

Transconjunctival or Transcutaneous Approach for Fat-preserving Lower Lid Blepharoplasty?

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Background: Lower lid blepharoplasty (LLB) has evolved significantly since its early description. The traditional subciliary incision is no longer the standard, and primary use of fat pad excision has been challenged by orbital fat preservation and repositioning. The current review aimed at determining whether effective pedicled orbital fat repositioning is better performed with a subciliary transcutaneous or a transconjunctival incision.

Methods: A comprehensive population, intervention, comparison, and outcome review of cohort clinical studies published from 2000 up to May 2025 in the English-language literature, adhering to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, was conducted using the PubMed, Embase, and Web of Science databases.

Results: Twenty-four studies met the inclusion criteria and were retrieved for analysis. LLB with fat excision or flap transposition can be safely performed with both approaches. However, the desired outcome seems to be equally achievable with both pedicle fat flap transposition and fat grafting.

Conclusions: LLB may be safely performed with both transcutaneous and transconjunctival access incisions. Orbital fat transposition is also possible with both approaches, although it is probably easier with the transcutaneous approach. However, fat transposition may not be the ideal technique for blending the lid-cheek junction or correcting tear trough deformity. Fat grafting may be more appropriate and easier to perform. Unfortunately, the LLB literature lacks rigorous reporting of outcomes and complications, greatly limiting the identification of the most appropriate approach. This deficiency needs to be seriously considered and corrected in future studies. (*Plast Reconstr Surg Glob Open* 2025;13:e7345; doi: 10.1097/GOX.00000000000007345; Published online 16 December 2025.)

INTRODUCTION

The correction of periorbital signs of aging, including excess skin, lid laxity, and orbital fat “pseudo-herniation,” while minimizing risks, is the goal of lower lid blepharoplasty (LLB).^{1–4} Traditionally, the technique involved subciliary transcutaneous (STC) incision with varied skin, muscle, or fat resection, with or without lateral canthus support.^{5–7} Since it was first described, LLB has evolved significantly.^{6,8,9} Fat removal alone is now believed to offer partial correction. Paradoxically, rather than rejuvenation,

in the long term, it results in a hollow-eyed appearance, a form of iatrogenic aging.^{5,8,10,11}

Depending on the particular demands, the STC incision with skin-only, composite skin muscle, or separate skin and muscle flaps has been described.² Complications of this approach are rounding of the lateral canthal angle, lid malposition, scleral show, ectropion secondary to excessive skin removal and vertical contracture forces, disruption of anterior and middle lamellar structures, and possible denervation of the orbicularis muscle.^{8,12–20}

To eliminate visible scarring, but most importantly, to reduce complications by allowing direct and safe access to orbital fat pads,^{2,12,17,21} transconjunctival (TC) blepharoplasty with retroseptal fat removal was described. First reported in the 1920s,^{4,22} it was popularized by Zarem and Resnick²³ in the 1990s. It mainly addresses younger

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patients with true orbital fat excess.^{2,4,10,15,17,21,24,25} Additional noninvasive skin tightening or skin pinch excision is usually necessary for patients with more advanced signs of aging.^{3,4,15,18}

Since the advantages of orbital fat preservation, first described by Loeb²⁶ and then championed by Hamra,²⁷ became evident, a paradigm shift has occurred. There was an evolution toward better periorbital contouring and a natural-appearing, smoother, and fuller lower eyelid, with a youthful transition at the lid-cheek junction, blending well with the full face.^{5,28}

LLB continues to be varied. Distinct approaches with a range of challenges and benefits have been described. Currently, there is no general consensus on the ideal and most effective approach. The LLB access incision remains a major controversial topic with continued debate regarding fat management, lateral canthal manipulation, and other concomitant procedures.^{5,29–31} Whether TC access allows the same exposure for precision and ease of execution of fat preservation and transposition of traditional STC, and results in a similar aesthetic outcome, remains a subject of anecdotal reports. There remains also wide disagreement about the best technique with the lowest complication rates.^{2,15,17,32} The current review aimed at determining whether effective fat transposition (FT) is better performed through an STC or TC incision.

