



Infraorbital Rejuvenation with PLLA-LASYNPRO™ A Retrospective Case Series Evaluating Efficacy and Safety

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Abstract

Background: Infraorbital aging is characterized by dermal thinning, skin laxity, fine rhytides, and volume loss. Poly-L-Lactic Acid (PLLA) may offer a bio stimulatory approach addressing both skin quality and mild-to-moderate volume deficiency.

Objective: To evaluate the clinical outcomes, patient satisfaction, and tolerability of PLLA-LASYNPRO™ for the treatment of age-related changes in the infraorbital region.

Methods: This retrospective case series included 30 patients treated with three sessions of PLLA-LASYNPRO™ at 4-week intervals. Each lower eyelid received 0.5 mL of reconstituted product delivered using a 25G cannula through a lateral entry point. Outcomes were assessed using the Pharma Research Under Eyelid Fine Line Severity (PULS) scale at baseline and 3 months after the final treatment. Patient satisfaction and adverse events were also recorded.

Results: A total of 30 patients (28 female) with a mean age of 50.5 years were included. At baseline, 26 patients (87%) had moderate to extreme under-eye wrinkles and volume loss. Three months after the final treatment, one-third of patients had no visible wrinkles or volume loss, while a further 47% had only minimal findings. Patient satisfaction increased progressively, with 19 patients (63%) satisfied or very satisfied 1 month after the first treatment and 28 (93%) at final follow-up. Treatment was well tolerated, with transient injection-related swelling, erythema, or bruising resolving within 2 weeks and no long-term adverse events reported.

Conclusion: PLLA-LASYNPRO™ was associated with improvements in infraorbital wrinkles and volume loss, high patient satisfaction, and favourable tolerability. Prospective controlled studies with longer follow-up are warranted.

Keywords: Infraorbital rejuvenation; PLLA-LASYNPRO™; Poly-L-lactic acid; Skin quality

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Introduction

The infraorbital region is more susceptible to aging compared with other facial areas. The thin skin is subject to continuous mechanical stress from frequent muscle activity, as well as environmental exposure [1]. With advancing age, degradation of collagen and elastin fibres further reduces skin thickness and elasticity, resulting in the formation of fine lines and wrinkles [2]. In addition, skin laxity combined with age-related structural changes, including atrophy and descent of the malar fat pads and enlargement of the orbital bony cavity, contributes to the progression of tear trough deformities [3]. These deformities may also present at a younger age, particularly in individuals with thin, translucent lower eyelid skin, where underlying vascular structures or hyperpigmentation are more visible [4].

Age-related changes in the infraorbital area are therefore multifactorial, involving volume loss, skin laxity, dermal thinning, and the development of fine rhytids, all of which contribute to a tired or aged appearance [5].

Non-surgical infraorbital rejuvenation in the clinic can be accomplished through a variety of treatment modalities, including skin resurfacing, fillers and injectables. Each is associated with inherent limitations. Ablative laser resurfacing can be effective, but is often associated with significant downtime and a higher risk profile, limiting patient acceptability [6]. Radiofrequency Micro Needling (RFMN) can improve skin laxity and texture when used cautiously below the infraorbital rim, although outcomes may be variable [7]. Hyaluronic acid fillers may improve tear trough deformity by addressing volume deficiency; however, they are associated with complications such as oedema, contour irregularities, and the Tyndall effect, particularly in patients with thin

skin [8]. Neuromodulator effects are short-lived are generally not favoured for repeated use in this region due to the risk of lower eyelid malposition or ptosis secondary to orbicularis oculi weakening [9]. Polynucleotides, including Polydeoxyribonucleotide (PDRN), have demonstrated potential for improving skin texture, elasticity, and overall appearance in aesthetic applications. However, the current evidence base is limited in quality, reported effects are often modest, and repeated treatments are typically required to maintain outcomes [10,11].

Given these limitations, there remains an unmet need for safe, effective, and minimally invasive treatments that address both skin quality and subtle volume restoration in the lower eyelid region. The introduction of a new Poly-L-Lactic Acid (PLLA) collagen stimulator has emerged as a potential solution to address multiple components of infraorbital ageing simultaneously. PLLA-LASYNPRO™ (JULÁINE™, Nordberg Medical AB, Sweden) is comprised of smooth and non-porous microspheres with a constant size range (median 32.6 µm) to minimize phagocytic uptake and optimize biocompatibility with the surrounding tissue [12,13]. The product is associated with broad regenerative effects in the skin [13-16], with preliminary observations demonstrating increases in skin thickness and visible clinical improvements in facial skin laxity combined with a favourable safety profile [17,18].

