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Lower Eyelid Blepharoplasty With Fat Transposition: A Comparative Study Between Subperiosteal Plane Versus Supraperiosteal Plane Procedures

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Abstract

Background: Whether fat is moved into the subperiosteal or supraperiosteal plane, transconjunctival blepharoplasty with fat relocation is performed safely with great outcomes. Although there are differences in the two treatments' immediate postoperative course, both have comparable and great long-term outcomes.

Objective: Of the study is to assess the effectiveness, technique, and drawbacks of fat transposition using subperiosteal against supraperiosteal planes during transconjunctival lower blepharoplasty.

Methods: In prospective, interventional, randomized comparative research, 30 individuals (60 eye lids) with lower eyelid fat bags and tear trough abnormality were randomly chosen. The research was done between July 2019 and December 2022. At Cairo's Al-Azhar University hospitals, patients underwent examinations, and surgeries. Patients were placed into two groups randomly: group A had subperiosteal fat transposition for 30 eyelids; group B received supraperiosteal fat transposition for 30 eyelids.

Results: Compared with 70 and 30 %, respectively in group (A), we found a greater incidence of hemorrhage in group B, which was mild to moderate in 36.37 % and severe in 63.3 %. Additionally, we found that group (B) had a greater incidence of postoperative ecchymosis, which was mild to moderate in 43.3 % and severe in 56.7 %, compared with group (A)'s 73.3 and 26.7 %, respectively. Regarding the correction of the tear trough and patient satisfaction, there was no statistically significant difference between the two groups.

Conclusion: Despite differences in the surgical technique and immediate postoperative course, both strategies provide comparable long-term outcomes. Postoperative outcomes did not substantially differ between the two groups in terms of patient satisfaction or tear through healing.

Keywords: Fat transposition, Lower blepharoplasty, Tear trough

1. Introduction

Lower eyelid rejuvenation is a challenging cosmetic procedure. One of the most important aspects of lower blepharoplasty is the technique utilized to identify the orbital fat pads. The two most typical techniques for getting access to the lower eyelid fat are transcutaneously and transconjunctivally.¹ Up until the second part of the 20th century, the primary goal of lower blepharoplasty was fat reduction. The patient seems even more worn out and fatigued despite the removal of the

aging-symbolizing bag because of the persistent empty eye socket, the excessively pronounced orbital bone contour, and the extended space between the lower eyelash edge and the highest point of the face.² To maintain the youthful fullness, curves, and contours of the face and eyelids, the objective of cosmetic lower blepharoplasty nowadays is to retain and improve volume.³ To increase the fullness of the tear trough and its corresponding medial and central triangular depression at the intersection of the eyelid and cheek, the lateral fat compartment is often removed, and the nasal and central fat compartments

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are used instead.⁴ The supraperiosteal plane and the subperiosteal plane are the two options we have for moving the infraorbital fat. Excellent outcomes, high patient satisfaction ratings, and a low frequency of issues have all been seen with both techniques. Whether the subperiosteal or supraperiosteal plane is preferable for fat translocation is still up for debate. No surgeon has ever contrasted the two techniques.⁵ In order to compare the effectiveness, method, benefits, and drawbacks of subperiosteal plane and supraperiosteal plane procedures for fat translocation during transconjunctival lower lid blepharoplasty, this study was conducted.

2. Patients and methods

A prospective, interventional, randomized comparative research that included 30 randomly selected patients from the ophthalmology outpatient clinics at Al-Azhar University Hospitals (60 eyelids). The study was conducted from July 2019 to December 2022. Patients were examined at the Al-Azhar University Hospital in Cairo for checkups, procedures, and aftercare. The study, which included each patient's written informed agreement, was approved by the Al-Azhar Medical Research Ethical Committee. Patients who match the inclusion criteria have distorted tear troughs and lower eyelid fat bags. The following conditions are excluded: lower eyelid malposition, scarring, eczema, and thyroid eye disease.

Detailed ocular exams were performed on the patients to look for tumors, herniated fat in the lower eyelids (eye bags), and lower eyelid malposition. Lower eyelid laxity was measured through the use of the snap test and the lid distraction test. Sensation in the supply region of the infraorbital nerve was thoroughly investigated. Each instance received four images: two lateral views, an up-facing frontal view, and a frontal view. Each of the two groups of patients, each of which had 30 eyelids, was randomly randomized to receive subperiosteal fat transposition or supraperiosteal fat transposition.

