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Facial skin rejuvenation with poly-L-lactic acid (PLLA): Four case studies

Cover Page Footnote

None

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Abstract

Background: Facial aging is characterized by the decline and loss of skin structure. Poly-L-lactic acid (PLLA) is a biopolymer and biodegradable injection material that functions as a collagen stimulator. This active ingredient works by stimulating the formation of skin collagen after interacting with the PLLA crystal component. The expected final result is an increase in the skin volume with the thickening and increased density of the skin layers due to collagen remodeling. At present, data on the application of PLLA for facial photorejuvenation remains limited.

Case Illustration: Four patients aged 22-49 years old, with different severity of aging, underwent PLLA injection procedures. The active component was administered through injection with a dilution ratio of 1:1 to 1:2 for the cheeks and temporal area and without dilution for the forehead, smile lines, and chin area. After the injection, a gentle massage was performed, and the patient was instructed to self-massage every day. Each patient was evaluated on the twentieth day and underwent additional injection sessions up to two times.

Discussion: All patients showed improvement as assessed using photography and the Global Aesthetic Improvement Scale (GAIS) 20 days after the procedure. All patients were satisfied with the final result. There was no significant pain during the procedure.

Conclusion: PLLA injection is a safe and effective procedure that stimulates the formation of new collagen adequately. Patient satisfaction with the treatment was excellent, and no complications were observed in all patients.

Keywords: collagen, poly-L-lactic acid, skin rejuvenation

Background

Aging is a complicated process that results from the interaction of internal (genetics) and external (lifestyle and environment) factors.^{1,2} Facial aging is characterized by the decline and loss of skin structure. Muscle atrophy, fat pad repletion, bone resorption, and alterations in skin tone and color are all associated with the aging process. As a result, the skin becomes dull, rough, dry, and wrinkled.^{1,3} The demand for non-surgical facial and body rejuvenation procedures is steadily rising as the aging population becomes more conscious of

their physical appearances.⁴ Patients prefer non-surgical modalities due to their ability to produce more natural, non-stiff, and smoother outcomes compared to the standard facial cosmetic surgery. These modalities also cause minimal trauma and have a substantially shorter recovery period.⁵ Several methods have been devised to improve skin aging, such as the application of topical agents, chemical peeling, dermabrasion, laser resurfacing, and injection of dermal fillers.⁶ Fillers such as hyaluronic acid (HA) are frequently used in cosmetic dermatology to restore firmness and counteract facial volume loss.⁷ Nevertheless, the

adverse effects of HA filling injection encompass vascular compression, occlusion-related ischemia, and skin necrosis.⁸ Poly-L-lactic acid (PLLA) is a biopolymer and biodegradable injection material that functions as a collagen stimulator.⁹ PLLA induces neocollagenesis by initiating a foreign body reaction to the injected substances, followed by a cellular inflammatory response that results in vascularization and the development of connective tissue. This process involves hydrolysis of PLLA into lactate, followed by its conversion to pyruvate and subsequent oxidation into carbon dioxide. Despite the resolution of the inflammatory response within six months, the production of the extracellular matrix persists, resulting in a progressive elevation in dermal thickness that lasts for two years. The expected final result is an increase in the skin volume with the thickening and increased density of the skin layers due to collagen remodeling.^{3,10} Although dermal fillers, such as HA, have been found to have volumizing and contour-correcting effects, PLLA injections offer the additional benefit of skin rejuvenation.³

The Food and Drug Administration (FDA) first approved PLLA in 2004 for the treatment of lipoatrophy associated with HIV. Later in 2009, the substance also was approved for the correction of superficial-to-deep nasolabial folds and other facial wrinkles in healthy patients.¹¹ Localized edema, redness, itching, bruising, and tenderness are frequent adverse effects that typically will subside within one to seven days. There have also been reports of papules and nodules appearing months after the injection; however, these side effects are preventable through post-injection massage, product dilution, and proper injection depth.³ Various studies from the last 30 years have reported that this active ingredient is safe and effective in the health and medical aesthetics industries.⁴ At present, data on the application of PLLA for facial photorejuvenation remains relatively limited. Four cases are presented to evaluate the efficacy and safety of PLLA in facial photorejuvenation.