In this case series we have retrospectively evaluated the use of PLLA-LASYNPRO™ for the treatment of the lower eyelid region, with a focus on its potential to improve undereye hollowing and skin quality.

Methods

Patients who received treatment with PLLA-LASYNPRO™ for age-related changes to the infraorbital area including undereye hollowness and poor skin quality over the period September 2024 to December 2025 were retrospectively identified from the treatment centre's clinical database. Relevant clinical and photographic records were retrieved and reviewed. Prior to treatment, all patients had undergone a comprehensive clinical assessment. Evaluation for volume loss included assessment of level of bony support, midface volume deficiency, and the presence of a palpable step at the lid-cheek junction. Skin quality was assessed visually and by palpation for level of dermal thickness and for the presence of crepiness, fine rhytides and photodamage. Exclusion criteria were severe midface volume loss, severe prolapse of facial fat pads, and a score of more than 17 out of 40 on the Appearance Anxiety Inventory [19], a screening tool for appearance-related anxiety and body dysmorphic disorder. Patients who had undergone previous undereye treatment with collagen stimulators were also excluded as were those who had undergone undereye treatments with Polydeoxyribonucleotide Acid (PDRN), micro needling, or energy-based devices in the past 6 months. There were no restrictions related to skin quality, skin pigmentation or level of dynamic muscle activity. Standardized photographic documentation was collected at baseline, 1 month after the first treatment, and 3 months after the final treatment.

Patients underwent 3 treatment sessions spaced 4 weeks apart. In each session, patients were treated with 1 vial of PLLA-LASYNPRO™ (150 mg) reconstituted with 5 ml of bacteriostatic 0.9% saline. Each lower eyelid was treated with 0.5 ml of reconstituted product placed as five 0.1 ml linear threads injected in a retrograde technique using a 25G cannula and 1 ml syringe. A volume of 0.5 mL per lower eyelid

was selected to optimize the balance between treatment response and local tolerability. Based on preliminary clinical experience, lower treatment volumes (0.2-0.3 mL) were associated with more modest clinical effects, while a higher volume (1.0 mL) resulted in greater post-treatment swelling and reduced tolerability.

A single cannula entry point was used, located 1 cm lateral and 1.5 cm - 2 cm inferior to the lateral canthus. This entry point lies in a relatively avascular subcutaneous plane over the zygomatic bone, lateral to the course of the angular artery and the vertical projection of the infraorbital artery. From this position, a cannula can be advanced medially within the subcutaneous layer to treat the lower eyelid and tear trough, while approaching the region from a vascular "safe side," rather than crossing high-risk medial midface structures (Figure 1).

Patients were followed for 3 months after the final treatment, for a total follow-up of 5 months. Prior to initial treatment and at the final follow-up visit, the injecting physician assessed the patients' undereye area using the Pharma Research Under Eyelid Fine Line Severity (PULS) scale [20] as follows: Grade 0 (none), no visible wrinkles or volume loss medially or laterally; Grade 1 (minimal), fine wrinkles with slight volume loss medial to the midpupillary line and a smooth lateral lid-cheek transition; Grade 2 (moderate), wrinkles extending laterally beyond the midpupillary line with moderate volume loss; Grade 3 (severe), well-defined wrinkles and a groove along the lid-cheek junction with moderate volume loss; and Grade 4 (extreme), prominent wrinkles and severe volume loss extending from the medial to the lateral canthus (Table 1). Photographic images were obtained prior to treatment and 3 months after the final treatment using a standardised Aura 3D imaging system (Hexagon Technology). In addition, patients were asked to rate satisfaction with improvement of skin texture, quality and general appearance of the undereye area, in writing, 1 month after the first treatment and 3 months after the final treatment, using a 5-point Likert scale: 1 (Very dissatisfied); 2 (Dissatisfied); 3 (Unsure); 4 (Satisfied); 5 (Very satisfied). All patients were assessed and questioned about adverse events at each visit.

All procedures performed were in accordance with the principles of the Declaration of Helsinki and the International Conference on Harmonization Good Clinical Practice guidelines. All patients were informed about the product and procedure and signed an informed consent form for their anonymized clinical data to be used for future training and scientific purposes.