2.1. Surgical technique

Under local anesthesia, all surgical operations were performed. 3–5 ml of 1 % lidocaine and 1 : 100 000 epinephrine were administered subcutaneously and subconjunctivally. A further 1 cc was injected below the orbital margin to block the infraorbital nerve.

The lower eyelid retractors were then separated from the underlying orbicularis by making an incision 4–5 mm below the inferior tarsal border

that ran the whole width of the eyelid from lacrimal punctum to close to the lateral canthus. Then, to access the fat compartment, the orbital septum was cut just below the orbital rim. Between the nasal and central fat pads, the inferior oblique muscle could be seen. In order to prevent bleeding and damage to the inferior oblique muscle, we did not cut through the fat. An incision was performed into the periosteum after exposing the lower orbital margin in the subperiosteal group (A). The Henderson Dissector (Periosteal Elevator) was then used to make the subperiosteal pocket. The incision did not go any further than 10 mm below the orbital margin to preserve the infraorbital neurovascular network. In the supraperiosteal group, we performed a blunt dissection using a Stevens tenotomy scissor or artery forceps in a spreading motion to establish a supraperiosteal pocket. In addition, a little portion of the infraorbital margin just 10 mm was dissected. The anterior maxilla was preserved in the center of the dissection by releasing the medial part of the orbicularis-retaining ligament. Both times, we severed the needle after threading a 5–0 Vicryl suture into the nasal fat pedicles (Fig. 1a), threaded the suture onto a manually threading needle. Finally, we inserted the needle into the pocket and towards the skin's specified region using the Micky Mouse Director (Fig. 1b). To hold the fat in a place like a horizontal mattress, we threaded the second end of the suture after passing the first end so that it would escape on the skin close to the first end (Fig. 1c). The central fat pedicle was relocated in a similar manner.

Sutures were applied over a bolster, and they were taken out a week later. The suture can also be secured over rubber components before being tension-free sewn onto the skin (Fig. 1d). After surgery evaluation, problems include symmetry, smoothness of the outlines, nerve damage, edema, hematoma, fat absorption, lid malposition, and diplopia in patients. Photos were taken following surgery.

3. Results

The 30 participants' 60 eyelids were examined. Nine (60 %) men and six (40 %) women made up group (A), whereas seven (46.7 %) men and eight (53.3 %) women made up group (B). In groups (A) and (B), the mean patient age was 56.07 and 51.27 years old, respectively (Table 1). Between the study groups, there was no statistically significant difference in either age or sex.

The reported time for the operation was a little bit longer in group (A). With a statistically significant difference between the two groups, the average

