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ORIGINAL ARTICLE

Endolift laser an effective method for the lower eye bag treatment: a case series study

Mohammad Ali Nilforoushzadeh[1,2] · Maryam Heidari-Kharaji[1,2,3] · Tannaz Fakhim[1,2] · Niloufar Najar Nobari[4] · Elham Torkamaniha[1,2,5] · Amirreza Hanifnia[1,2] · Elham Behrangi[4]

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Abstract

Numerous individuals suffer from the lower eye bag. Lower eye bag treatment is a challenge that might require new methods. Depending on the cause, there are different treatment approaches to reduce puffiness under the eyes. In this pilot study, 9 patients with lower eye bags received Endolift therapy (200–300-nm fiber) and were followed up for 6 months. The patients were evaluated according to biometric characteristics. Additionally, outcomes were evaluated by three blinded dermatologists, and patients' satisfaction was assessed. The obtained biometric results showed that Endolift laser treatment could increase both the dermis and epidermis of the skin and skin elasticity in this area. Furthermore, the results indicated that Endolift therapy showed good and very good improvement in about 90% of patients. Photographic data evaluation indicated a 90% improvement in the appearance of eye bags ($P < 0.05$). Endolift laser seems to be a safe and effective method for lower eye bag treatment. It is a noninvasive treatment with satisfactory results with minimal downtime and side effects. Endolift therapy significantly reduces the appearance of eye bags and wrinkles and increases skin elasticity under the eyes; therefore, it is an effective method for lower eye bag treatment. The method is pain-free, bloodless, and without the need for stitches. Endolift therapy allows the patient to avoid surgery.

Keywords Endolift laser · Laser · Lower eye bag · Treatment

Introduction

The lower eye bag is one of the beauty concerns and occurs when sagging skin loosens. The pads of fat under the eyes then slide down and fill the space, thereby showing the appearance of a bag. Moreover, with the accumulation of excess body fluid in this area, the lower eyelids become even more swollen and puffy. Any discolored skin or shadows under the eyes causes the eye bags look more prominent. The lower eye bags are typically harmless; however, in some cases, it can be a sign of an underlying disease [1]. The lower eye bag can happen due to numerous complex mechanisms; the most common are anatomical reasons, including lower lid skin elasticity, fat orbital prolapse, and under-eye hollowness. Aging is the most common reason for the lower eye bag. Aging causes the loss of collagen and fat padding, the main factor of connective tissues in muscles, skin, and other body parts. A lower level of collagen makes the skin and underlying muscles throughout the body lose their elasticity [2]. This sagging under the eyes is very noticeable due to the thinness of the skin in that area. There are numerous methods for the treatment of the lower eye bag, including wrinkle therapies and skin treatments, intended to tighten the skin under the eyes and decrease the puffiness, such as chemical peels, injectable dermal fillers, and laser resurfacing [3–5]. Recently, Endolift as a noninvasive method has been considered for skin disorders treatment [6–8]. This

✉ Elham Behrangi
Behrangii.elham@gmail.com; Behrangi.e@iums.ac.ir

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

2 Jordan Dermatology and Hair Transplantation Center, Tehran, Iran

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

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

5 Department of Microbial Biotechnology, Islamic Azad University, Kish Branch, Iran

study evaluated the effect of Endolift on the treatment of the lower eye bag.

Materials and methods

The present study was performed in Jordan Dermatology and Hair Transplantation Center, Tehran, Iran (2020). A total of 9 patients, including 4 males and 5 females, with the lower eye bag, were enrolled in the study. The age range of the participants was within 35–75 years. Before starting the treatment, informed consent was obtained from the patients. The patients with any kind of treatments in the area within the previous 12 months, history of lidocaine sensitivity, history of the use of aspirin, isotretinoin, and immunosuppressed drugs in the last year, and use of cosmetic agents which can affect collagen synthesis, such as vitamin C, retinoid, and pregnancy, were not included in the study. The area to be treated was sterilized. For this study, Endolift™ (LASEMAR1500TM machine from Eufoton s.r.l., Via Flavia 23/1, Italy – 34,148 Trieste) was used. Endolift laser therapy (power: 75–150 W, pulse: 25–50, energy: 600–800 J, and fiber: 200–300 micron) was performed for lower eye bag treatment. No incisions or anesthetics were used. Endolift laser was used for the treatment of the lower eye bag without any other methods. This procedure was utilized once for each patient. This technique does not need recovery time. The patients were evaluated for results 6 months after the last procedure. The photographs of the patients were taken by Visioface before and after the treatment. The results of the treatment were measured by three blinded dermatologists. Furthermore, 6 months after the treatment, biometric characteristics were evaluated by the Cutometer and Visioface 1000 D (purchased from Courage + Khazaka Electronic GmbH, Germany). Visioface was applied to evaluate the wrinkle changes mechanically and give quantitative numbers. The Cutometer evaluated skin elasticity by preparing three parameters (i.e., R2, R5, and R7). In addition, ultrasound was used to assess skin layers' thickness and density before and after the treatment. Furthermore, patients' satisfaction was evaluated at the end of the procedure. The patients categorized their responses to treatment as poor, moderate, good, and very good.