Results

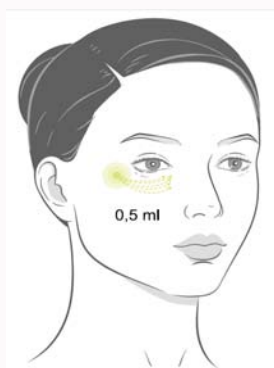
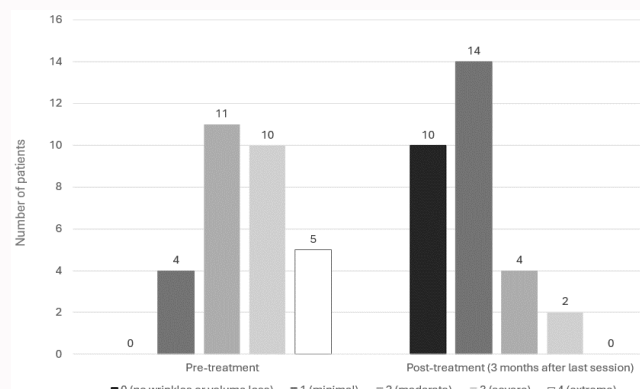
A total of 30 consecutive patients were retrospectively identified: 28 female and 2 males. Patients were aged 28-68 years with a mean age of 50.5 years. Fitzpatrick skin types I-V were represented. Prior to treatment the majority of patients (26 [87%]) had moderate to extreme undereye wrinkles and volume loss according to the PULS scale (Figure 2).

Evaluation of the PULS scores obtained 3 months after the final treatment revealed a significant improvement in undereye wrinkles and volume loss. A third of patients now had no visible wrinkles or volume loss and a further 47% had only minimal wrinkles and volume loss (Figure 2). Before and after images of the undereye area of four patients following 3 treatment sessions with PLLA-LASYNPRO™ are shown in Figure 3.

The physician's observations were confirmed by the patient satisfaction scores. There was a progressive improvement in

Table 1: Grade definitions for the Pharma Research Under Eyelid Fine Line Severity (PULS) scale [20].

Grade	Description
0 (None)	No visible wrinkles or volume loss medially or laterally
1 (Minimal)	Presence of wrinkles with some volume loss medial to the midpupillary line; smooth lateral lid-cheek transition
2 (Moderate)	Defined wrinkles extending laterally beyond the midpupillary line with moderate volume loss; smooth lateral lid-cheek transition with mild volume loss
3 (Severe)	Defined wrinkles extending laterally beyond the midpupillary line with moderate volume loss creating a defined groove along the lid-cheek junction
4 (Extreme)	Defined wrinkles extend from medial to lateral canthus; severe volume loss creates a marked step along the lid-cheek junction

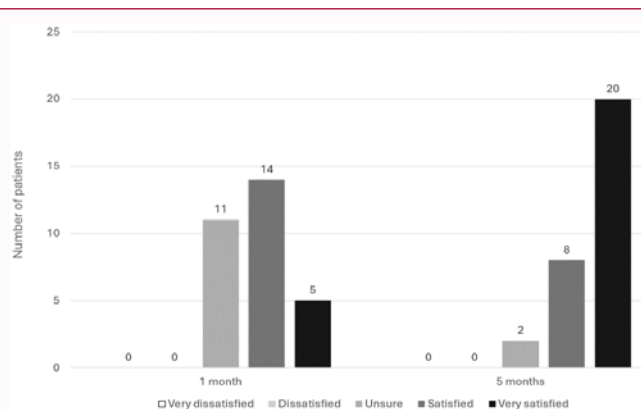
**Figure 1:** Schematic illustrating treatment technique. Each lower eyelid was treated with 0.5 mL of reconstituted product placed as five 0.1 mL linear threads injected using a retrograde technique using a 25G cannula and 1 mL syringe.**Figure 2:** Pharma Research Under Eyelid Fine Line Severity (PULS) scores [20] at pretreatment evaluation and 3 months after third treatment session.

satisfaction scores over the follow-up period. At 1 month after the first treatment, 19 (63%) of patients were already satisfied or very satisfied with treatment (Figure 4). Patients underwent 3 treatment sessions in total and repeat satisfaction scores taken 3 months after the final treatment showed 28 (93%) of patients were satisfied or very satisfied (Figure 4). Importantly, no patients experienced a reduction in satisfaction between visits.

Treatment was very well tolerated. Any adverse reactions were transient (limited to 2 weeks) and injection related, including swelling, erythema and bruising. No long-term adverse events were observed.

Discussion

The present case series demonstrates that treatment with PLLA-LASYNPRO™ is associated with significant improvements in both under-eye hollowing and skin quality, as evidenced by marked

**Figure 3:** Before (left) and after (right) images of the under-eye area of four patients following 3 treatment sessions with PLLA-LASYNPRO™.**Figure 4:** Patient satisfaction scores 1 month after the initial treatment and 3 months after the final treatment assessed using a 5-point Likert scale.

reductions in PULS scores and high levels of patient satisfaction. The majority of patients improved from moderate-to-severe baseline grades to minimal or no visible wrinkles or volume loss, with progressive enhancement observed over time.