MATERIAL AND METHODS

A comprehensive population, intervention, comparison, and outcome review of clinical studies published from 2000 up to May 2025 in the English-language literature was conducted using PubMed, Embase, and Web of Science databases, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines to identify studies describing LLB with fat preservation. Two investigators screened titles and abstracts and analyzed full texts of selected papers for eligibility. Disagreements were resolved by consensus or with the senior investigator, and data extraction from selected studies was conducted. Inclusion and exclusion criteria are detailed in Table 1, and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses search algorithm is illustrated in Figure 1. No patient data were collected or

Takeaways

Question: Is transconjunctival (TC) or transcutaneous access more effective for performing orbital fat flap repositioning in lower lid blepharoplasty?

Findings: This population, intervention, comparison, and outcome-based systematic review of 24 cohort studies found that both subciliary transcutaneous (STC) and TC approaches can safely achieve effective fat excision or repositioning, with no significant difference in outcomes. However, STC offers easier access for pedicled flap manipulation, whereas TC may be more suited for younger patients requiring no skin excision.

Meaning: Both STC and TC approaches are safe and effective, but STC may offer better exposure for complex maneuvers, whereas fat grafting may be more reliable for correcting tear trough deformity.

used for the preparation of this study to warrant IRB approval.

RESULTS

Twenty-four studies involving a total of 3623 patients, mostly women, were retrieved for analysis. (See figure, **Supplemental Digital Content 1**, which displays demographic data and details of studies, <https://links.lww.com/PRSGO/E532>.) Gender distribution was not reported in 3 studies.^{24,33,34} Ethnic background of patients was explicitly reported in only 2 studies^{35,36}; however, it could be deduced from patients' illustrations in Asian studies. In other studies, illustrations were all of White patients (Table 2).

Severity of deformity and outcome were documented in 10 studies based on various grading systems with different classification parameters (Table 3).^{22,25,33,35–38,43–45,48} The Barton scale is the most frequently mentioned. In 1 study, the depth of tear trough deformity (TTD) was measured with calipers.⁴⁹ In another, the depth of the nasojugal fold and pretarsal orbicularis crease were graded according to the Barton scale but not reported; instead, measurements of lower eyelid length, nasojugal fold depth, and pretarsal orbicularis depth were described.⁴⁷

Table 1. Inclusion and Exclusion Criteria and Literature Search Methodology

Criteria	Inclusion	Exclusion
Study design	• Peer-reviewed cohort studies	• Reviews, case reports, comments, and letters to the editor
Population	• Subjects undergoing LLB	• Subjects undergoing facial rejuvenation with LLB not a major component of the procedure
Outcome	• Reported improvement in TTD and/or blending of lid-cheek junction	• Description of the surgical intervention without explicit reporting of outcome
Methodological quality	• Clearly defined methodologies and measuring tools for determining improvement in TTD and/or blending of the lid-cheek junction	• Studies with poor methodological quality or insufficient reporting of outcome
Publication date	• Studies published since 2000 to capture the most recent evidence related to LLD techniques	• Studies published before this time frame
Language	• Studies published in English	• Non-English publications

Keywords used alone or in combination for the search were “blepharoplasty,” “lower blepharoplasty,” “transcutaneous,” “anterior subciliary incision,” “transconjunctival,” “lid-cheek junction,” “septal reset,” “orbital retaining ligament release,” “fat repositioning,” “fat augmentation,” “arcus marginalis release,” “fat herniation,” “nasojugal groove,” “malar bags,” and “complications.” An additional unstructured search was conducted.