Statistical analysis

The data were analyzed by the paired samples t-test with SPSS software (version 22.0). The results were expressed as mean ± standard deviation. A p-value less than 0.05 was considered statistically significant.

Results

Results of biometric characteristics

The results of the biometric assessment of the skin under the eyes before and 6 months after the treatment were evaluated (Table 1). The Visioface results showed that the wrinkles of the skin under the eyes before and after the treatment were significantly decreased ($P < 0.001$) (Table 2 and Fig. 1), and the wrinkles of the area between the lower eye bag and cheek were significantly decreased (Fig. 2 and Table 3). The results of skin ultrasound results for case A are showed in

Table 1 Comparing biometric characteristics of the skin under the eyes before and 6 months after the treatment

	Measured values		Percent change	P-value
	Before	After (6 months)		
Visioface				
Wrinkle				
%Area	2.1 ± 0.9	0.99 ± 3.2	52.50 ± 11.01	< 0.001
Volume	224 ± 19.1	101 ± 40.2	51.33 ± 12.1	< 0.001
Skin ultrasonography				
Skin density (μm)	30.00 ± 13.43	66.23 ± 10.16	36.23 ± 10.35	< 0.001
Skin thickness (μm)	650.23 ± 104.62	920.25 ± 226.17	41.5 ± 16.23	< 0.001
Epidermis density (μm)	68.26 ± 33.916	91.89 ± 48.12	35 ± 16.41	< 0.001
Epidermis thickness (μm)	104.40 ± 41.27	190.11 ± 52.45	82.79 ± 20.32	< 0.001
Dermis density (μm)	35.60 ± 5.79	50.27 ± 15.74	41.42 ± 302.39	< 0.001
Dermis thickness (μm)	634.25 ± 101.67	960.30 ± 326.12	50.51 ± 20.20	< 0.001
Density[a]				
R2	0.54 ± 0.11	0.77 ± 0.08	42.5 ± 3.58	< 0.001
R5	0.47 ± 0.12	0.64 ± 0.11	36.17 ± 5.48	< 0.001
R7	0.34 ± 0.085	0.49 ± 0.085	45.01 ± 3.26	< 0.001

[a]Density of the skin measured by Cutometer

Table 2 Data of wrinkle analysis with Visioface for case A: decrease in volume, area and depth of the wrinkle in the skin of under the eyes after treatment

Image	Volume	Area	Depth	%Area
1	227,029 px^3	23,110 px^2	9 px	1.268%
2	142,857 px^3	14,136 px^2	10 px	0.775%

Table 3 Data of wrinkle analysis with Visioface for case A: decrease in the wrinkle of the area between the lower eye bag and cheek after treatment

Image	Volume	Area	Depth	%Area
1	101,076 px^3	10,625 px^2	9 px	0.583%
2	49,268 px^3	5,536 px^2	8 px	0.304%

Fig. 3 and Table 4 and the results indicated that the skin became denser in both dermis and epidermis. Also, the results of skin ultrasound for all patients presented that the skin became denser in both dermis and epidermis (Table 1) ($P < 0.001$). The results of the Cutometer demonstrated that the treatment led to a significant increase in the R2, R5, and R7 parameters (Table 1) ($P < 0.001$) and could increase skin elasticity in this area.

Patients' satisfaction and physicians' assessment results

After analyzing the photographs of before and after the treatment by dermatologists, the results indicated good and very good improvement in about 90% of patients. The patients' satisfaction results showed good and very good improvement in 90% of patients. A significant improvement was observed in the appearance of lower eye bags in photographic documents in all 9 patients (Fig. 4). No severe bruising and swelling were observed in patients. The patients were followed up for 6 months, and no side effect or recurrence was reported throughout the course of the study.