Case Illustration

Data were obtained from patients who visited a private dermatology clinic. Prior to PLLA (Rich PL[®], Promoitalia, Italy) injection, informed consent was obtained from each of the four patients for the publication of the case and clinical photos. The patients consist of three (non-pregnant) females and one male. The age of the patients varied between 22 and 49 years old. They presented varied levels of aging severity (under the categories of prejuvenation, rejuvenation, and restoration), and mild-to-severe loss of volume. They were all novice patients, as they had not had filler injections for the past year.

The PLLA injections were administered to various facial anatomical sites, such as the temporal, cheekbones, smile lines, and chin areas. Active component injections at a dilution ratio of 1:1 to 1:2 were administered to the patient's cheeks and temporal area, and undiluted injections were administered to the patient's forehead, smile lines, and chin area. The dilution process was performed by diluting 1 ml of PLLA with 1 ml of NaCl and 0.1-0.2 ml of lidocaine. Subsequently, the mixture was mixed using three ways and injected using the retrograde bolus method with a 22G x 50mm cannula. After administering the injection, the participant received a gentle massage and was told to perform self-massage independently for 5 minutes, 5 times a day, for the next 5 days (following the 'three-five rule').

The patients were evaluated on the twentieth day after injection, and each participant received a maximum of two additional injection sessions. Photographs of all patients were obtained before, immediately after, and twenty days after the treatment. The satisfaction indices were assessed with the global aesthetic improvement scale (GAIS) based on the aforementioned photographic images (Table 1).

Table 1. Global Aesthetic Improvement Scale (GAIS)¹²

Degree	Description
Very much improved	Excellent corrective result
Much improved	Marked improvement of the appearance, but not completely optimal
Improved	Improvement of the appearance, is better when compared to the initial condition, but a touch-up is advised
Unchanged	Appearance substantially remains the same when compared to the initial condition
Worsening	Appearance has worsened when compared to the initial condition

GAIS was used in this study due to its ability to gather data for evaluating treatment efficacy as a secondary outcome. Throughout this procedure, we assess the enhancements after a pre-established duration. Additionally, implementing GAIS in daily practice is most practical.

Results

Four patients received PLLA injections in various facial anatomical areas according to each patient's specific requirements. The first patient was a 22-year-old female with the objective of rejuvenation. Injections were administered to the nasolabial lines, anterior cheeks, marionette lines, and chin area. One milliliter of PLLA was diluted with 1 ml NaCl and 0.1 ml lidocaine to create a 2 ml total solution. The patient's pain level was rated as 1 on a scale of 1-5 (Figure 1). The second patient is presented in Figure 2, a 24-year-old male with the objective of rejuvenation. The patient received injections at the nasolabial lines, anterior cheeks, and anterior part of the zygomatic arches with a total solution volume of 2 ml. The patient's pain level was rated as 1 on a scale of 1-5.

The third patient is presented in Figure 3, a 26-year-old female with the objective of rejuvenation. An injection was administered to the nasolabial lines and anterior cheek areas with a total solution volume of 2 ml. The patient's pain level was rated as 1 on a scale of 1-5.

The fourth patient is presented in Figure 4, a 49-year-old female with the objective of restoration. Injections were administered to the nasolabial lines, anterior cheeks, and temporal areas with a total solution volume of 4 ml. The patient experienced a pain level of 1 on a scale of 1-5. According to the GAIS scale and photographs taken before and 20 days after the treatment, every individual showed signs of improvement. The final result was satisfactory for each of the patients. Throughout the process, there was a minimal level of pain. This study shows that injecting PLLA into the skin positively impacts skin quality.

