

Efficacy evaluation of endolift laser for treatment of nasolabial folds and marionette lines

Mohammad Ali Nilforoushzadeh^{1,2}  | Maryam Heidari-Kharaji^{1,2,3}  | Tannaz Fakhim² | Seyedeh Tina Hosseini⁴ | Shohreh Rafiee² | Mohammadhasan Shahverdi² | Niloufar Najar Nobari^{2,5}

¹Skin and Stem Cell Research Center, Tehran University of Medical Sciences, Tehran, Iran

²Skin Repair Research Center, Jordan Dermatology and Hair Transplantation Center, Tehran, Iran

³Institut National de la Recherche Scientifique (INRS)-Centre Armand-Frappier Santé Biotechnologie (CAFSB), Laval, Québec, Canada

⁴Department of Cellular and Molecular Biology, Faculty of Advanced Science and Technology, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

⁵Department of Dermatology, Rasool Akram Medical Complex, Iran University of Medical Sciences, Tehran, Iran

Correspondence

Niloufar Najar Nobari, Skin Repair Research Center, Jordan Dermatology and Hair Transplantation Center, Tehran, Iran and Department of Dermatology, Rasool Akram Medical Complex, Iran University of Medical Sciences, Tehran, Iran.
Email: Nobarii.ni@gmail.com

Tannaz Fakhim, Skin Repair Research Center, Jordan Dermatology and Hair Transplantation Center, Tehran, Iran.
Email: Tannaz.Fakhim60@gmail.com

Abstract

Background: The nasolabial folds are the most marked sign of aging. Endolift laser was used for the treatment of nasolabial folds and marionette lines (one of the facial danger zones).

Methods: Ten female subjects were engaged in this study. Patients underwent Endolift laser for nasolabial folds and marionette lines treatment. The efficacy of the Endolift technique on the nasolabial folds and marionette lines was evaluated by biometric assessment with Cutometer, Visioface, and the Skin Ultrasound Imaging system. Also, patient's satisfaction and blinded dermatologists' assessment were assessed.

Results: The Visioface results displayed that the Endolift laser treatment significantly declined the depth and area of the nasolabial wrinkles. The skin ultrasonography results reported that the epidermis and dermis density and thickness were significantly increased. Also, the cutometer outcomes showed that the Endolift laser treatment can increase skin elasticity. The results showed that a large number of patients were very satisfied with the technique.

Conclusion: In conclusion, Endolift laser has an effective technique for decreasing the nasolabial folds, marionette lines, and improve the appearance of the face without any severe side effect. This technique does not need general anesthesia and recovery time.

KEYWORDS

endolift laser, laser treatment, marionette lines, nasolabial folds, treatment

1 | INTRODUCTION

Aging leads to a decrease in a collagen production, increases the fat volume in the nasolabial folds lower portion, lose the nasolabial sulcus volume, and fold the upper cheek area,¹ so protrude the nasolabial groove.^{1,2} Also ageing lead to a reduction in skin thickness, that affects

the biomechanical possessions of the skin.³ The aging is a natural process in the humans, but it can accelerate by several factors that cause advanced physiological and structural changes in the skin such as environmental pollution and sun exposure. These factors reduce elastic fibers and collagen and thus loss the skin elasticity.^{4,5} Changes in the nasolabial folds are one of the primary features of face aging. These

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2023 The Authors. *Skin Research and Technology* published by John Wiley & Sons Ltd.

changes are due to morphologic changes of the muscle function and skin sagging.⁶ Nasolabial folds look like wrinkles, because both are shaped by folding of the dermis. Several aesthetic techniques are used for nasolabial rejuvenation like microneedle,^{7,8} radiofrequency,⁹ and filler injection^{10–13} but each method has its own risks. Ablative laser resurfacing by erbium: YAG (Er:YAG) laser and carbon dioxide laser is an effective method for rejuvenation of the skin but has probable side effects like, infection, prolonged erythema, and scarring.¹⁴ Sometimes, non-ablative lasers for instance, neodymium: YAG (1320 nm) laser and fractional erbium glass (1550 nm) laser, are used together to reduce the ablative lasers side effects however they have less improvement and need more sessions for treatment.^{15–18} Therefore, this study aimed to investigate the effect of Endolift laser therapy as a novel technique on nasolabial fold and marionette lines (one of the facial danger zones).