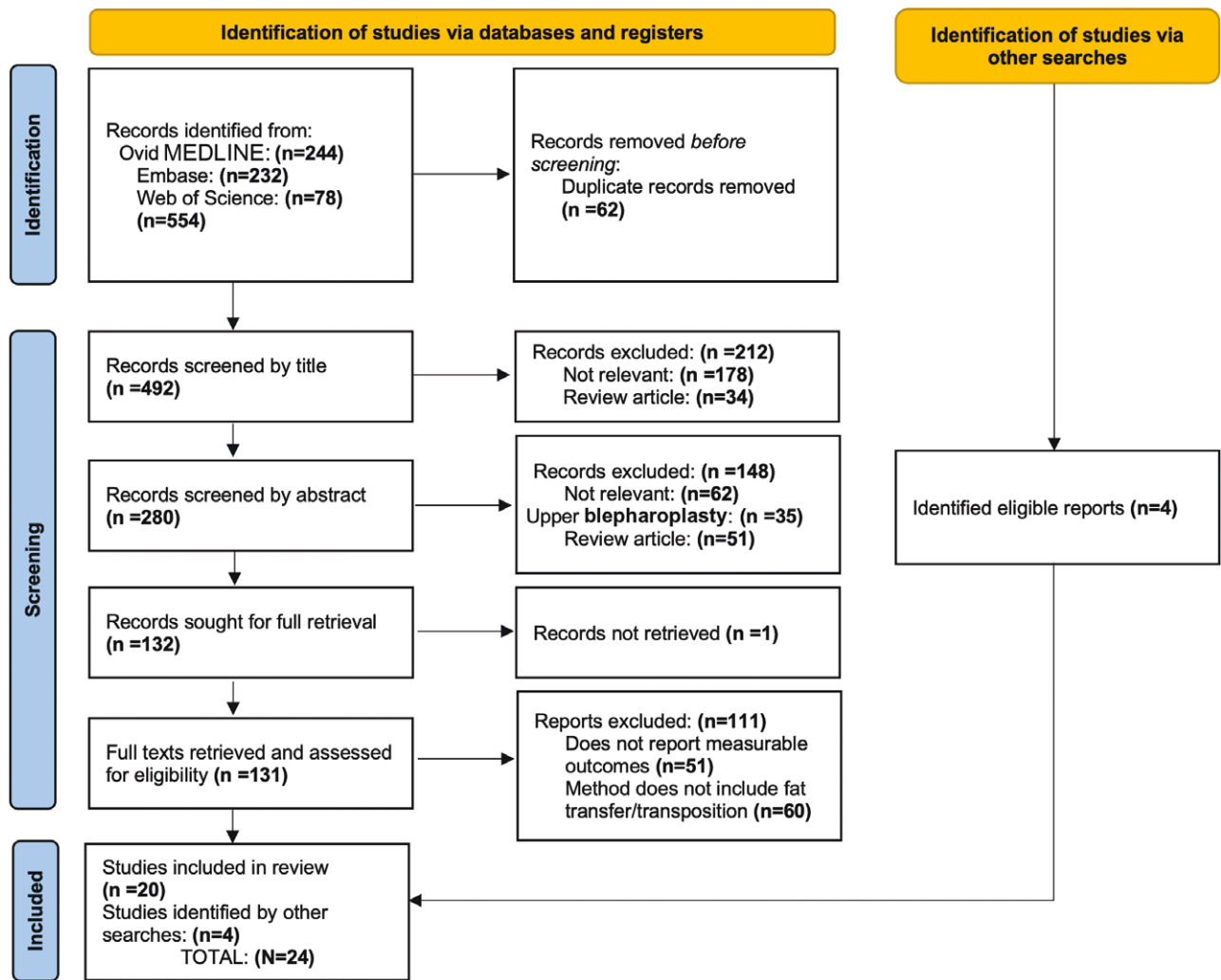


Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses search algorithm.