Discussion

During the aging process, there is a noticeable and gradual reduction in facial volume caused by bone and fat resorption, collagen loss, and reduced collagen formation. These factors contribute to texture, tone, and overall skin quality alterations.¹³ By filling the affected area, fillers enable volume restoration, wrinkles correction, and enhancement of facial contours.⁴ In clinical practice, the volume of a PLLA-containing injectable device has progressively grown, frequently accompanied by adding lidocaine to the solution.¹⁴ The extent to which PLLA is diluted varies depending on the diverse spectrum of applications, ranging from deep injection for increasing volume to superficial injection for enhancing skin quality.^{15,16}

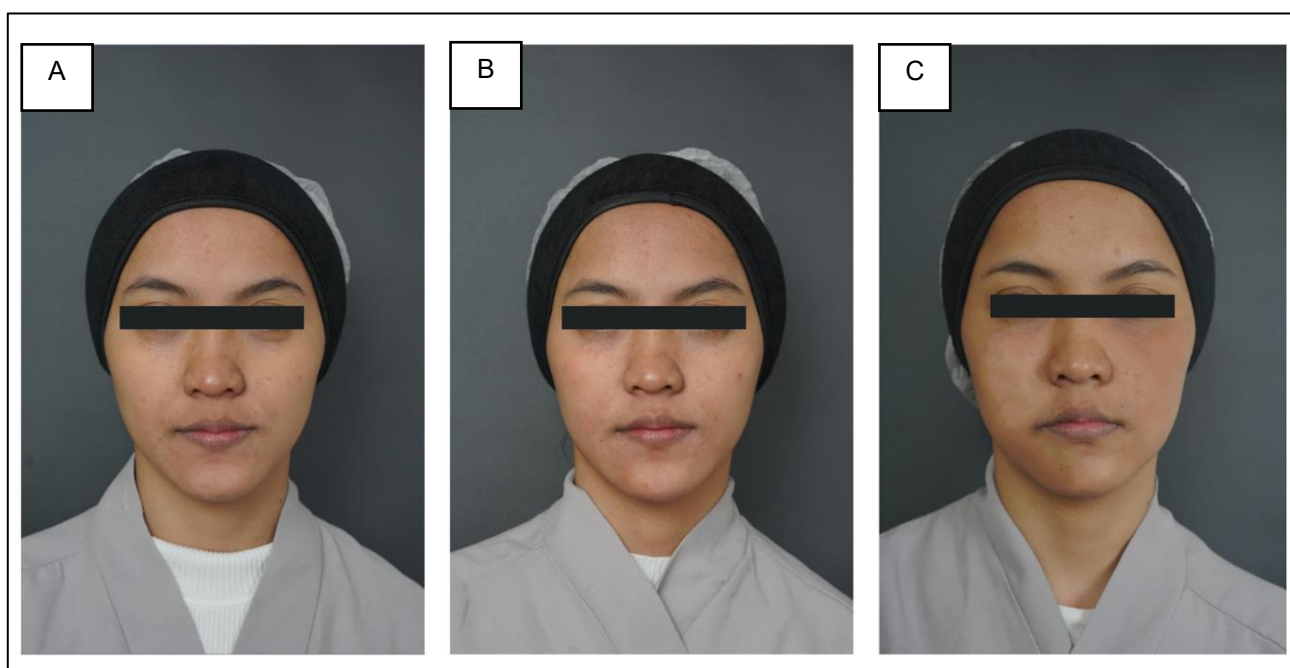


Figure 1. Representative Clinical Images of a 22-Year-Old Female Patient. (A) Before, (B) Immediately after, and (C) 20 days after PLLA treatment.