2 | SUBJECTS AND METHODS

2.1 | Subjects selection

In total, 10 healthy female and male patients suffering nasolabial fold and marionette lines were joined in this study. The age variety was from 25 to 58. Written informed consent forms were gained from all individuals for the investigations. Patients with coagulopathy, immunocompromised status, active infection, cancer, and autoimmune disease were excluded, pregnant patients were also excluded.

2.2 | Study design and laser technique

Endolift™ (LASEMAR1500™ machine, Eufoton s.r.l.) was used in this study. A sterile set was prepared for each patient. A sterile set includes betadine galipot, injectable serum galipot, syringe containing injectable lidocaine for anesthesia, sterile gauze, sterile gloves, and sterile fibers for Endolift. The intervention area (perioral area) was cleaned using betadine and the target area was cleaned of betadine using injected serum. Injectable lidocaine (2% lidocaine) was used in the nasolabial area that was the site of Endolift fiber insertion in to the skin and the fiber movement area was numbed. After local anesthesia, the sterile fiber was inserted into the skin and the fiber was moved superficially in fanning motions to avoid temperature rise in the intervention area, the laser diode was induced at the same time (Figure 1). In this treatment method, the 300 μ fiber was used. To perform the procedure in this area, energy and time were reduced because this area is one of the facial danger zones. The intensity and the power of the device include; Pulse: 3, T on -T off: 25–75, shot number: 200–250 shots on each side of the face, total shots for the whole of the nasolabial area: 400–500. The intensity and power of the device were the same in all area of intervention and the patients received the treatment one time. The necessary care after treatment was explain to the patients. For the patients with the history of herpes, acyclovir tablets were prescribe and the antibiotic was prescribed to prevent possible infections after the procedure of 5 days. The possible side effects like infection, ery-



FIGURE 1 Endolift laser procedure.

thema, and swelling were noted and managed after treatment. This treatment method does not have recovery period or down time. The patients were followed for 3 months after the procedure and they underwent biometry and skin analysis.

3 | ASSESSMENT

3.1 | Biometric evaluation

Before and after 3 months of the treatment, the patients biometric parameters were appraised by Cutometer, the Skin Ultrasound Imaging system (TPM, Germany; DUB Skin Scanner; 75 MHz probe) and Visioface (Germany). The skin elasticity was measured by Cutometer with analyze of three factors R2, R5, and R7. The skin aging and elasticity were evaluated by R2 and R7 and it showed that they are the important parameters of Cutometer. R2 reported skin viscoelasticity, containing viscous deformation and R7 reported the biological elasticity, R5 reported net elasticity. The changes in the volume, depth, and area of the skin wrinkle were appraised by Visioface (multi-probe adapter). The skin ultrasound imaging system is related to the dermis and epidermis diameter and density. The increase in the dermis density is associated with the increase in dermis collagen. The erythema was assessed by Mexameter MX 18 probe (data not shown).

3.2 | Objective and subjective methods

Before and after 3 months, the treatment digital photographs were taken with identical camera (Nikon, 10.2 million pixels, Tokyo, Japan) settings. The clinical effects of the Endolift methods on the nasolabial fold and marionette lines were evaluated by objective and subjective methods. The objective method comprised three blinded dermatologist evaluations of photographs before and after laser treatment. The subjective method included patient's satisfaction. The outcomes were classified as follow: no satisfaction, slightly satisfied, moderately satisfied, and well satisfied.

TABLE 1 Comparing biometric characteristics of the skin before and 3 months after treatment.

