



Patient-perceived Emotional and Functional Benefits of Poly-L-Lactic Acid (PLLA) for the Treatment of Facial Volume Loss

ABSTRACT

Background: Facial volume loss can substantially impact self-perception of the affected individual and his or her social/professional interactions and opportunities. Persons who are perceived as more youthful and attractive are rated as nicer, more energetic, healthier, and more likely to be productive than those perceived to be older and unattractive. **Objective:** The goal of this study was to assess the changes in emotional and functional status of subjects treated with 2 to 4 monthly PLLA injections to the upper, mid, and lower face. **Methods:** Fifty subjects were recruited from two community dermatology centers in the United States (Bucks County, Pennsylvania, and Spokane, Washington). Two patient self-report measures were used—The Facial Volume Restoration Outcome Questionnaire and the Rosenberg Self Esteem Scale. **Results:** Approximately 30 percent of the subjects who completed pre- and post-injection instruments reported increased confidence, increased sense of control, more comfort with others, increased happiness when looking in the mirror, more happiness when their faces were touched, healthier eating, increased contentment, beliefs that they were seen as less stressed by others, increased happiness with their bodies, exercising more, and that their lives were better. Additionally, 43 percent felt more optimistic and 33 percent felt less anxious. The changes in self-esteem, which was self-reported on the Rosenberg scale, were very modest but also favorable. Investigator's Global Assessment (IGA) of facial volume loss improved from 2.2 at baseline to 1.2 at six-month follow-up assessment. **Conclusion:** Treatment of facial volume loss with PLLA was associated with improvements in patient-perceived emotional and functional status at six months after initial injection.

KEYWORDS: Poly-L-Lactic acid, fillers, volume loss, volume restoration

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Facial volume loss can substantially impact self-perception of the affected individual and his or her social/professional interactions and opportunities. Persons who are perceived as more youthful and attractive are rated as nicer, more energetic, healthier, and more likely to be productive than those perceived to be older and unattractive.^{1–3}

The observed facial changes that result from underlying volume loss associated with age and photodamage can produce a subjectively older and less attractive appearance. Loss of facial volume can produce a sad, sunken, deflated, dull, tired, and/or lackluster appearance, subjectively, which might suggest to others that the individual is older than he or she actually is. In addition, some individuals might consciously or subconsciously see these changes as harbingers of their own progressive deterioration and decline. Injection of approved fillers into the upper face, mid face, and lower face can create a more youthful, better rested, and kinder appearance. Randomized, controlled trials (RCTs) demonstrating the effectiveness of injectable fillers in improving emotional and functional status remain scarce.

A hallmark of hyaluronic acid and calcium hydroxylapatite filler products is their ability to produce notable volumetric changes

immediately.⁴ The recent proliferation of technologically improved hyaluronic fillers has dramatically enhanced the armamentarium available to active clinicians.⁵ Claims of anatomic regional superiority and longer duration might be considered enticing reasons to use hyaluronic fillers.⁶ The early days of fillers characterized by “briefly there til completely gone” are being supplanted by “there now, persistently there, and stimulatory for a reasonable period of time.”⁷ The persistence of filler presence with enhancement of collagen production is a meaningful step forward in filler products, as these characteristics might slow the facial aging process. In contrast to the immediate deposition of hyaluronic acid and calcium hydroxylapatite fillers, another option exists for enhancement of collagen production and persistence of benefit. Poly-L lactic acid (PLLA) (Sculptra®, Galderma Laboratories, L.P., Ft. Worth, Texas) has been shown to effectively stimulate collagenases and fibroplasia, which can produce a gradual volumizing effect of the treated areas.⁸ While there is apparent immediate volume repletion with PLLA injections, it is mostly from the sterile water and lidocaine commonly used to prepare the product, which largely dissipates within days after injection. The subsequent enhancement in collagen production and facial

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volumization occurs gradually over the next 1 to 3 months following each injection. Optimal correction usually occurs 1 to 3 months after 3 to 4 monthly injections of PLLA. While the exact dilution of PLLA varies among injectors, 6- to 7cc of sterile water with 2cc of lidocaine was used in this study.