Discussion

Lower eye bag is one of the most common eye problems for both men and women. It frequently appears as swelling or puffiness below the eyes. Different reasons can cause the lower eye bag, including allergies, high-salt diet [9], genetics, medical conditions, and natural aging process [10, 11]. Loss of firmness in the skin and muscles happens as we age. Older skin becomes very loose and tends to sag or wrinkle. The tissues and muscles around the eye can also weaken and help appear the baggy look. This weakening lets the fat nearby the eye bulge out, forming that bubble-like appearance. Goldberg et al. [2] reported that there are numerous anatomic changes that cause the formation of eyelid bags. Tears trough deformity under the eye, orbital fat pads, and reduced skin elasticity are the most common reasons that lead to eyelid bags. With increasing age, these changes become more prominent. For effectively getting rid of the lower eye bags that are prominent and permanent, medical treatment is necessary. Depending on the cause, there are different methods to reduce puffiness under the eye [2]. The treatment of the lower eye bag with a new base device is challenging. All treatment approaches are permanently

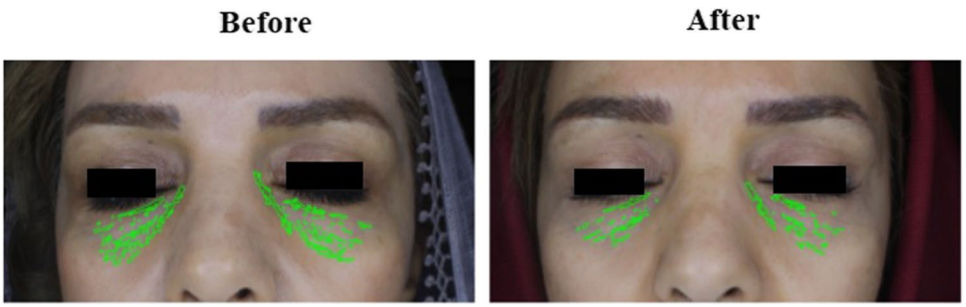

Fig. 1 Visioface wrinkle analysis for case A: decrease in volume, area, and depth of the wrinkle in the under the eyes skin after treatment

Fig. 2 Visioface wrinkle analysis for case A: decrease in the wrinkle of the area between the bags under the eyes and cheek after treatment