Reviewed reports are mostly cohort studies of various STC and TC LLB approaches. A wide range of techniques with various combinations of surgical steps are described. For TC, both retro- and preseptal dissections are reported. Subperiosteal, preperiosteal, sub-sub-orbicularis oculi fat (sub-SOOF), intra-SOOF, pre-SOOF, and subcutaneous FT are described, as well as internal and transcutaneous fat fixation and lipoaspirated or minced fat grafting^{32,38} (Figs. 2, 3). (See figure, Supplemental Digital Content 2, which displays details of various interventions performed, <https://links.lww.com/PRSGO/E533>.) Massry and Hartstein²⁸ reported both subperiosteal and preperiosteal FT without appreciable difference in outcome between the 2 techniques.

Few studies are comparative. Two compared STC and TC with no significant difference in outcome.^{25,49} Ramesh et al⁴⁷ compared fat excision to FT. Mean nasojugal fold depth was effaced with both, but significantly more with transposition. Youn et al⁴⁸ compared TC subperiosteal FT to septal reset. In patients with grades II and III deformities, better outcomes were observed with septal reset. Transcutaneous and EZ-Tcon internal fixation of

transposed fat were compared by Chang et al,⁴⁵ concluding that this original internal fixation could have advantages over conventional internal and external fixation techniques. FT and minced fat grafts were also compared by Karimi et al³²; desired outcomes are equally achievable with both.

Excellent correction of deformity is described by all studies. Patients' satisfaction was measured for 179 STC (3 studies) and 553 TC (9 studies) patients. Despite sampling imbalance, the *t* test demonstrated that the 2 groups have comparable overall means with standard error and a high Pearson correlation (0.7316904). Overall, excellent and good patient satisfaction was 84.26% for TC and 74.10% for STC (analysis of variance $P = 0.87602855$) (Table 4). The difference is not significant; however, it must be interpreted with care due to incomplete reporting and the inherent subjectivity bias of several studies.^{22,32,37,38,40}

Reported complications were very few. No major complications were noted by most studies. The incidence was not significantly different between the 2 approaches (analysis of variance $P = 0.06378577$). Minimal swelling was most commonly observed in all patients.²⁴ Chen et al⁴⁴

Table 2. LLB Studies Retrieved for Analysis With Listing of Year of Publication, Country of First Author, Number and Ethnic Background of Patients, and Level of Evidence Provided

Authors	Year of Publication	Country of First Author	No. Patients	Patients' Ethnic Background	Level of Evidence
Huahui et al ³⁷	2025	China	112	Not explicitly mentioned. Photographs are for Asian patients	IV
Zhang et al ³⁸	2025	China	37	Not explicitly mentioned. Photographs are for Asian patients	IV
Lin et al ³⁹	2025	China	17	Not explicitly mentioned. Photographs are for Asian patients	IV
Chen et al ³⁵	2025	China	97	Chinese patients	IV
Gu et al ³⁴	2024	China	22	Not explicitly mentioned. Photographs are for Asian patients	IV
Xu et al ²²	2024	China	104	Not explicitly mentioned. Photographs are for Asian patients	II
Abdelhamid Elhendawy et al ⁴⁰	2024	Egypt	15	Not explicitly mentioned	IV
Karimi et al ³²	2023	United States	142	Not explicitly mentioned	IV
Bernardini et al ⁴¹	2023	Italy	30	Not explicitly mentioned	IV
Liu et al ²⁵	2022	China	913	Not explicitly mentioned. Photographs are for Asian patients	IV
Wu et al ⁴²	2022	China	51	Not explicitly mentioned. Photographs are for Asian patients	IV
Jin et al ²⁴	2021	Philippines	184	Not explicitly mentioned. Photographs are for Asian patients	IV
Majidian Ba et al ¹⁴	2021	United States	41	Not explicitly mentioned	IV
Cheng et al ⁴³	2021	China	492	Not explicitly mentioned. Photographs are for Asian patients	IV
Chen et al ⁴⁴	2021	China	226	Not explicitly mentioned. Photographs are for Asian patients	IV
Chang et al ⁴⁵	2020	South Korea	545	Not explicitly mentioned. Photographs are for Asian patients	IV
Wang et al ³³	2020	China	36	Not explicitly mentioned. Photographs are for Asian patients	IV
Gao et al ⁴⁶	2019	China	14	Not explicitly mentioned. Photographs are for Asian patients	IV
Ramesh et al ⁴⁷	2019	United States	60	Not explicitly mentioned	III
Youn et al ⁴⁸	2014	South Korea	133	Not explicitly mentioned. Photographs are for Asian patients	IV
Massry and Hartstein ²⁸	2012	United States	54	Not explicitly mentioned	IV
Liao and Wei ⁴⁹	2011	Taiwan	212	Not explicitly mentioned. Photographs are for Asian patients	IV
Momosawa et al ³⁶	2008	Japan	20	Japanese	IV
Mohadjer and Holds ⁵⁰	2006	United States	66	Not explicitly mentioned	IV

