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Case Report

Poly-L-lactic acid fillers for nasal alar retraction: safety and effectiveness in 13 cases

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Abstract: Objective: To assess the effectiveness and safety of poly-L-lactic acid (PLLA) fillers in treating nasal alar retraction. We conducted a series of case reports on 13 patients treated for nasal alar retraction at the Chengdu Ningyue FRESKIN Medicine Cosmology Clinic from September 2022 to July 2023. Patients ranged from 23 to 49 years, comprising 12 females and 1 male. Of these, 5 had no prior medical history, 7 had previously undergone rhinoplasty, and 1 had a history of nasal trauma. Treatment outcomes and adverse reactions were monitored following PLLA filler injections. The mean pre-treatment severity score was 1.62±0.65, improving to 0.54±0.66 post-treatment ($t=4.19$, $df=23$, $P<0.001$). All participants reported satisfaction with their results without adverse effects. PLLA facial fillers are a safe and effective treatment for nasal alar retraction, presenting no embolism risk. This treatment merits consideration for broader clinical application.

Keywords: Nasal alar retraction, poly-L-lactic acid fillers

Introduction

Surgical intervention on the alar rim-nostril-columellar complex (ARNC) is complicated due to its delicate anatomy. This complexity is further analyzed through four critical inclination angles observed from a lateral perspective: 1) the nasal tip angle, 2) the nasal alar crease line, 3) the anterior nasal angle, and 4) the nasal columellar angle. ARNC retraction, which leads to a concave or contracted appearance of the complex, compromises the alar rim's fullness and contributes to facial disharmony [1]. Various etiological factors, including congenital, acquired, and iatrogenic causes, are implicated in this condition, primarily related to the soft tissues and cartilage of the nasal wings. Specifically, insufficient soft tissue volume between the lateral crus and the nasal alar rim, or a malposition of the lateral crus, are notable contributors to nasal retraction [2].

The therapeutic landscape for ARNC retraction encompasses autologous tissue filling (utilizing materials such as adipose tissue, stromal vascular fraction, and platelet-rich plasma), nasal rim implants (including lateral crural strut grafts and alar rim grafts), facial fillers, and surgical anatomical reconstruction [3, 4]. Facial fillers, serving as an alternative to cartilage grafts, aim to correct soft tissue deficits, mitigate static wrinkles, and refine facial contours with minimal bodily trauma [5].

In cosmetic surgery's evolving field, collagen became the first Food and Drug Administration-approved skin filler in 1981, succeeded by the advent of hyaluronic acid in the early 21st century [6-8]. The introduction of polymer fillers marked a significant advancement, emphasizing the need for biocompatibility, safety, and aesthetic effectiveness. Poly-L-lactide (PLLA), a lyophilized powder reconstituted with saline for injection, emerged as a promising candidate by minimizing embolism risks and fostering collagen growth, enhancing scar repair [9, 10].

Avelan PLLA, a synthetically produced, National Medical Products Administration-certified biodegradable material, distinguishes itself by stimulating fibroblasts to produce collagen, offering volume enhancement and skin firming over

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Table 1. Classification of ARNC retraction

Classification	Interpretation
Type I	The columella is hanging, the distance between the long axis of the nostril and the columellar rim is >2 mm, while the distance from the long axis to the alar rim is 1-2 mm.
Type II	Alar rim retraction, the distance from the long axis of the nostril to the alar rim is >2 mm, while the distance from the columellar rim to the long axis is 1-2 mm.
Type III	This is a combination of Type I and Type II, meaning it involves both columella hanging and alar rim retraction.
Type IV	Alar drooping, where the distance from the long axis of the nostril to the alar rim is too short, leading to alar hanging and reduced columella exposure.
Type V	Columella retraction, where the distance between the columellar rim and the long axis of the nostril is shortened.
Type VI	A combination of Type IV and V, involving both alar drooping and columella retraction.

Note: ARNC: alar rim-nostril-columellar complex.

several months, with effects lasting up to 2.5 years [11, 12]. However, initial PLLA formulations were prone to clumping and nodule formation upon injection, limiting their application to deeper skin layers. Innovatively, the Changchun Sinobiom Company's PLLA, featuring a patented single sphere dispersion technique and MEC & SPACE series technology, ensures rapid and homogeneous dissolution of the powder, facilitating its use in superficial treatments, including the forehead, perioral, and periorbital areas, as well as mesoderm therapy.

This report aims to assess the PLLA filler's effectiveness and safety for ARNC retraction treatment, underlining the innovative application of PLLA as a biocompatible material in addressing this condition.

Case report

Case description

This study was conducted on 13 patients treated at the Chengdu Ningyue FRESKIN Medicine Cosmology Clinic for ARNC retraction from September 2022 to July 2023. The report included 12 females and 1 male, aged between 23 to 49 years old, with varying medical histories including previous rhinoplasty and trauma. This study adhered to the Declaration of Helsinki and received approval from the Research Ethics Committee of the Chengdu Ningyue FRESKIN Medicine Cosmology Clinic (Ethical No: HBNU202103005), with informed consent obtained from all participants.