	Measured values		Percent change	P value
	Before	After		
Visioface				
Wrinkle				
Volume (px ³)	63.55 ± 20.1	46.36 ± 19.27	26.78 ± 10.46	<0.05
Area (%)	0.60 ± 0.17	0.4.33 ± 0.19	33.45 ± 9.73	<0.05
Skin ultrasonography				
Skin density (μm)	6.30 ± 2.12	8.71 ± 4.16	38.11 ± 9.21	<0.05
Skin thickness (μm)	875.12 ± 180.62	1138.25 ± 206.01	30.02 ± 10.13	<0.05
Epidermis density	35.13 ± 11.16	45.15 ± 12.12	28.19 ± 9.31	<0.05
Epidermis thickness	47.44 ± 15.11	63.11 ± 17.15	34.25 ± 11.02	<0.05
Dermis density	4.29 ± 4.29	6.14 ± 6.71	43.75 ± 12.22	<0.05
Dermis thickness	876.71 ± 160.07	1219.14 ± 166.13	39.8 ± 11.12	<0.05
Density^a				
R2	0.70 ± 0.12	0.88 ± 0.12	25.32 ± 8.14	<0.05
R5	0.52 ± 0.04	0.66 ± 0.16	26.13 ± 10.08	<0.05
R7	0.36 ± 0.02	0.45 ± 0.04	25.41 ± 6.26	<0.05

^aDensity of the skin measured by cutometer.

3.3 | Statistical analysis

Statistical analysis was performed by SPSS 15.0 statistical software (SPSS) in this study. A P value of less than 0.05 was noted statistically significant.

4 | RESULTS

4.1 | Biometric parameters changes results

The biometric measurement results of all patients are shown in Table 1 as mean ± SD. According to the Visioface results, the Endolift laser treatment significantly declined the depth and area of nasolabial wrinkle, and the percentages of change for volume and area were 26.78 ± 10.46 and 33.45 ± 9.73, respectively ($p < 0.05$; Table 1). The results of Visioface for the cases A and B are shown in the Figures 2 and 3. Also, the skin ultrasonography results reported that the epidermis and dermis density and thickness are significantly increased (Table 1) and the percentages of change in epidermis thickness and density were 34.25 ± 11.02 and 28.19 ± 9.31 and for dermis thickness and density the percentages of change were 39.8 ± 11.12 and 43.75 ± 12.22 ($p < 0.05$). The cases A and B skin ultrasound results are shown in Figures 4 and 5. The cutometer results showed similar results and the cutometer outcomes displayed that the Endolift laser treatment can increase skin elasticity ($p < 0.05$) (Table 1). The percentages of change in R2, R5, and R7 were 25.32 ± 8.14, 26.13 ± 10.08, and 25.41 ± 6.26, respectively. The patients showed mild edema and erythema, after the treatment which was completely resolved after 1 or 2 days. The mexameter data showed no significant difference

TABLE 2 Patient satisfaction for nasolabial folds and marionette lines treatment 3 months after Endolift laser treatment. The $P < 0.05$ was considered as statistically significant.

	Valid	Frequency	Percent	P value
After 3 months	No satisfaction	0	0	≤0.05
	Moderately satisfied	4	40	
	Well satisfied	6	60	
Total		10	100	

between the erythema before and after procedure. The patients were monitored for 3 months and no side effects were informed during the study.

4.2 | Patients and physicians' assessment results

Regarding patients' satisfaction, a significant number of patients were well satisfied ($N = 6$) after treatment (Table 2) ($p < 0.05$). The physician reported a significant satisfaction after Endolift laser treatment. The results are shown in Table 3 ($p < 0.05$).

5 | DISCUSSION

In the past decades, there have been many requests for skin rejuvenation to achieve youthful looking skin. Nasolabial folds are one of the signs of aging that depends on several factors such as smoking, aging, and sun exposure. Nasolabial folds look like wrinkles, because



FIGURE 2 Visioface wrinkle analysis for case A: decrease in volume, area and depth of the nasolabial folds and marionette lines after treatment.