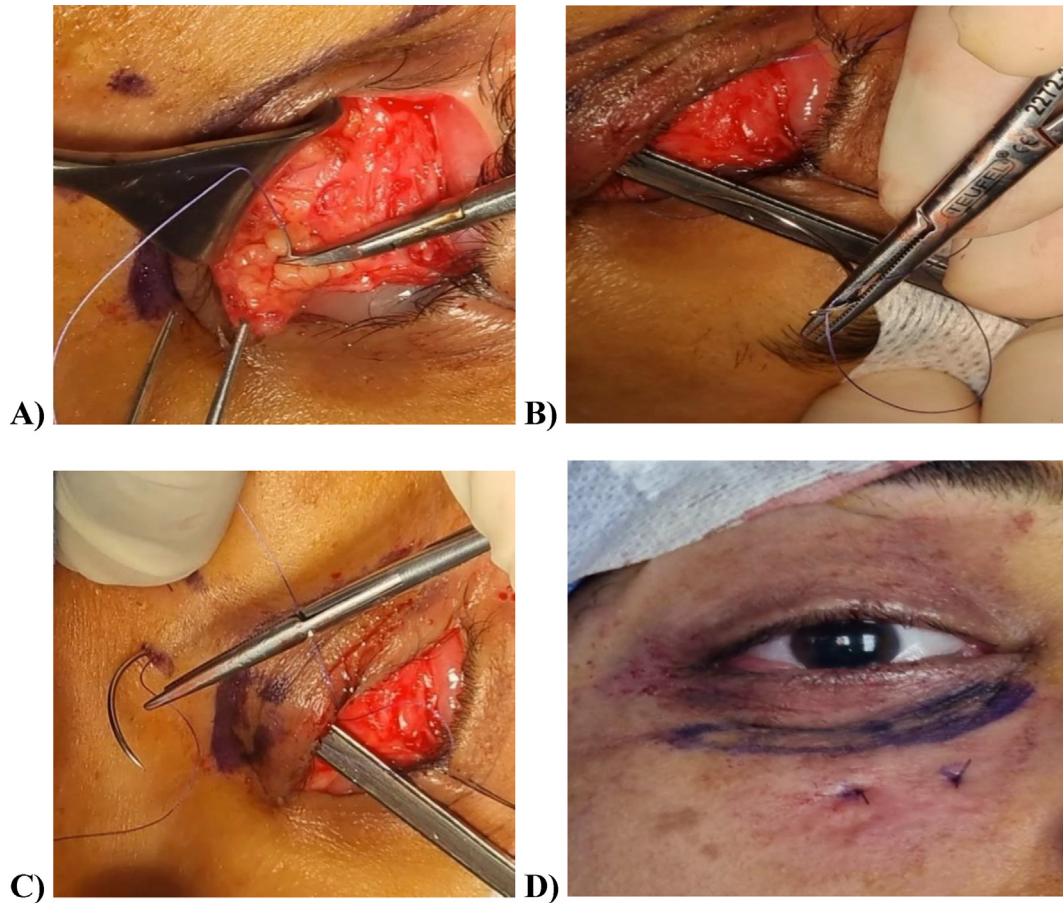


Fig. 1. A(The 5/0 Vicryl suture is passed through the nasal fat pedicle. B)The manually threaded needle is slid over the Micky mouse. C) The needle is passed through the marked skin area. D) Vicryl suture is sutured directly on the skin.

Table 1. Comparison between the two studied groups according to demographic data.

Demographic data	Group A (n = 30) No. (%)	Group B (n = 30) No. (%)	Test of sig.	P
Sex				
Male	18 (60)	14 (46.7)	$\chi^2 = 1.071^a$	0.301 ^a
Female	12 (40)	16 (53.3)		
Age (y)				
Min–max	46.0–72.0	35.0–71.0	t = 1.415 ^a	0.168 ^a
Mean \pm SD.	56.07 \pm 8.55	51.27 \pm 9.67		
Median (IQR)	53.0 (48.0–65.0)	51.0 (44.0–58.0)		

χ^2 : Chi-square test, t: Student t-test.

IQR, Inter quartile range; SD, Standard deviation.

Group A: Subperiosteal, Group B: Supraperiosteal.

P: P-value for comparing the studied groups.

^a Statistically significant at $P \leq 0.05$.

operation time for each eye was 24.17 min in group (A) and 21.7 min in group (B) (Table 2).

The main objective of the investigation was tear-through repair. Both groups (A and B) reported having 17 (56.67 %) and 19 (63.3 %) eyes, respectively, that had excellent or very good correction. The differences between the two groups were statistically insignificant. (Table 3).

Six (20 %) eyes in group (A) and five (16.7 %) eyes in group (B) reported satisfactory results, whereas 17 (56.67 %) eyes in group (A) and 19 (63.3 %) eyes in group (B) reported very satisfied results. The differences between the two groups were statistically insignificant. (Table 4).

We found that bleeding during pocket dissection in supraperiosteal pockets was more pronounced

Table 2. Comparison between the two studied groups according to surgical time.

Surgical time	Group A (n = 30)	Group B (n = 30)	T	P
Min–max	19.0–29.0	17.0–27.0	3.483*	0.001*
Mean ± SD.	24.17 ± 2.55	21.70 ± 2.93		
Median (IQR)	24.0 (22.0–26.0)	21.50 (19.0–24.0)		

Table 3. Comparison between the two studied groups according to tear trough correction by photographs.

Tear through correction by photographs	Group A (n = 30) No. (%)	Group B (n = 30) No. (%)	χ^2	P
Moderate	8 (26.67)	4 (13.3)	1.7778	0.4111
Good	5 (16.67)	7 (23.3)		
Very good	17 (56.67)	19 (63.3)		

Table 4. Comparison between the two studied groups according to patient satisfaction.