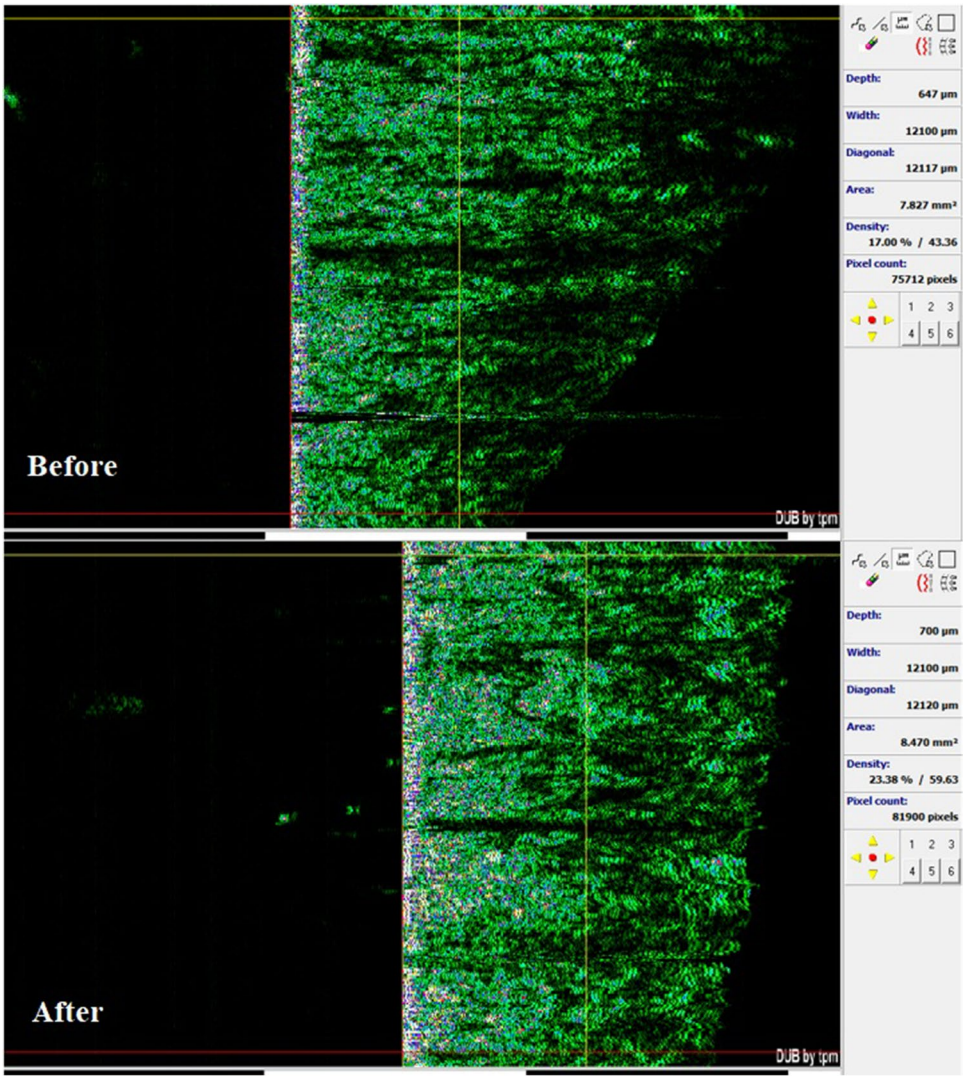

Fig. 3 Skin analysis with ultrasonography for case A

Table 4 Comparing skin ultrasonography results before and 6 months after the treatment for case A

	Measured values	
	Before	After (6 months)
Skin ultrasonography		
Skin density (µm)	43.36	59.63
Skin thickness (µm)	647	700
Epidermis density (µm)	111.19	126.78
Epidermis thickness (µm)	69	78
Dermis density (µm)	35.11	50.96
Dermis thickness (µm)	578	622

changed through convenient, easier, and practical techniques to reach the best final results with fast recovery and minimal problems. For the achievement of the desired outcomes, a treatment plan should be organized given the conditions of the patient. Medical treatments (surgical and nonsurgical) can improve or sometimes remove the lower eye bags. Surgical options, such as lower (blepharoplasty), are difficult for patients and have side effects [12]. Nonsurgical options are preferred to surgical ones. These noninvasive treatments smooth the area under the eye. For example, filler injection for lower eye bag treatment is a relatively new practice, especially for patients with complicated deformities [13–15]. In this treatment, a filler material (i.e., generally hyaluronic acid) is placed in the under-eye area. In a study performed by Goel A. et al., hyaluronic acid filler was used for the treatment of the lower eye bag, and the efficacy of filler injections was evaluated [4]. Similar to any other injection, serious complications related to vascular occlusion (e.g., vision loss or necrosis) can occur, which makes safety a critical issue. Numerous arteries and arterioles overly the lower eye area, which creates additional challenges. Therefore, it is needed to develop new techniques without any side effects. It is reported that chemical peel cures the wrinkly area under the skin of the eye via eliminating the superficial top layers