FIGURE 3 Visioface wrinkle analysis for case B: decrease in volume, area and depth of the nasolabial folds and marionette lines after treatment.

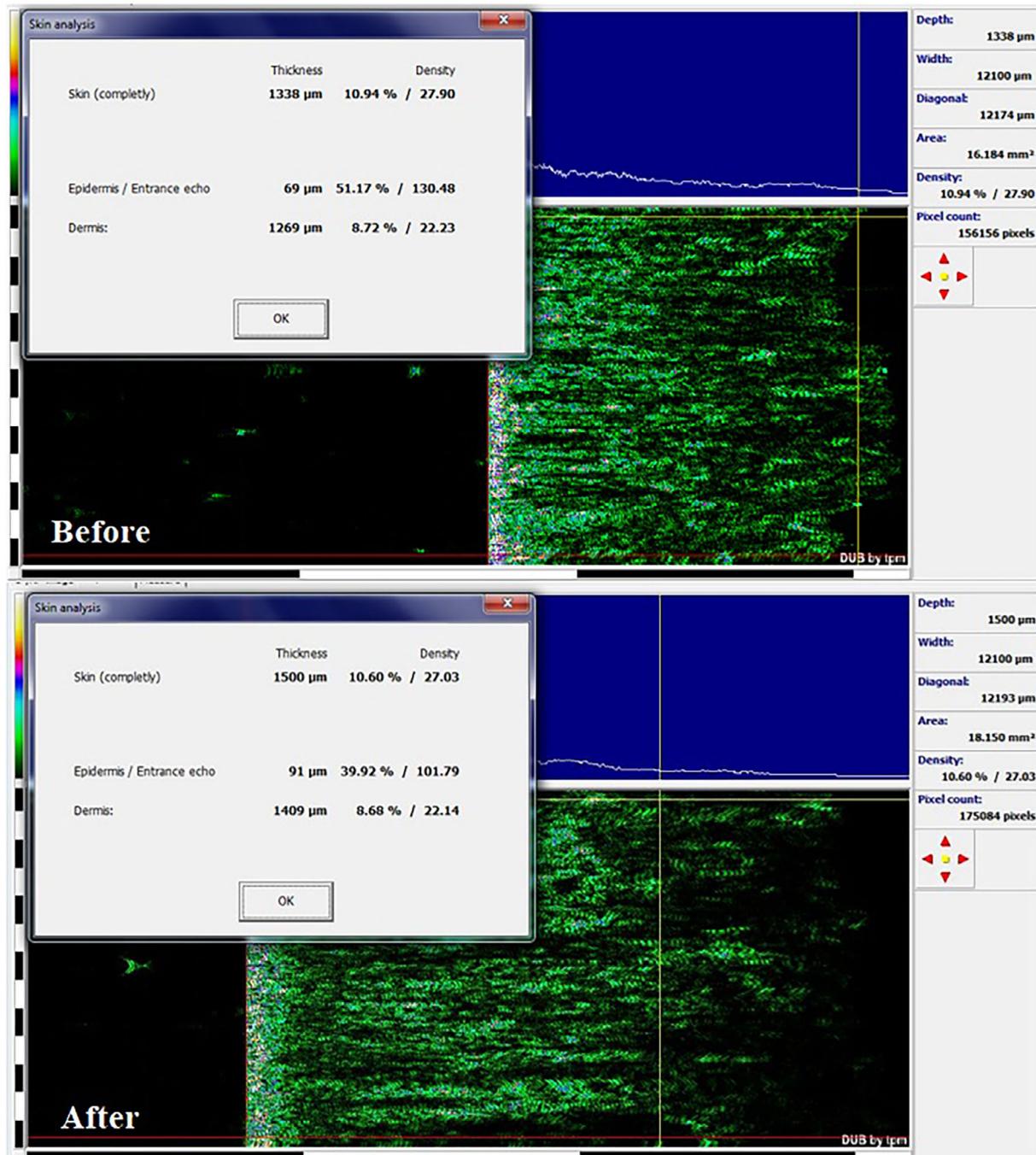


FIGURE 4 Skin analysis with ultrasonography for case A.