PLLA is a synthetic, biocompatible, biodegradable polymer. For its use in soft tissue augmentation, it is supplied as a lyophilized powder containing PLLA microparticles, the size and chemical attributes of which are tightly controlled.⁹ As a biocompatible material, PLLA generates a subclinical inflammatory tissue response that leads to encapsulation of the microparticles and stimulation of host collagen and fibroplasia production. Over time, as the PLLA degrades, the inflammatory response wanes and host collagen production increases. This response leads to the generation of new volume and structural support that occurs in a gradual, progressive manner and can last for years.^{8,10}

While the efficacy, safety, and duration of PLLA injection benefits are well supported by the literature,¹¹ its mechanism of action as a biostimulator that produces gradual tissue augmentation over several months is unique. One concern that clinicians might have when using PLLA is the possibility that its delayed onset of effects will result in treatment dissatisfaction among those patients who expect immediate, visible results. Other patients, however, might be more concerned that the immediately visible effects of a hyaluronic acid or calcium hydroxylapatite filler will be too obviously noticeable by others. The goal of this study was to assess the subjective changes in emotional and functional status of subjects treated with 2 to 4 monthly PLLA injections to the upper, mid, and lower face.

METHODS

Fifty subjects were recruited from two community-based dermatology centers in the United States (Bucks County, Pennsylvania, and Spokane, Washington). All 50 subjects were eligible and enrolled according to protocol inclusion and exclusion criteria—49 women and one man. Subjects were required to be in good health without known contraindications to filler. Subjects were also required to be naive to fillers or not have had filler injections in the prior two years before enrollment. Fifty-eight

TABLE 1. Rosenberg Self Esteem Scale

SCALE ITEMS	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
I feel that I am a person of worth, at least on an equal basis with others.	1	2	3	4
I feel that I have a number of good qualities.	1	2	3	4
All in all, I am inclined to feel that I am a failure.	1	2	3	4
I am able to do things as well as most other people.	1	2	3	4
I feel I do not have much to be proud of.	1	2	3	4
I take a positive attitude toward myself.	1	2	3	4
On the whole, I am satisfied with myself.	1	2	3	4
I wish I could have more respect for myself.	1	2	3	4
I certainly feel useless at times.	1	2	3	4
At times, I think I am no good at all.	1	2	3	4

percent of subjects were age 45 to 60 years, 33 percent were 60 to 75 years, and eight percent were 35 to 45 years. The protocol was approved by a central Institutional Review Board (IRB) and full informed consent was provided by all subjects.

Two patient self-report measures were used: The Facial Volume Restoration Outcome Questionnaire (Appendix 1) and the Rosenberg Self Esteem Scale (Table 1). The Facial Volume Restoration Outcome Questionnaire is a 35-item patient self-report Likert scale-based instrument. Subjects self-report and self-rate selected areas of their emotional and functional status. The Rosenberg Self Esteem Scale is also a Likert scale-based instrument measuring overall self-esteem. Subject self-report measures were completed at baseline and six months after the subjects' first injections. Facial volume loss was assessed on a 0 to 4 scale (Investigator Global Assessment [IGA]) (Table 2) before and after treatment by either the principle investigator or a sub-investigator.

Subjects were injected monthly with PLLA over 3 to 4 consecutive months. Subjects received one full vial at each treatment visit. The PLLA was reconstituted with 7cc of sterile water and 2cc of lidocaine without epinephrine. The contents of the vial were injected in areas deemed appropriate by the certified injector and agreed upon by the study subject. Approximately 4 to 6 weeks later, a second vial was reconstituted as above and injected according to the above parameters. Finally, approximately 4 to 6 weeks later (12–16 weeks after the first injections), subjects were evaluated and a decision was jointly made with

TABLE 2. IGA Facial Volume Loss

GRADE	DESCRIPTION
0	No visible volume loss
1	Mild volume loss.
2	Moderate volume loss
3	Severe volume loss
4	Very severe volume loss
IGA: Investigator's Global Assessment	

the injector regarding whether a third vial was desired and appropriate. All 50 subjects were injected at Week 1, 49 subjects were injected at the second visit, and 35 were injected at the third visit.

