 μL of the substance. The procedure was performed in a noncontact mode, ensuring even distribution across the affected areas. Additionally, the treatment was spaced to allow sufficient time for collagen production between sessions. Posttreatment care included daily moisturization and sun protection, as recommended.

Despite experiencing mild discomfort, described as a slight stinging sensation during each session, the procedure was well tolerated. The discomfort was measured using a validated visual analog scale, where the patient rated the discomfort as 2 out of 10, reflecting minimal pain.

RESULTS

Clinical assessments were conducted using standardized digital photography and 3-dimensional imaging at baseline, 4 weeks posttreatment, and 12 weeks posttreatment. Pore size was evaluated using a visual scale ranging from 0 (faint/small pores) to 6 (obvious/large pores), as previously used in the study by Kim et al.⁷ The patient's satisfaction was measured using a 4-point Likert scale, where 0 indicated "not satisfied," 1 indicated "slightly satisfied," 2 indicated "satisfied," and 3 indicated "very satisfied."

Results showed a significant improvement in pore size, with the baseline score decreasing from 6 to 3 within 4 weeks posttreatment. This improvement was maintained through the 12-week follow-up period (Fig. 1). The patient reported a satisfaction score of 2 at both follow-up periods, indicating a substantial positive outcome.

To provide additional context, the patient noted a significant reduction in the visibility of her pores and an overall smoother skin texture. She expressed satisfaction with the treatment outcome, highlighting that her skin felt firmer and more refined, particularly in areas where the pores were previously most noticeable. Despite the

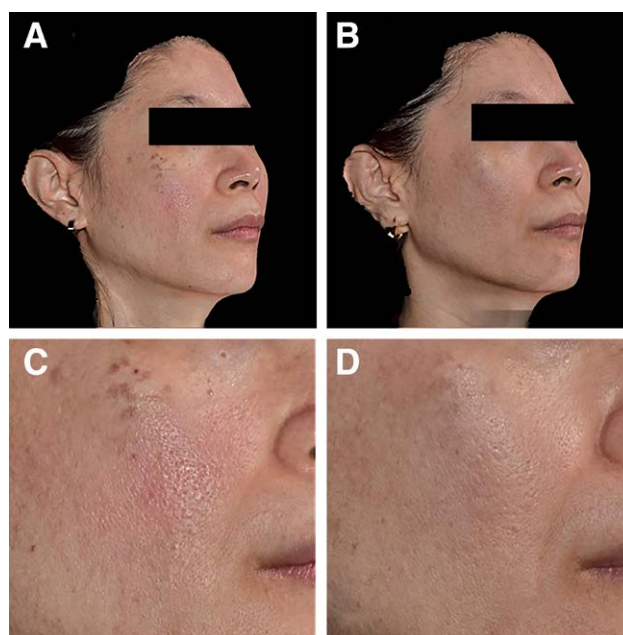


Fig. 1. Three-dimensional images of case 1 (41-year-old woman), demonstrating the improvement of enlarged pores. A and C, Before treatment, showing obvious and large pores (visual assessment of pores grade 6). B and D, 12 weeks after final treatment (visual assessment of pores grade 3). Images captured using a 3-dimensional camera (LifeViz Infinity, QuantifiCare, Biot, France).

positive results, the patient did experience mild discomfort during the treatment sessions, described as a slight stinging sensation, which was tolerable and resolved quickly. The treatment was well tolerated overall, with no adverse effects observed, affirming the safety of the needle-free microjet system.

DISCUSSION

This case report explores the potential of PDLA delivered via a needle-free microjet system as a novel approach for treating enlarged facial pores. The results showed a significant reduction in pore size and improved skin texture, with the patient reporting satisfaction. However, the study's limitations must be acknowledged, particularly the single-patient design, which limits the generalizability of the results.