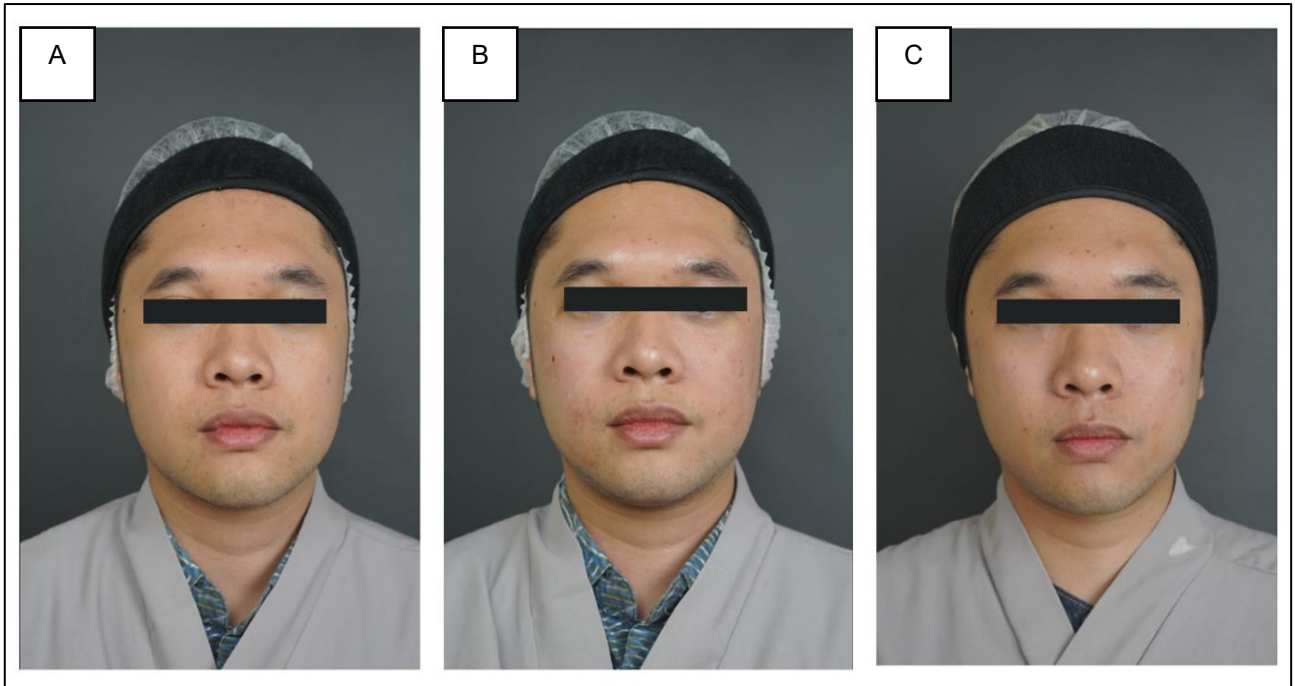


Figure 2. Representative Clinical Images of a 24-Year-Old Male Patient. (A) Before, (B) Immediately after, and (C) 20 days after PLLA treatment.