Patient satisfaction	Group A (n = 30) No. (%)	Group B (n = 30) No. (%)	χ^2	P
Fair to moderate	7 (23.3)	6 (20)	0.278	0.8698
Satisfied	6 (20)	5 (16.7)		
Very satisfied	17 (56.67)	19 (63.3)		

than in subperiosteal pockets. We saw mild to moderate bleeding at a rate of 70 % in the subperiosteal plane versus 36.367 % in the supra- periosteal plane. Subperiosteal plane eyes only had serious bleeding in 30 % of instances, as opposed to 63.3 % of cases in supra- periosteal plane eyes. The differences between the two groups were statistically distinct. (Table 5).

Numerous individuals in both groups had postoperative ecchymosis. 22 (73.3 %) eyes in group (A) had mild to moderate ecchymosis, compared with 13 (43.3 %) eyes in group (B). Compared with group (B), which had 17 (56.7 %) eyes, group (A) had 8 (26.7 %) eyes with severe ecchymosis. The differences between the two groups were statistically distinct. Table 6 and (Fig. 2)

The infraorbital nerve distribution, the function of the lower eyelid orbicular muscle, or the function

Table 5. Comparison between the two studied groups according to intraoperative bleeding.

Bleeding	Group A (n = 30) No. (%)	Group B (n = 30) No. (%)	χ^2	P
Mild to moderate	21 (70)	11 (36.367)	5.4241	0.01986
Severe	9 (30)	19 (63.3)		

Table 6. Comparison between the two studied groups according to ecchymosis.

Ecchymosis	Group A (n = 30) No. (%)	Group B (n = 30) No. (%)	χ^2	P
Mild to moderate	22 (73.3)	13 (43.3)	4.3886	0.0362
Severe	8 (26.7)	17 (56.7)		

of the lip elevator muscles did not show any postoperative sensory deficits in either group. Conjunctival incision granulomas, postoperative infections, or corneal injury were nonexistent in either group (Figs. 3 and 4).

3.1. Illustrated cases

Group (A); subperiosteal group.

Group (B); supra- periosteal group.

4. Discussion

Either the supra- periosteal plane or the sub- periosteal plane can be used to relocate the intra- orbital fat. When we examined the data on cosmetic outcomes, we learned that both procedures have been proven to deliver exceptional results, high levels of patient satisfaction, and few complications. It is still debatable whether the supra- periosteal or sub- periosteal plane is better for fat transfer. To the best of our knowledge, there had never been a single- surgeon comparison of the two procedures, and discussions prior to our study had mostly focused on the experiences of certain surgeons who had used a particular strategy. Even with the little transconjunctival incision, the supra- periosteal plane dissection was easier than the sub- periosteal plane dissection. The supra- periosteal pocket formation caused a more serious injury to the orbicularis oculi muscle, leading to a higher incidence of hemorrhage (36.37 % mild to moderate and 63.3 % severe bleeding as opposed to 70 and 30 %, respectively, in group A). Intraoperative bleeding was strongly associated with increased postoperative ecchymosis. Compared with 73.3 and 26.7 %, respectively, in the sub- periosteal group, reported postoperative ecchymosis was mild to moderate in 43.3 % and severe in 56.7 % of eyelids in the supra- periosteal group. The orbicularis oculi holding ligament might potentially be removed by dissection in the supra- periosteal plane. Haddock said that because the orbicularis retention ligament begins 4–6 mm below the orbital rim, any surgical repair of the tear trough and lid/ cheek connection must extend much below the infraorbital rim.⁶ Additionally, Liao and Wei claim



Fig. 2. A) Mild to moderate ecchymosis in subperiosteal group. B) severe ecchymosis in suprapariosteal group.



A) B)



C)

Fig. 3. A) Preoperative. B) 1 week postoperative. C) 1 month postoperative.