Product details

The treatment utilized Avelan Poly-L-lactic acid filler, a white lyophilized powder activated with sodium chloride injection. The particle size distribution (d(50)) ranged from 20-50 μm, adhering to standards set by the Jilin Food and Drug Administration (License No: 20160015).

Evaluation and treatment methodology

According to Gunter's classification, several scenarios are conceivable. Frontally, the vertical distance between the angle of the columella-lobular junction (Sheen's angle) and the tip-defining points should be bisected by a horizontal line traversing or proximate to the alar rim's apex. Laterally, the nostril contour exhibits an oval shape, encompassing the alar rim and the skin covering the columella and nasal vestibule. A straight line connecting the oval's foremost and rearmost points constitutes its long axis, dividing the nostril into superior and inferior segments. Ideally, the maximum distance from this axis to either the alar or columellar rim should not exceed 1-2 mm. Utilizing these measurements, ARNC retraction is categorized into six morphological types (**Table 1**) [13, 14].

An alar retraction deformity is characterized by a vertical distance exceeding 2 mm between the alar rim and the nostril's long axis. This deformity is further classified into mild (2-3 mm retraction), moderate (3-4 mm retraction), and severe (>4-5 mm retraction), with a scoring system from 0 (normal) to 3 (severe). The scoring system utilized assigns 0 points to a vertical

Table 2. Comparison of data from 13 patients before and after treatment

Patients ID	Alar rim retraction score before treatment	Alar rim retraction score after treatment
1	2	0
2	1	0
3	1	0
4	3	1
5	2	1
6	1	0
7	2	1
8	1	0
9	2	1
10	2	1
11	1	0
12	2	1
13	1	0

distance of 1-2 mm, 1 point to a distance of 2-3 mm, 2 points to a distance of 3-4 mm, and 3 points to a distance greater than 4 mm.

Outcome evaluation

This institution included 13 patients for case series analysis, with a comprehensive pre- and post-treatment evaluation outlined in **Table 2**. According to **Table 3**, the pretreatment score of these patients averaged 1.62±0.65, whereas the post-treatment score decreased significantly to 0.54±0.66. Statistical analysis revealed a t-value of 4.19 with 23 degrees of freedom and a *p*-value less than 0.001, indicating a statistically significant improvement.

Representative case

A 33-year-old female presenting with severe ARNC retraction after costal cartilage rhinoplasty received 340 mg of Avelan PLLA fillers. The treatment involved precise injections at the retraction sites, following a specific protocol to ensure depth and distribution accuracy. After four sessions, the patient showed significant improvement, with no adverse reactions reported.

During the procedure for alar rim retraction, a 30G-13 mm sharp needle was used. Firstly, the needle was inserted at the nasal tip, with its tip reaching the columella. The subcutaneous tissue was separated with a sharp needle and aspirated to ensure no blood reflux, and injected in a fan-shaped pattern, with each injection volume ranging from 0.1 to 0.3 ml. Secondly, horizontally along the columellar scar, tissue was loosened and subsequently injected until it attained a firm and slightly white appearance, with a single injection of 0.1 to 0.3 ml. Thirdly, a retrograde injection was given along the retracted alar rim, with a single dose of 0.1-0.2 ml. Lastly, a vertical injection was given at the defect on both sides of the nose tip, with a retrograde injection and a single dose of 0.1 ml. Notably, all injections were targeted at the deep dermis, with a depth of approximately 0.2-0.3 cm.

This report highlights the effectiveness and safety of PLLA facial fillers in treating ARNC retraction, underscoring the importance of this technique in achieving satisfactory outcomes. **Figures 1** and **2** provide frontal and head-up views of the treatment results, with **Figure 3** detailing the operation steps.

Discussion

Alar rim retraction, a notable nasal morphological deformity, arises when the distance between the alar rim and the vertical axis of the nostril surpasses the normal range [15]. This condition can result from various causes, including genetic factors, congenital issues, nasal surgery complications, or trauma [16]. Beyond affecting the aesthetic appearance, alar rim retraction can have profound psychological and social impacts on individuals [17].

In the realm of facial aesthetics, the nose is pivotal, significantly contributing to the face's overall balance and harmony [18]. Alar retraction disrupts this balance, potentially leading to dissatisfaction and feelings of inferiority regarding one's appearance [19]. Treatments for alar retraction typically involve surgical correction for severe cases, which aims to reshape the ala for improved facial aesthetics, or filler restoration for milder cases, employing materials such as PLLA to elevate the alar to its normal position, thus enhancing facial appearance [20, 21].

This report focused on the use of PLLA fillers for alar rim retraction treatment, chosen for their efficacy. The recommended injection interval for PLLA fillers is usually 4 weeks, with

Table 3. Comparison of effects before and after treatment

	N	Minimum	Maximum	Sum	Mean	Standard deviation	t value#	*p* value#
Before treatment	13	1	3	21	1.62	0.650	4.19	P<0.001
After treatment	13	0	2	7	0.54	0.660		

#: Comparison between before and after treatment.