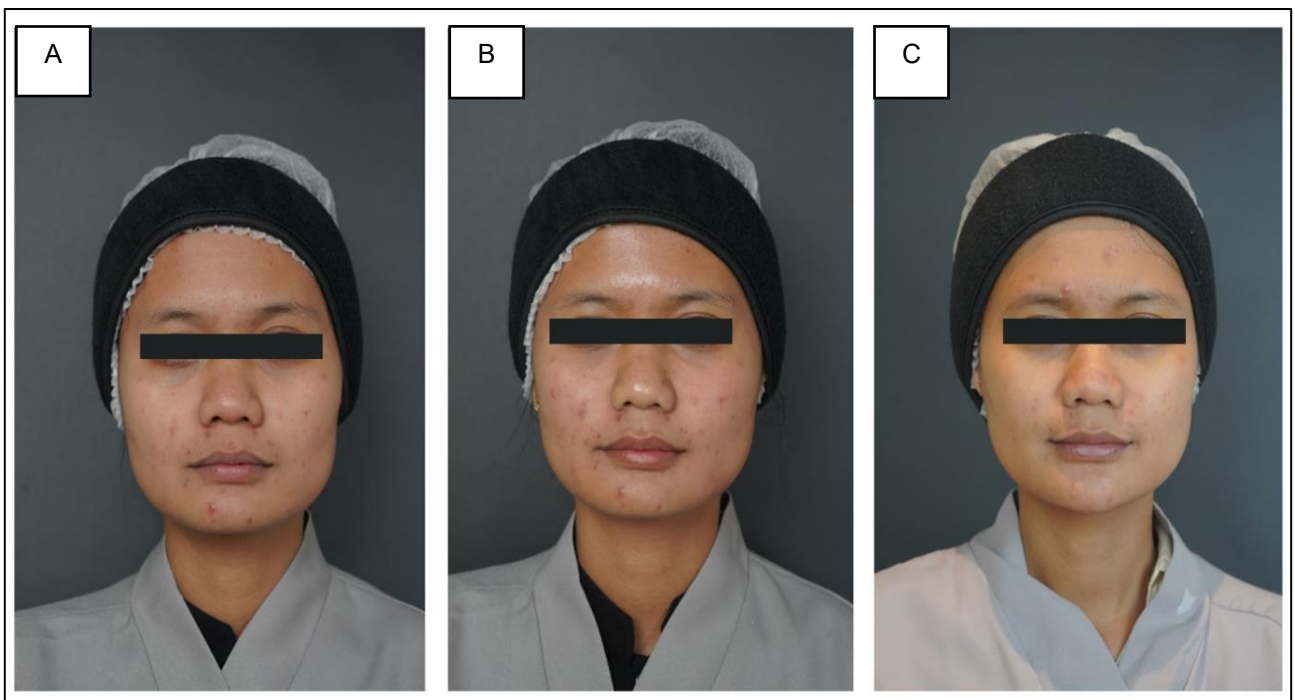


Figure 3. Representative Clinical Images of a 26-Year-Old Female Patient. (A) Before, (B) Immediately after, and (C) 20 days after PLLA treatment.

In clinical practice, the volume of a PLLA-containing injectable device has progressively grown, frequently accompanied by adding lidocaine to the solution.¹⁴ The extent to which

PLLA is diluted varies depending on the diverse spectrum of applications, ranging from deep injection for increasing volume to superficial injection for enhancing skin quality.^{15,16}

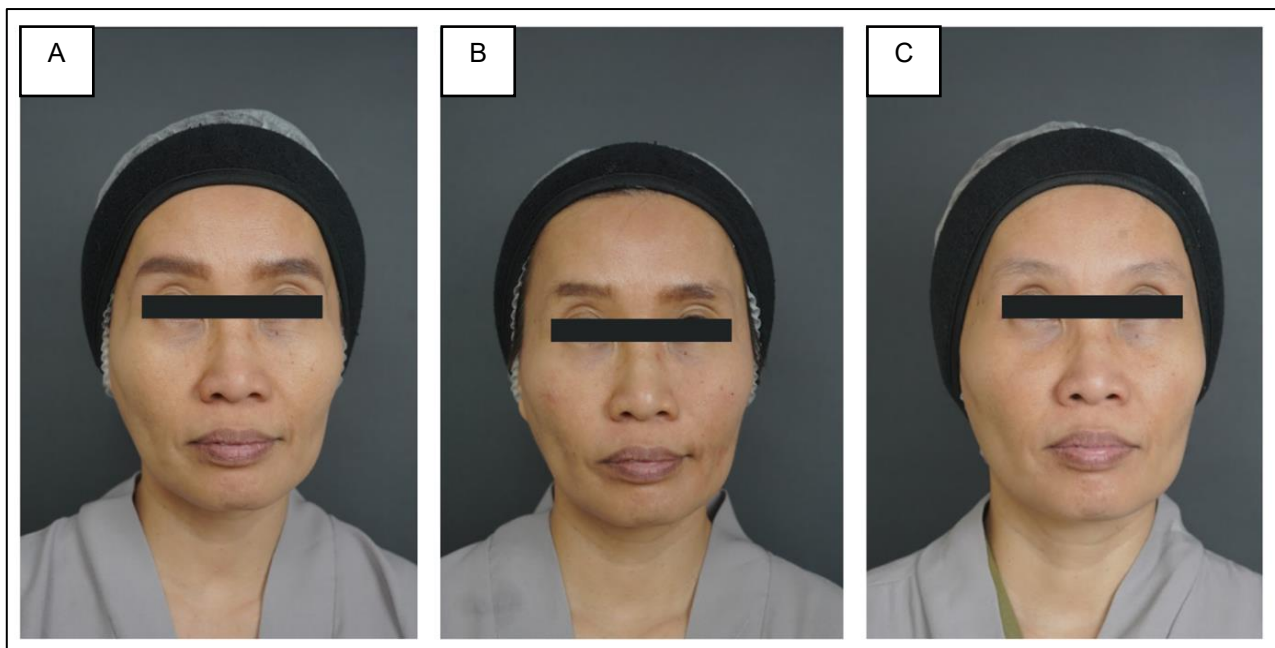


Figure 4. Representative Clinical Images of a 49-Year-Old Female Patient. (A) Before, (B) Immediately after, and (C) 20 days after PLLA treatment.