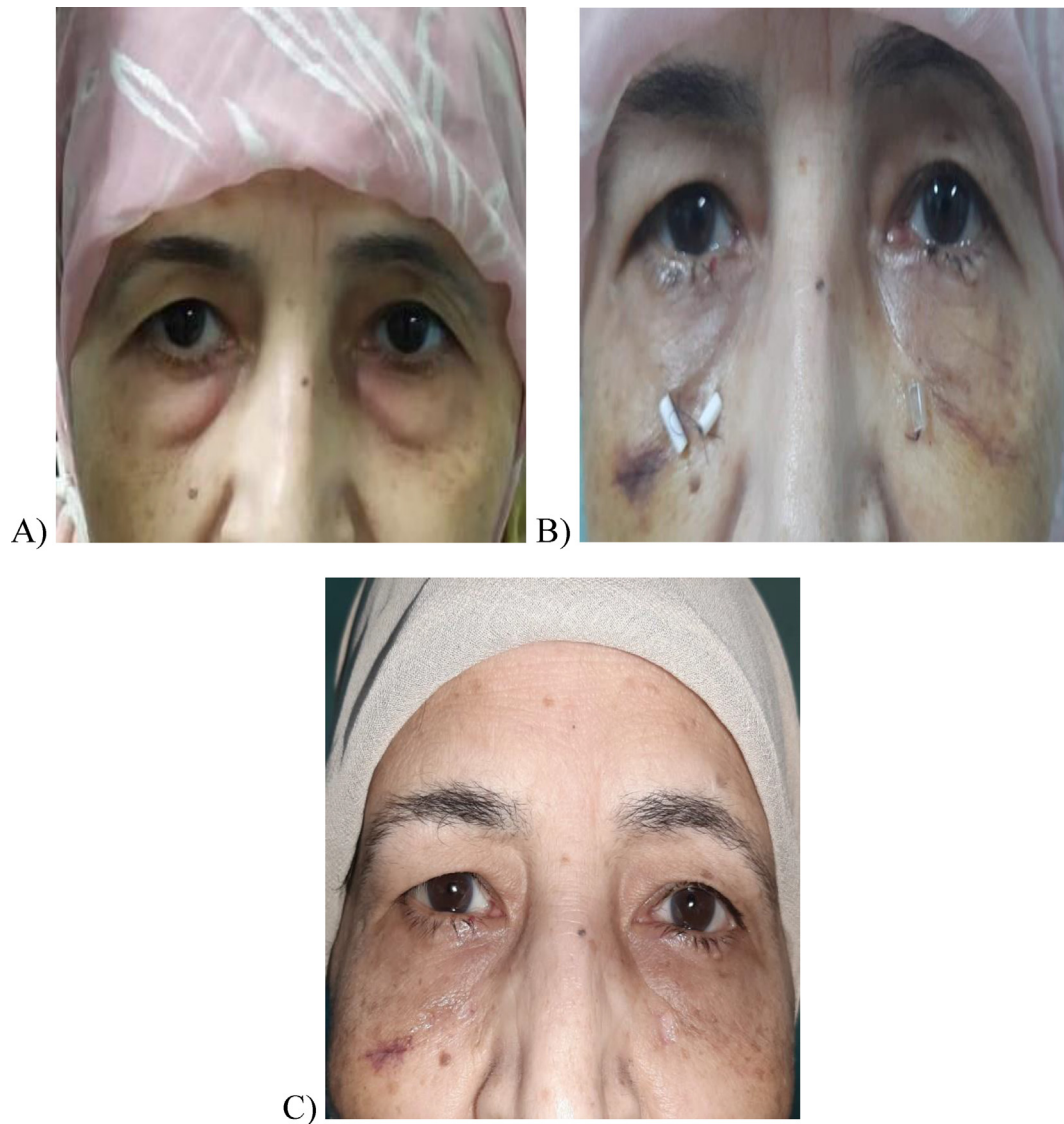


Fig. 4. A) Preoperative. B) first week postoperative. C) 1-month postoperative front view.

that the supraperiosteal plane has a better blood supply, which could aid fatty tissue in surviving and delivering more constant, long-lasting effects.⁷ No one of the two situations in our study's groups had evidence of the transposed fat pedicles' resorption. The infraorbital nerve, which might be damaged during dissection, is another issue with lower lid blepharoplasty. Infraorbital nerve damage can be prevented by carefully dissecting no more than 10 mm from the orbital margin⁵. By limiting the dissection in both groups to 10 mm below the orbital border, we were able to spare our patients' infraorbital neurovascular bundles. Additionally, we employed the Micky mouse to protect the infraorbital nerve and its branches by allowing the needle point to pass through the bottom end of the excised pocket. None of our patients displayed any

symptoms or outward indications of infraorbital nerve damage. The authors distinguished between internal and exterior fixations as two different forms of fixation. Grant favoured transcutaneous fixation, therefore the sutures were wrapped around a short piece of rubber tubing or taped with flesh-colored tape to keep them in place.⁸ Core used both internal and transcutaneous sutures depending on the cases. If the fat pedicles are not securely fastened, there may be a danger of fat pedicle displacement after the outer sutures are removed.⁹ Wang inserted the sutures into the premaxillary area via the epidermis using a long, straight, hollow hypodermic needle.¹⁰ Using the Micky mouse, which was also used to slide the needle on the skin, the other end of the suture was externalized on the skin's surface. In our early cases, the sutures both ends were wrapped