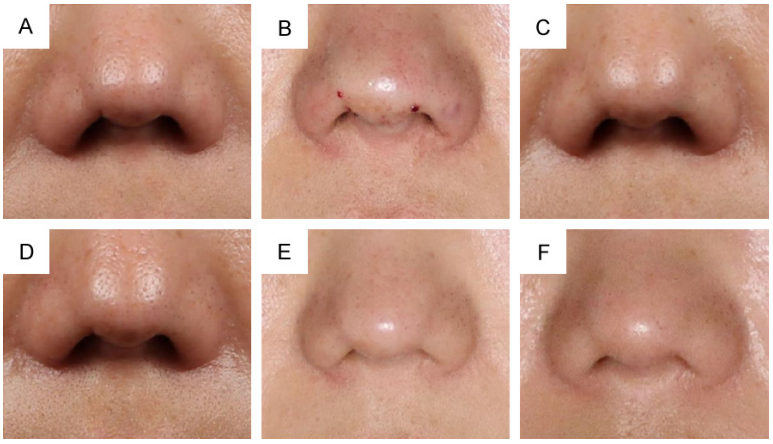

Figure 1. Frontal-view photos of the patients. A: Before treatment; B: Immediately after the first treatment; C: One month after the first treatment; D: One month after the second treatment; E: One month after the third treatment; F: One month after the fourth treatment.

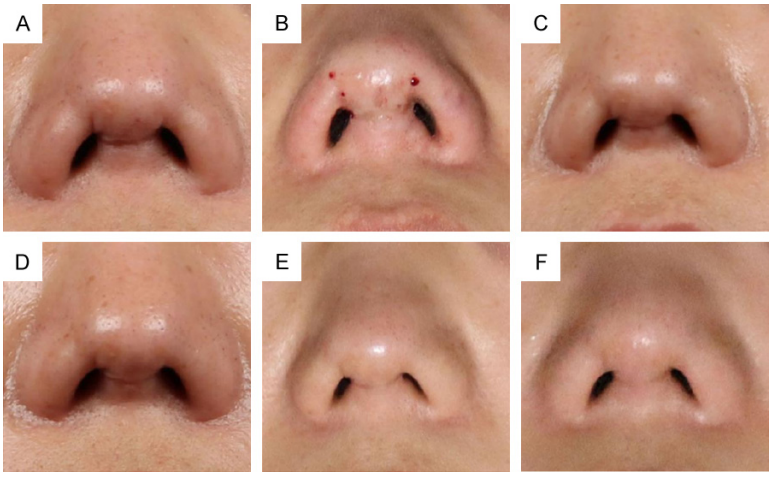

Figure 2. Photo of a patient in the head-up position. A: Before treatment; B: Immediately after the first treatment; C: One month after the first treatment; D: One month after the second treatment; E: One month after the third treatment; F: One month after the fourth treatment.

possible adverse reactions including bruising, edema, and inflammatory responses, which generally subside after 3 days. Our analysis of 13 patients revealed a significant improvement in their condition post-treatment, with a decrease in the average score from 1.62±0.65 to 0.54±0.66, a t-value of 4.19, degrees of freedom of 23, and a *p*-value of less than 0.001. All patients demonstrated satisfaction with the treatment outcome without adverse reactions.

Nevertheless, this study is not without limitations. It was a small-scale, single-center case series report, which could introduce bias. The focus was on short-term efficacy and safety, omitting long-term effects and potential complications. Also, the study lacked control interventions, limiting its clinical applicability. Future research could involve larger, multicenter randomized controlled trials to confirm the effectiveness and safety of PLLA fillers for treating alar rim retraction and to explore long-term outcomes.

With advancements in research and technology, treatment protocols for PLLA fillers are anticipated to be optimized further. Enhanced injection techniques, personalized treatment plans, and dosages could improve outcomes and reduce adverse reactions. Additionally, the development of new facial fillers could offer improved features, providing more treatment options for patients.

Disclosure of conflict of interest

None.

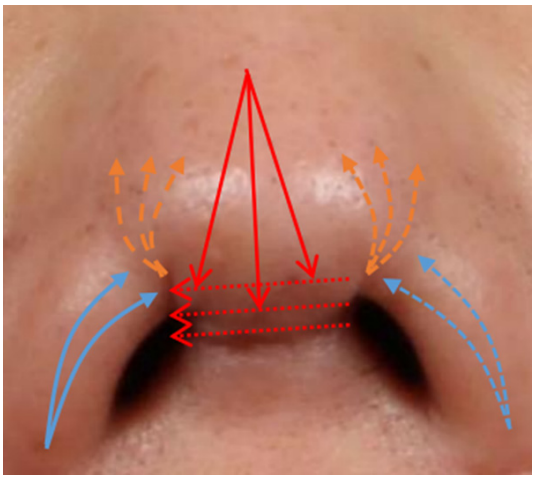

Figure 3. Injection steps. Note: The red solid line represents the first step of the operation; the red dotted line depicts the second step; the blue line indicates the third step; and the orange line reveals the fourth step.

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