The extent to which PLLA is diluted varies depending on the diverse spectrum of applications, ranging from deep injection for increasing volume to superficial injection for enhancing skin quality.^{15,16} As these areas necessitate a greater concentration of PLLA to achieve firmness, the undiluted solution was utilized to inject PLLA into the forehead, smile lines, and jawline areas. The diluted solution was subsequently injected into the temporal and facial regions. The dosages and sites of PLLA injection were modified to meet each patient's specific requirements.¹⁷ In contrast to the first three patients, the fourth patient, approximately twice the other patients' age, exhibited more apparent signs of facial volume loss. As a result, a greater volume of injection was administered to this patient.

The hypothesized positive impact of PLLA injections on skin physiology parameters, including skin hydration, transepidermal water loss (TEWL), elasticity, and skin quality assessments (such as pigmentation, erythema, radiance, pore size, and smoothness), is primarily attributed to the promotion of neocollagenesis by PLLA. This is supported by previous findings indicating that increased collagen levels are associated with improved skin quality.^{3,18,19} Injecting the soft tissues in the deep dermal layer stimulates the adipose stem cells to release growth factors, initiating tissue regeneration and ultimately rejuvenating the area where the filler was injected.³ The visibility of skin pores is often minimal throughout youth and tends

to increase in size and prominence with age. In addition to increasing in size, pores also grow elongated as a result of the aging process. Pores are inherent features of the skin, and alterations in their appearance throughout time suggest that they can be indicative of the skin aging process.²⁰ Increased collagen has been reported to enhance skin quality; therefore, it is hypothesized that the significant reduction in pore size observed in a study by Bohnert, et al. after repeated PLLA injections is primarily attributable to PLLA-dependent neocollagenesis.³

A gradual and continuous increase in thickness characterizes the process of dermal thickening. It is crucial to allow for the sequential occurrence of the underlying biological reaction, known as the cellular cascade, to take place before proceeding with each treatment. This has been previously described as the 'treat-wait-assess' approach, which aims to prevent over-correction. Administering further treatments before the effects of the preceding therapy become evident can lead to overtreatment of the specific location. The response time and subsequent indications of improvement vary based on individual characteristics, such as age, skin type, and skin quality, which contribute to interpersonal variances.⁵ It is important to advise patients to massage the area undergoing treatment following the 'three-five rule'. A lack of post-treatment massage, an allergic or inflammatory host response, variations in filling volumes, improper

reconstitution, inconsistent product distribution in the suspension, or imprecise or superficial injection technique may all contribute to undesirable subcutaneous papules.^{11,21} The main limitation of this study lies in its short-term follow-up. Conducting further studies with larger sample sizes and long-term follow-ups is crucial to establish more comprehensive research.

Conclusion

PLLA injection is a safe and effective procedure and stimulates the formation of new collagen adequately. Patients' satisfaction with the treatment was excellent, and no complications were found in all patients.

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Author Contributions

All authors act as guarantors of the manuscript. SS and TH participated in conceptualization, investigation, and resources. SS, TH, and SL participated in the methodology, formal analysis, validation, review, and editing of the manuscript. SS, TH, and SL made the original draft of the manuscript and visualization. All authors read and approved the final manuscript.

Conflict of interest

No conflict of interest.