These findings are complemented by data from a recent perspective comparative study evaluating PLLA and an HA filler for upper-eyelid hollowing [21]. Using a comparable PLLA microsphere formulation to PLLA-LASYNPRO™ and a similar PLLA treatment protocol, the study demonstrated significantly greater improvement in eyelid hollowing at 9 months with PLLA, whereas the HA filler was associated with more immediate volumetric correction. When considered together with the present findings, the available data suggest that PLLA-based bio stimulatory treatment may represent a versatile approach for comprehensive periorbital rejuvenation,

capable of addressing both upper- and lower-eyelid volume loss and skin quality changes through progressive tissue regeneration rather than simple volumization alone.

Aging of the infraorbital region is characterized by a combination of volume loss, dermal thinning, and skin laxity [22], yet many currently available treatments address only a single component. Hyaluronic Acid (HA) fillers, for example, are effective for restoring volume in the tear trough, but do not directly improve dermal quality or tissue laxity. Similarly, energy-based devices such as radiofrequency micro needling and laser resurfacing primarily target skin quality and laxity, but do not address volume deficiency. In contrast, bio stimulatory agents such as PLLA-LASYNPRO™ offer a mechanistically distinct approach by targeting multiple aspects of infraorbital ageing simultaneously. Through stimulation of new collagen synthesis, PLLA-LASYNPRO™ induces gradual increases in dermal thickness and structural support, resulting in improvements in both skin quality and mild-to-moderate volume deficiency [17,23]. This regenerative mechanism is particularly advantageous in the infraorbital region, where subtle, diffuse correction is required.

The progressive nature of the clinical response observed in this case series is consistent with the known mechanism of action of PLLA-LASYNPRO™ induced collagen production [13,17]. A substantial proportion of patients reported satisfaction as early as 1 month after the first treatment, with further improvement following completion of the treatment course. This highlights the importance of patient counselling regarding the gradual onset of results. The absence of any decline in satisfaction over time further suggests that outcomes are stable, at least within the duration of follow-up.

Choice of treatment modality is an important consideration in the infraorbital region due to its thin skin, limited subcutaneous fat, complex vascular anatomy and susceptibility to complications [22]. In this study, treatment was well tolerated, with no adverse events reported other than mild and transient injection site reactions. In particular, no nodules were observed. PLLA-LASYNPRO™ may potentially have a reduced risk of nodule formation compared with other PLLA formulations [24] due to its uniform, non-porous microsphere structure, optimal particle size, and improved suspension properties, which enable more homogeneous tissue distribution and controlled collagen stimulation [12,13]. The use of a cannula-based technique with a lateral entry point in a relatively avascular plane likely also contributed to the favourable outcomes. In addition, the non-hydrophilic nature of PLLA-LASYNPRO™ may reduce the likelihood of oedema compared with hyaluronic acid fillers, which is a particular advantage in an area susceptible to oedema.

The results of this study suggest that PLLA-LASYNPRO™ may fill an important gap among current treatment options for infraorbital rejuvenation. By addressing both skin quality and undereye hollowing through a single, minimally-invasive approach, it offers a potential alternative to combination treatment strategies, particularly in patients with mild-to-moderate infraorbital ageing. Future prospective, controlled studies with longer follow-up and standardized outcome measures are warranted to further define its role and to compare its efficacy directly with established treatments.

Limitations

The findings of this study should be interpreted in light of several limitations. The retrospective nature and relatively small sample size limit the generalizability of the results. The absence of a

control group or direct comparator precludes definitive conclusions regarding the relative efficacy of PLLA-LASYNPRO™ compared with other treatment modalities. Furthermore, follow-up was limited to 5 months, and longer-term data are required to assess durability of response and the timing of maintenance treatments. Although no adverse events were observed other than mild injection site reaction, larger studies are necessary to more fully characterize the safety profile in the infraorbital area, particularly in routine clinical practice.

Conclusion

In this retrospective case series, PLLA-LASYNPRO™ was associated with significant improvements in both under-eye hollowing and skin quality, accompanied by high patient satisfaction and a favourable safety profile. By targeting multiple components of infraorbital ageing, including dermal thinning, skin laxity, and mild-to-moderate volume loss, this bio stimulatory approach offers a promising alternative to conventional treatments that typically address only a single component. The gradual and natural-looking results observed, combined with good tolerability, support its use as a minimally-invasive option for infraorbital rejuvenation. Further prospective, controlled studies with larger cohorts and longer follow-up are warranted to confirm these findings and better define long-term efficacy and safety.

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