both are shaped by folding of the dermis. Nasolabial folds and marionette lines are the most visible signs of aging in lower face likewise, they are very common at the age of under 30.¹⁹ Most of the patients would like nasolabial fold and marionette lines to be less visible. In this study, Endolift laser technique was performed for the nasolabial fold and marionette lines treatment. In this research study, the results were evaluated by biometric changed and patients satisfaction. Also, three blind dermatologist assessed the results. Our Visioface results displayed that the Endolift laser significantly decrease the area and depth of nasolabial fold and marionette lines. The skin ultrasonog-

raphy results reported that the epidermis and dermis density and thickness were significantly increased. Also the cutometer outcomes displayed that the Endolift laser treatment can increase skin elasticity. In some previous published study, the effect of Endolift laser for treatment of forehead wrinkles, acne scars, upper eyelid, and eyebrow ptosis, arm and under abdomen fat, lower eyebag, skin laxity, jowl fat, were evaluated.^{20–28} Our results were similar to these studies results. According to these previous studies, Endolift laser can decrease the skin laxity and can tight the skin and also can decrease the facial wrinkles. To our knowledge, this is the first report of Endolift laser that show

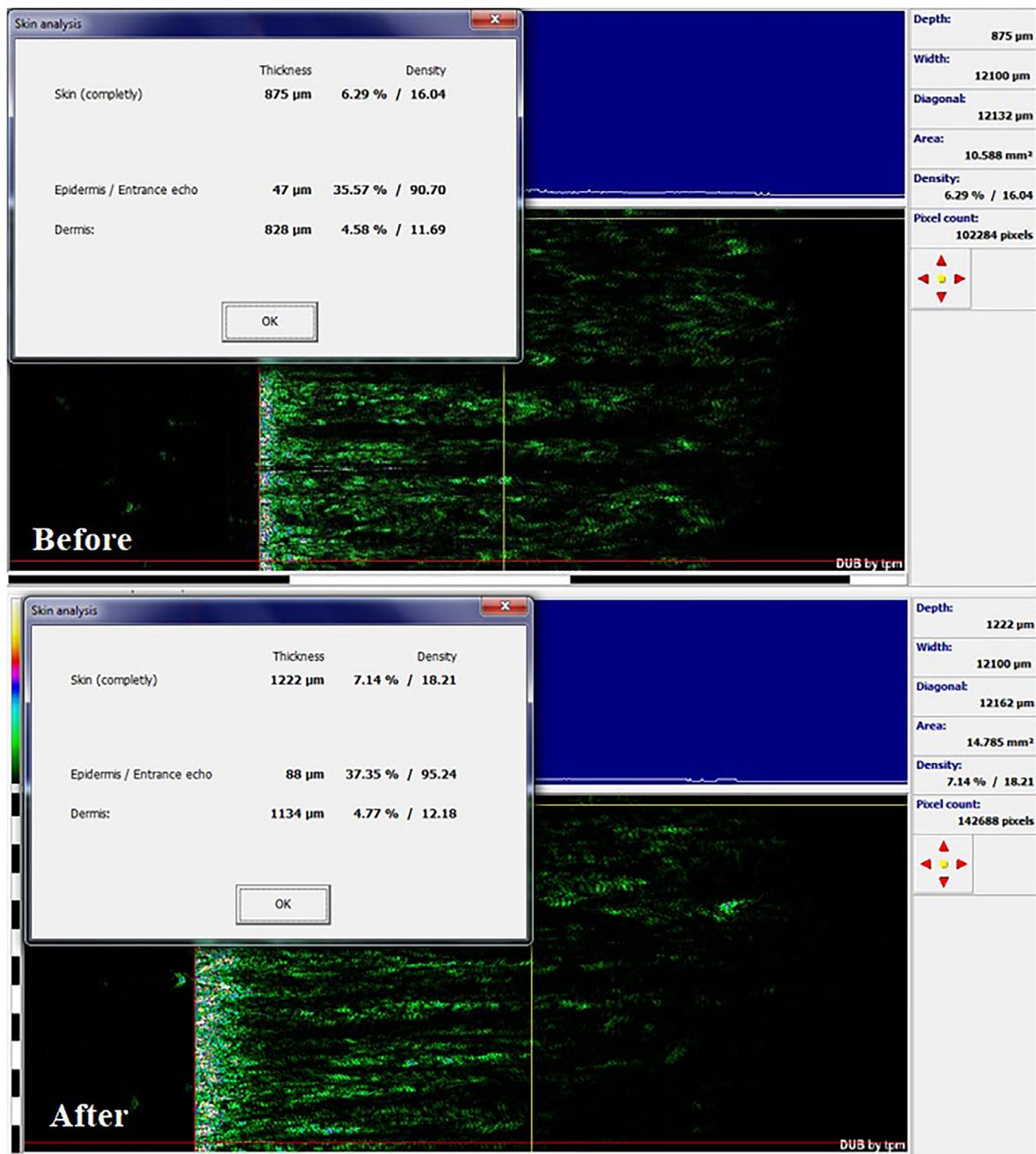


FIGURE 5 Skin analysis with ultrasonography for case B.

it is a safe and effective method to decrease the nasolabial fold and marionette lines, and improve the appearance of the face. This procedure does not require general anesthesia and recovery time. Various treatment methods have been used for nasolabial folds' improvement comprising, botulinum toxin injection, dermal fillers, high intensity focal ultrasound (HIFU), fractional CO₂ laser, and thread lifting.²⁹ Sometimes, to gain a better cosmetic results, a combination of some treatment modalities is used. Laser skin resurfacing has still been considered the gold standard for skin rejuvenation. Howyda et al. reported that intraoral Er:YAG laser is effective treatment for nasolabial folds