RESULTS

Pre-and post-assessments were completed on 41 subjects. The remaining nine patients were lost to follow-up or withdrew and did not complete the post-filler assessments or return for investigator evaluation. None failed to return due to known adverse events.

Approximately 30 percent of subjects who completed pre-and postinjection assessments reported increased confidence, increased sense of control, increased productivity, increased comfort with others, feeling more attractive, increased happiness when looking in the mirror, more happiness when their faces were touched, healthier eating, increased contentment, beliefs that they were seen as less stressed by others, being happier with their bodies, exercising more, and better lives. Additionally, 43 percent felt more optimistic, and 33 percent reported feeling less anxious (Table 3). The self-reported

TABLE 3. Facial Volume Restoration Questionnaire Results

#	ITEMS	CHANGE FROM BASELINE ON LIKERT SCALE, %
1	Less anxious	33.3
2	More optimistic	43.6
3	More energetic	23.1
4	Eating more healthy food	33.3
5	Happier	23.1
6	Exercising more	28.2
7	Less irritable	17.9
8	More amorous	20.5
9	More social	28.2
10	More productive	33.3
11	More focused	17.9
12	Less tired	28.2
13	Less angry	20.5
14	More confident	33.3
15	More sexually confident	15.4
16	More assertive	28.2
17	Less argumentative	17.9
18	More comfortable with others	30.8
19	More likely to go out	25.6
20	More involved in community activities	20.5
21	Doing better at work/school	15.4
22	More in control	28.2
23	Taking less medications	10.3
24	Less depressed	20.5
25	Seen by others as less stressed	33.3
26	Feeling more attractive	30.8
27	More relaxed	20.5
28	Happier when looking in the mirror	30.8
29	Using less cosmetic to hide effects	23.1
30	Happier when my face is touched	33.3
31	My life is better	33.3
32	Drinking less alcohol	17.9
33	Happier with my body	28.2
34	More in control of my eating	25.6
35	More content	28.2

changes in self-esteem on the Rosenberg scale were modest but also favorable. IGA of facial volume loss improved from 2.2 at baseline to 1.2 at the six-month follow-up assessment (lower score suggesting less volume loss).

DISCUSSION

Injection of PLLA has been shown to be a safe and effective method for facial volume and contour restoration.^{11,12} A potential drawback of PLLA injection is the delay in persistent, clinically evident volume repletion. The improvements are gradual as enhanced endogenous collagen production and fibroplasia gradually replenish volume-depleted areas.¹⁰ In the present study, we assessed patient satisfaction with the delayed onset effects of PLLA on facial volume using two patient self-reported assessments. The data suggest that patients perceived favorable emotional and functional improvements at six months after their first PLLA injection.

A benefit of PLLA's gradual onset of effects is the potentially less obvious observation from others that a patient has undergone a cosmetic procedure. Clinicians might include this point in their discussions with patients regarding volume repletion treatment options.

Dissemination of the data from this study together with existing data supports the theory that volume restoration can slow the aging process. Thus, the beneficial effects of injectable PLLA might extend beyond those of a cosmetic procedure, which might serve as a compelling recruitment tool for its use among maturing individuals who struggle with facial volume loss associated with aging, medications, stress, and illness.

Limitations. Limitations of the study include the self-reported nature of the data collected from study participants, thus any favorable changes reported by the patients might not be directly attributable to the filler treatment. Additionally, lack of quantification of Likert scale gradations limits our findings. Finally, the absence of a comparable group of subjects treated with a hyaluronic acid or calcium hydroxylapatite product does not allow for assessment of equivalence, superiority, or inferiority of immediate volumizing products. Additional research addressing these limitations is needed to support and clarify our data on the emotional and functional benefits of facial volume restoration using PLLA.