References

1. Cabral LRB, Teixeira LN, Gimenez RP, et al. Effect of hyaluronic acid and poly-l-lactic acid dermal fillers on collagen synthesis: An in vitro and in vivo study. *Clin Cosmet Investig Dermatol* 2020;13:701–10.
2. Chaudhary M, Khan A, Gupta M. Skin ageing: Pathophysiology and current market treatment approaches. *Curr Aging Sci* 2019;13(1):22–30.
3. Bohnert K, Dorizas A, Lorenc P, Sadick NS. Randomized, controlled, multicentered, double-blind investigation of injectable poly-l-lactic acid for improving skin quality. *Dermatol Surg*. 2019;45(5):718–24.
4. Christen MO. Collagen stimulators in body applications: A review focused on poly-l-lactic acid (PLLA). *Clin Cosmet Investig Dermatol*. 2022;15:997–1019.
5. Li K, Meng F, Li YR, et al. Application of nonsurgical modalities in improving facial aging. *Int J Dent* 2022;2022:8332631.
6. Seo SB, Park H, Jo JY, Ryu HJ. Skin rejuvenation effect of the combined PDLLA and non cross-linked hyaluronic acid: A preliminary study. *J Cosmet Dermatol* 2024;23(3):794–802.
7. Campiche R, Jackson E, Laurent G, et al. Skin filling and firming activity of a hyaluronic acid inducing synthetic tripeptide. *Int J Pept Res Ther*. 2020;26(1):181–9.
8. Ors S. The effect of hyaluronidase on depth of necrosis in hyaluronic acid filling-related skin complications. *Aesthetic Plast Surg*. 2020;44(5):1778–85.
9. Chen SY, Lin JY, Lin CY. Compositions of injectable poly-d,l-lactic acid and injectable poly-l-lactic acid. *Clin Exp Dermatol*. 2020;45(3):347–8.
10. Durairaj KK, Devgan L, Lee A, et al. Poly-l-lactic acid for gluteal augmentation found to be safe and effective in retrospective clinical review of 60 patients. *Dermatol Surg*. 2020;46:S46–53.
11. Bravo BSF, Carvalho R de M. Safety in immediate reconstitution of poly-l-lactic acid for facial biostimulation treatment. *J Cosmet Dermatol* 2021;20(5):1435–8.
12. Faria G, Boggio R, Bellini M. Gluteal remodelling protocol: Volumization with hyaluronic acid and collagen biostimulation with poly-l-lactic acid. *Skin Health Dis*. 2023;3(4):e244.
13. Munia C, Parada M, Morais MH de A. Changes in facial morphology using poly-l-lactic acid application according to vector technique a case series. *J Clin Aesthet Dermatol*. 2022;15(7):38–42.
14. Palm M, Weinkle S, Cho Y, LaTowsky B, Prather H. A randomized study on PLLA using higher dilution volume and immediate use following reconstitution. *J Drugs Dermatol*. 2021;20(7):760–6.
15. Lin CY, Pervykh S, Lysikova V, Markova N, Lin JY. Two-fold serial dilution: A simple method to adjust thickness of injectable poly-d,l-lactic acid. *Plast Reconstr Surg Glob Open*. 2021;9(8):e3753.
16. Nikolis A, Avelar LE, Enright KM. Evaluation of cannula safety in injection of poly-l-lactic acid.

- Clin Cosmet Investig Dermatol. 2021;14:615–22.
17. Ao YJ, Yi Y, Wu GH. Application of PLLA (poly-l-lactic acid) for rejuvenation and reproduction of facial cutaneous tissue in aesthetics: A review. *Medicine (Baltimore)*. 2024;103(11):e37506.
 18. Oh S, Lee JH, Kim HM, et al. Poly-l-lactic acid fillers improved dermal collagen synthesis by modulating M2 macrophage polarization in aged animal skin. *Cells*. 2023;12(9):1320.
 19. Shridharani SM, Tisch GM, Ebersole TG, Moak TN, Edwartz C. Clinical experience of poly-l-lactic acid injections for body contouring treatment. *J Cosmet Dermatol*. 2021;20(6):1655–62.
 20. Lee S, Cherel M, Gougeon S, Jeong E, Lim JM, Park SG. Identifying patterns behind the changes in skin pores using 3-dimensional measurements and k-means clustering. *Skin Res Technol*. 2022;28(1):3–9.
 21. Avelar L, Ong A, Ong D, et al. Consensus recommendations on the use of injectable poly-l-lactic acid in Asian patients. *J Cosmet Dermatol*. 2023;22(12):3223-31.