wrinkle.³⁰ There are some studies studying the efficacy of intraoral fractional Er: YAG laser in improvement of nasolabial folds.^{31,32} In this study we used Endolift laser for nasolabial fold treatment. The Endolift laser technique is non-invasive method with don't need anesthesia, recovery time, and have no adverse effects, also it will tolerate with the patients. Endolift laser is leading to shrinkage and contraction of tissue which resulting in new collagen formation and collagen remodeling. The collagen is responsible for improvement of skin thickness, elasticity, and fill in wrinkles³³⁻³⁶. So this technique can increase tissue tightness and improvement of nasolabial fold wrinkles. Endolift laser

TABLE 3 Physician assessment after treatment. The data was shown as mean \pm SD.

Dermatologists	Physician satisfaction (%) (mean \pm SD)	P value
Physician 1	80 \pm 2.2	$P < 0.05$
Physician 2	78 \pm 3.3	
Physician 3	75 \pm 3.1	

method gives a significant improvement in the patients, particularly those who did not prefer filler or surgery.

6 | CONCLUSION

Endolift laser is an effective technique for decrease of the nasolabial folds and marionette lines (one of the facial danger zones) and improvement of the appearance of the face without any severe side effect. This technique does not need general anesthesia and recovery time.

6.1 | Study limitation

Further studies are recommended to assess more numbers of patients and longer follow-up periods.

ACKNOWLEDGEMENTS

We appreciatively acknowledge the colleagues and staffs in Skin and Stem Cell Research Center, Tehran University of Medical Sciences, Tehran Iran and Skin Repair Research Center, Jordan Dermatology and Hair Transplantation Center, Tehran, Iran.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

Informed consent was obtained from all the patients. All patients were provided with a complete description of the study design, purpose, and probable outcomes. All the patients were checked before and 6 months after the last session of treatment.