CONCLUSION

Treatment of facial volume loss with PLLA was associated with improvements in patient-perceived emotional and functional status at six months after initial injection. These data suggest that the gradual volumization produced by PLLA injections might result in better long-term results and higher patient satisfaction with treatment outcomes compared to the immediate, but shorter-lived, volumetric changes associated with hyaluronic acid and calcium hydroxylapatite filler products.

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APPENDIX 1. Facial Volume Restoration Outcome Questionnaire

Table 1. Facial Volume Restoration Outcome Questionnaire

Site # _____ Subject # _____ Date: _____
 Treatment visit 1 date: _____ Sex: _____ Female _____ Male
 Treatment visit 2 date: _____ Age: _____ 35-45 _____ 45-60 _____ 60-75
 Treatment visit 3 date: _____ City/Country of residence: _____
 Number of Poly-L-Lactic Acid treatments: _____

Please circle the number that best describes how you feel. Circling the number one suggests that you believe that the description on the left hand column best describes how you feel. Circling the number 7 suggests that you believe that the description on the right hand column best describes how you feel. Circling number 4 suggests that you feel that there has been no change. Please be honest.

Since my Poly-L-Lactic Acid injection (s), I find that I am in general...

1. Less anxious	1 2 3 4 5 6 7	More anxious
2. More optimistic	1 2 3 4 5 6 7	Less Optimistic
3. More energetic	1 2 3 4 5 6 7	Less energetic
4. Eating more healthy food	1 2 3 4 5 6 7	Eating less healthy food
5. Happier	1 2 3 4 5 6 7	Sadder
6. Exercising more	1 2 3 4 5 6 7	Exercising less
7. Less irritable	1 2 3 4 5 6 7	More irritable
8. More amorous	1 2 3 4 5 6 7	Less amorous
9. More social	1 2 3 4 5 6 7	Less social
10. More productive	1 2 3 4 5 6 7	Less productive
11. More focused	1 2 3 4 5 6 7	Less focused
12. Less tired	1 2 3 4 5 6 7	More tired
13. Less angry	1 2 3 4 5 6 7	More angry
14. More confident	1 2 3 4 5 6 7	Less confident
15. More sexually confident	1 2 3 4 5 6 7	Less sexually confident
16. More assertive	1 2 3 4 5 6 7	Less assertive
17. Less argumentative	1 2 3 4 5 6 7	More argumentative
18. More comfortable with others	1 2 3 4 5 6 7	Less comfortable with others
19. More likely to go out	1 2 3 4 5 6 7	Less likely to go out
20. More involved in community activities	1 2 3 4 5 6 7	Less involved in community activities
21. Doing better at work/school	1 2 3 4 5 6 7	Doing worse at work/school
22. More in control	1 2 3 4 5 6 7	Less in control
23. Taking more medications	1 2 3 4 5 6 7	Taking less medications
24. Less depressed	1 2 3 4 5 6 7	More depressed
25. Seen by others as less stressed	1 2 3 4 5 6 7	Seen by others as more stressed
26. Feeling more attractive	1 2 3 4 5 6 7	Feeling less attractive
27. More relaxed	1 2 3 4 5 6 7	Less relaxed
28. Happier when looking in mirror	1 2 3 4 5 6 7	Less happy looking in mirror
29. Using less cosmetics to hide defects	1 2 3 4 5 6 7	Using more cosmetic to hide defects
30. Happier when my face is touched	1 2 3 4 5 6 7	Less happy when my face is touched
31. My life is better	1 2 3 4 5 6 7	My life is worse
32. Drinking more alcohol	1 2 3 4 5 6 7	Drinking less alcohol
33. Happier with my body	1 2 3 4 5 6 7	Less happy with my body
34. More in control of my eating	1 2 3 4 5 6 7	Less in control of my eating
35. More content	1 2 3 4 5 6 7	Less content

Thank you for your time and honesty.