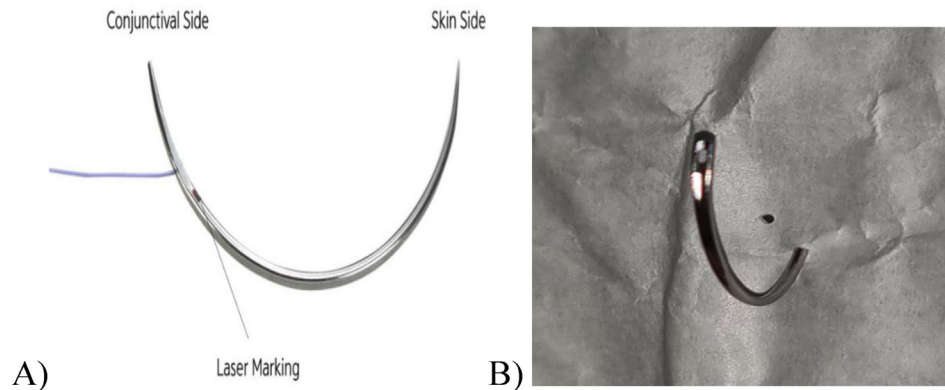


Fig. 5. A) Chang's needle. B) Our unidirectional needle.

around pieces of rubber or gauze; subsequently, we put the sutures directly on the skin's surface. In none of our cases was there a displacement of the fat pedicle.

A 23-gauge needle and metal conductor can be used as a guide in the Duan and colleagues approach to introduce a thread into the infraorbital pocket.¹¹ Duan's method was altered by Ou and colleagues to make the process simpler and more efficient. This technique made internal fixation swift and accurate.¹² Since external fixation is simpler and quicker, we went with it. The double-armed, 6–0 Vicryl suture's needles are too short to fit through the dissected pocket's lengthy, narrow opening. To restore the fat pedicle, we thus clipped the needles and utilized a unique, manually threaded needle. Chang and Cha developed 'Chang's needle' in 2016, a spherical bidirectional needle with a hole that allows suture threading. Chang's needle is a great choice for this operation since there is less possibility of the thread being cut through. The architecture of the internal connection procedure makes it quick, dependable, and simple.¹³ (Fig. 5a). Even while the needle we used (Fig. 5b) is similar to Chang's, it is unidirectional, thus external fixation was only possible once the skin had been completely pierced. In our study, external fixation produced excellent results, particularly when we used this needle that allowed us to use small sutures like 6/0 vicryl sutures, which were barely perceptible on the skin before removal and left no discernible scars on the cheeks at the knot sites after sutures were removed. The ultimate aesthetic outcomes of external and internal fixing procedures might not be different.

One of the difficulties this study encountered was the absence of a quantitative and objective method to evaluate particular parameters, such as intraoperative bleeding and postoperative ecchymosis. In comparison to general surgery, blepharoplasty is

thought to have much less intraoperative bleeding and blood loss. We did not utilize the amount of blood loss or the amount of gauze soaked with blood to determine intraoperative bleeding. Based on the techniques used to stop the bleeding, like compression and cautery, we classified intraoperative bleeding as mild-moderate or severe. Based on the severity of the ecchymosis and the time needed for recovery, we also categorize postoperative ecchymosis into mild, moderate, and severe categories.

4.1. Conclusion

Whether fat is moved into the subperiosteal or subperiosteal plane, transconjunctival blepharoplasty with fat relocation is a procedure that may be performed safely and with outstanding outcomes. Despite differences in the surgical technique and the immediate postoperative course, both strategies provide favorable and comparable long-term outcomes. Postoperative outcomes did not substantially differ between the two groups in terms of patient satisfaction, cosmetic results, or tear trough repair. Currently, repositioning fat is an essential part of lower blepharoplasty surgery. Because of this, it is essential to enhance the surgical procedure and outcomes of this type of lower blepharoplasty. As an improvement to the present methods, we introduced the use of a widely accessible grooved director and manually threaded a surgical needle to join the translocated fat pedicles into the dissected pocket quickly and safely. We also put out a special scale for gauging intraoperative bleeding and postoperative ecchymosis.

Conflicts of interest

No conflict of interest.

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