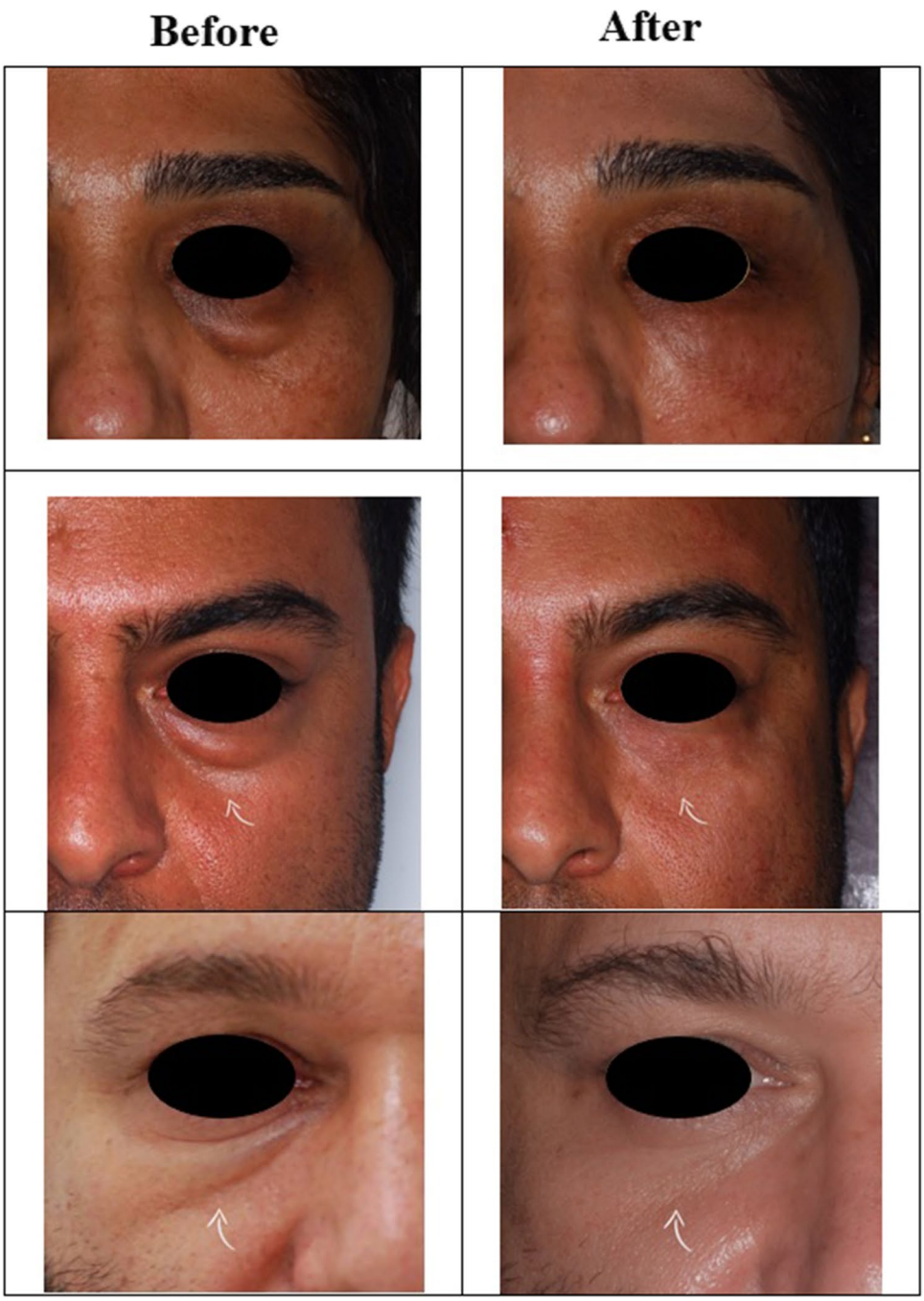

Fig. 4 The study patients before and 6 months after the Endolift treatment

[3]. Using a chemical solution dissolves old skin cells to expose brighter and tighter skin. The result depends on the sun exposure and skin type [5]. However, the use of chemical peel under the eyes that is a sensitive area might have numerous side effects. Laser resurfacing is another technique that is used for the treatment of the lower eye bag. This treatment uses a laser to remove the surface layers of the wrinkly skin in the under-eye area, thereby stimulating new collagen growth. Endolift laser is an appreciated procedure that can be used to reduce puffiness. The Endolift laser technique is now a reliable alternative to the more aggressive classical techniques for 80% of patients, with more comfort for both patients and surgeons [6, 16, 17]. Endolift laser therapy improves wrinkles with two functions; the first one is the mechanical role which is the movement of the fiber under the skin, and the second is the role of the diode laser, which together stimulate the production of collagen and elastin. The Endolift laser method is a noninvasive technique and does not have any side effects. In this study, Endolift was used for lower eye bag treatment. This study reported that Endolift laser is an effective method for lower eye bag treatment. Endolift laser treatment targets fat cells and causes

neocollagenesis; therefore, it can stimulate the production of collagen and elastin in the intervention area. The obtained outcomes showed that the Endolift technique decreased the wrinkles of the skin under the eyes. Additionally, the Cotumeter results showed that Endolift laser treatment increased skin elasticity by increasing the R2, R5, and R7 parameters (R2: viscoelasticity in % [resistance to the mechanical force versus recovery ability]; eR5: net elasticity in %: *Ur*/*Ue* = elastic part of the suction phase versus immediate recovery during relaxation phase; fR7: Ur/Uf proportion of the immediate recovery compared to the amplitude after suction in %). Endolift laser can increase epidermis and dermis density and thickness; therefore, it is an effective method for lower eye bag treatment. However, our study sample size was very small. Thus, further studies are needed with large sample size.

Conclusion

The results of this study showed that the Endolift technique significantly reduces the appearance of the lower eye bag without any side effects. Endolift increases the dermis, epidermis, and skin elasticity under the eyes.

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Declarations

Ethics approval The authors state that the patients have given their informed consent for the photographs and details.

Conflict of interest The authors declare no competing interests.

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