When comparing this method to other established treatments for enlarged pores, laser therapies and chemical peels are commonly used. Lasers, such as the 1064-nm picosecond laser, effectively reduce pore size by inducing collagen remodeling, with results lasting several months.⁸ However, they often require multiple sessions and can cause side effects such as erythema, swelling, or postinflammatory hyperpigmentation, particularly in individuals with darker skin tones.⁹

Chemical peels, such as those using salicylic or glycolic acid, are effective by exfoliating the skin, reducing sebum production, and promoting cell turnover. Although more accessible and cost-effective, chemical peels may cause irritation, peeling, and pigmentation changes, especially at higher concentrations.¹⁰

This case report has significant limitations, including the lack of a control group or comparison with other treatments. The findings cannot be generalized beyond this single patient. Larger scale studies, including randomized controlled trials, are needed to validate the efficacy and safety of the microjet system and compare it with established methods.

Needle-free microjet technology has broader potential beyond treating enlarged pores. It could be adapted for various cosmetic procedures, including dermal filler delivery and scar management. However, thorough investigations into long-term safety and efficacy are crucial. Potential risks, such as nodule or granuloma formation, must be closely monitored, particularly if the product is unevenly distributed. The high-pressure delivery method could also cause unintended tissue damage, underscoring the need for skilled application.

In conclusion, although the PDLLA microjet system shows promise as a noninvasive treatment for enlarged pores, its efficacy and safety require further validation. Comparative studies with established treatments are essential to fully understand its benefits and limitations. As needle-free technologies evolve, they offer new, patient-friendly alternatives, but rigorous testing is vital to ensure long-term effectiveness and safety.

Kyu-Ho Yi, MD, PhD

Division in Anatomy and Developmental Biology
Department of Oral Biology
Human Identification Research Institute, BK21 FOUR Project
Yonsei University College of Dentistry
Seoul 27454, South Korea
E-mail: kyuho90@daum.net
Instagram: @kyuhoyi

DISCLOSURES

The authors have no financial interest to declare in relation to the content of this article. The products utilized in this study were donated by the injectors for the purposes of this study.

PATIENT CONSENT

The authors obtained written consent from patients for their photographs and medical information to be published in print and online and with the understanding that this information may be publicly available.

DECLARATION OF HELSINKI

This study was conducted in compliance with the principles set forth in the Declaration of Helsinki.

REFERENCES

1. Lee SJ, Seok J, Jeong SY, et al. Facial pores: definition, causes, and treatment options. *Dermatol Surg*. 2016;42:277–285.
2. Suh DH, Jeong JY, Lee SJ, et al. Can a radiofrequency device reduce the pore size? *Lasers Med Sci*. 2022;37:1203–1208.
3. Flament F, Francois G, Qiu H, et al. Facial skin pores: a multiethnic study. *Clin Cosmet Investig Dermatol*. 2015;8:85–93.
4. Seo SB, Wan J, Thulesen J, et al. Poly-d,l-lactic acid via transdermal microjet drug delivery for treating rosacea in Asian patients. *J Cosmet Dermatol*. 2024;23:3993–3998.
5. Seo SB, Wan J, Chan LKW, et al. Poly-d,l-lactic acid-enhanced atrophic scar treatment via transdermal microjet drug delivery in Asians. *Skin Res Technol*. 2024;30:e13762.
6. Seo SB, Park H, Jo JY, et al. Skin rejuvenation effect of the combined PDLLA and non cross-linked hyaluronic acid: a preliminary study. *J Cosmet Dermatol*. 2024;23:794–802.
7. Kim SJ, Shin MK, Back JH, et al. Pore volume is most highly correlated with the visual assessment of skin pores. *Skin Res Technol*. 2014;20:429–434.
8. Zhou Y, Hamblin MR, Wen X. An update on fractional picosecond laser treatment: histology and clinical applications. *Lasers Med Sci*. 2023;38:45.
9. Palawisuth S, Manuskiatti W, Apinuntham C, et al. Quantitative assessment of the long-term efficacy and safety of a 1064-nm picosecond laser with fractionated microlens array in the treatment of enlarged pores in Asians: a case-control study. *Lasers Surg Med*. 2022;54:348–354.
10. Măgeruşan E, Hancu G, Rusu A. A comprehensive bibliographic review concerning the efficacy of organic acids for chemical peels treating acne vulgaris. *Molecules*. 2023;28:7219.