ORCID

Mohammad Ali Nilforoushzadeh  <https://orcid.org/0000-0001-6143-8039>

Maryam Heidari-Kharaji  <https://orcid.org/0000-0001-6954-7942>

REFERENCES

- Ezure T, Amano S. Involvement of upper cheek sagging in nasolabial fold formation. *Skin Res Technol.* 2012;18(3):259-264.
- Li K, Meng F, Li YR, et al. Application of nonsurgical modalities in improving facial aging. *Int J Dent.* 2022. 2022.
- Pawlaczyk M, Lelonkiewicz M, Wieczorowski M. Age-dependent biomechanical properties of the skin. *Adv Dermatol Allergol.* 2013;30(5):302-306.
- Rabe JH, Mamelak AJ, McElgunn PJ, et al. Photoaging: mechanisms and repair. *J Am Acad Dermatol.* 2006;55(1):1-19.
- Chung J H, Hanft VN, Kang S. Aging and photoaging. *J Am Acad Dermatol.* 2003. 49(4):690-697.
- Zhang L, Tang MY, Jin R, et al. Classification of nasolabial folds in Asians and the corresponding surgical approaches: by Shanghai 9th People's Hospital. *J Plast Reconstr Aesth Surg.* 2015;68(7):914-919.
- Pruettijarai U, Meephansan J, Prapapan O, et al. Efficacy of a novel microneedle patch for rejuvenation of the nasolabial fold. *Skin Res Technol.* 2022;28(6):786-791.
- Nilforoushzadeh MA, Alavi S, Heidari-Kharaji M, et al. Biometric changes of skin parameters in using of microneedling fractional radiofrequency for skin tightening and rejuvenation facial. *Skin Res Technol.* 2020;26(6):859-866.
- Paasch U, Bodendorf MO, Grunewald S, Simon JC. Skin rejuvenation by radiofrequency therapy: methods, effects and risks. *JDDG.* 2009;7(3):196-203.
- Ascher B, Bayerl C, Brun P, et al. Efficacy and safety of a new hyaluronic acid dermal filler in the treatment of severe nasolabial lines—6-month interim results of a randomized, evaluator-blinded, intra-individual comparison study. *J Cosm Dermatol.* 2011;10(2):94-98.
- Ascher B, Bayerl C, Kestemont P, Rzany B, Edwartz C, Podda M. A 12-month follow-up, randomized comparison of effectiveness and safety of two hyaluronic acid fillers for treatment of severe nasolabial folds. *Dermatol Surg.* 2017;43(3):389.
- Rzany B, Bayerl C, Bodokh I. An 18-month follow-up, randomized comparison of effectiveness and safety of two hyaluronic acid fillers for treatment of moderate nasolabial folds. *Dermatol Surg.* 2017;43(1):58-65.
- Rzany B, Bayerl C, Bodokh I, et al. Efficacy and safety of a new hyaluronic acid dermal filler in the treatment of moderate nasolabial folds: 6-month interim results of a randomized, evaluator-blinded, intra-individual comparison study. *J Cosmet Laser Ther.* 2011;13(3):107-112.
- Fitzpatrick R E, Rostan E F, Marchell N. Collagen tightening induced by carbon dioxide laser versus erbium: YAG laser. *Lasers Surg Med.* 2000;27(5):395-403.
- Sadick NS. Update on non-ablative light therapy for rejuvenation: a review. *Lasers Surg Med.* 2003;32(2):120-128.
- Leffell DJ. Clinical efficacy of devices for nonablative photorejuvenation. *Arch Dermatol.* 2002;138(11):1503-1508.
- Bonan P, Fusco I, Brusolino N, et al. Laser-assisted blepharoplasty: an innovative safe and effective technique. *Skin Res Technol.* 2023;29(5):e13351.
- Piccolo D, Mutlag MH, Fusco I, Bonan P. Facial and body contouring with 1444 nm Nd: YAG laser-assisted lipolysis: clinical evidence. *Skin Res Technol.* 2023;29(7):e13400.
- Ganceviciene R, Liakou AI, Theodoridis A, Makrantonaki E, Zouboulis CC. Skin anti-aging strategies. *Dermatoendocrinology.* 2012;4(3):308-319.
- Nilforoushzadeh MA, Heidari-Kharaji M, Fakhim T, Endolift laser an effective method for the lower eye bag treatment: a case series study. *Lasers Med Sci.* 2022;37(8):3123-3128.
- Nilforoushzadeh MA, Fakhim T, Heidari-Kharaji M, et al. Endolift laser an effective treatment modality for forehead wrinkles and frown line. *J Cosm Dermatol.* 2022;21(6):2463-2468.
- Nilforoushzadeh M A, Heidari-Kharaji M, Behrangi E, et al. Effect of Endolift laser on upper eyelid and eyebrow ptosis treatment. *J Cosm Dermatol.* 2022;21(8):3380-3385.

23. Dell'Avanzato R, Endolift® the “lunch-time” laser lifting for the lower eyelids. *Laser Ther.* 2022;29(3).
24. Nilforoushzadeh MA, et al. Efficacy of Endolift laser for arm and under abdomen fat reduction. *J Cosm Dermatol.* 2018-2022, 2023.
25. Nilforoushzadeh MA. Endolift laser for jowl fat reduction: clinical evaluation and biometric measurement. *Lasers Med Sci.* 2022;37(5):2397-2401.
26. Longo L, Dell'Avanzato R, Longo D, ENDOLIFT® and multi-wavelength laser photobiomodulation: a randomized controlled trial study on 96 subjects, treating skin laxity of the lower third of the face. *Laser Ther.* 2022;29(2):115-120.
27. Nilforoushzadeh MA, Heidari-Kharaji M, Behrangi E, et al. Efficacy evaluation of Endolift-based Subcision on acne scar treatment. *J Cosmet Dermatol.* 2021;20(8):2579-2582.
28. Sadoughifar R, et al., Nonsurgical eyelid ptosis: topical treatment with Endolift® direct optical energy. *J Appl Cosmetol.* 2023;41(1):33/36-33/36.
29. Haitham S, El M. Nasolabial folds: one indication and 3 treatment modalities. 2023.
30. Ebrahim HM, Gharib K. Correction of nasolabial folds wrinkle using intraoral non-ablative Er: YAG laser. *J Cosmet Laser Ther.* 2018;20(6):364–368.
31. Gaspar A, Gasti GA. Tightening of facial skin using intraoral 2940 nm Er: YAG smooth mode. *J Laser Health Acad.* 2013;2013(2):17–20.
32. Pidal CM. Intra and extraoral treatment for rejuvenation of the nasolabial fold and perioral wrinkles. *Clin Bull.* 2012. 31:10.
33. El-Domyati M, Abd-El-Raheem T, Medhat W, Abdel-Wahab H, Al Anwer M. Multiple fractional erbium: yttrium–aluminum–garnet laser sessions for upper facial rejuvenation: clinical and histological implications and expectations. *J Cosmet Dermatol.* 2014;13(1):30-37.
34. Ciocon D H, Doshi D, Goldberg DJ. Non-ablative lasers, *Basics in Dermatological Laser Applications.* 2011, Karger Publishers. 48-55.
35. Olczyk P, Mencner Ł, Komosinska-Vassev K. The role of the extracellular matrix components in cutaneous wound healing. *BioMed Res Int.* 2014. 2014, 1-8.
36. Trelles MA, Vélez M, Mordon S. Correlation of histological findings of single session Er: YAG skin fractional resurfacing with various passes and energies and the possible clinical implications. *Lasers Surg Med.* 2008;40(3):171-177.

How to cite this article: Nilforoushzadeh MA, Heidari-Kharaji M, Fakhim T, et al. Efficacy evaluation of endolift laser for treatment of nasolabial folds and marionette lines. *Skin Res Technol.* 2023;29:e13480. <https://doi.org/10.1111/srt.13480>