reported that half of the patients developed transient granulomas of transposed fat. In 2 studies, all patients routinely complained about palpable firmness and developed a slight lumpy appearance early postoperatively.^{43,49} Complications are summarized in Table 5. They were not reported in 1 study.³⁷ (See graph, Supplemental Digital Content 3, which displays the statistical analysis, <https://links.lww.com/PRSGO/E534>.)

DISCUSSION

Initially, LLB was focused on resecting skin, muscle, and “herniated” orbital fat.⁵¹ How much fat to resect was subjective. Though early results were generally described to be satisfactory, overresection invariably resulted in a hollowed-out periorbital area with a more aged appearance and persistent TTD.^{8,13} Although there remains a role for fat debulking, fat excision alone may be adequate in only a handful of patients. Optimal rejuvenation for

youthful and revitalized facial appearance in most patients requires restoration of the natural lower eyelid midface transition.^{2,5,21,29,51}

Addressing patient-specific lower eyelid, lid-cheek junction, and canthal changes in a graded approach, with judicious use of surgical maneuvers for correction of sharp demarcation along the orbital rim and malar depression with a smooth midface contour, is essential.^{20,25,52,53} This requires correction of the tear trough and palpebromalar grooves with no or minimal fat and skin excision, selective release of orbicularis retaining ligament, orbital fat and SOOF transposition, augmentation of deep malar fat compartment, and preservation of the orbicularis muscle, together with orbicularis and/or lateral canthal support and midface suspension.^{2,5,10,16,20,22,41,54–56}

With the current gold standard trend of transposing previously discarded protruding fat,^{2,7,12,16,32,49,52,57} the TC technique, preferred when fat excision is the main focus,^{10,29,58} has been adapted to FT.^{8,14,24,43} TC retroseptal

Table 3. Summary of Studies in Which Measurement of Deformity Correction Was Reported

Authors and Year	Surgical Technique	Grading System	Preoperative	Postoperative
Huahui et al, 2025 ³⁷	TC preseptal; extension of fat flap; external transcutaneous fixation	Measurement of lower eyelid gray scale	eb-tt-z: 0.1812 ± 0.054 mc-tt-z: -0.432 ± 0.0616 mc-ftt-z: -0.581 ± 0.058 pi-tt-z: 0.289 ± 0.044	eb-tt-z: 0.074 ± 0.049 mc-tt-z: -0.531 ± 0.092 mc-ftt-z: -0.629 ± 0.061 pi-tt-z: 0.227 ± 0.061
Zhang et al, 2025 ³⁸	TC preseptal; combined FT and injection of SVF-gel rich in vascular stromal components; external transcutaneous fixation	Measurement of lower eyelid gray scale	eb-tt-z: 0.1704 ± 0.0123 mc-tt-z: -0.5078 ± 0.0710 mc-ftt-z: -0.6147 ± 0.0537 pi-tt-z: 0.2831 ± 0.0840	eb-tt-z: 0.1000 ± 0.0322 mc-tt-z: -0.5368 ± 0.1230 mc-ftt-z: -0.6122 ± 0.0597 pi-tt-z: 0.2391 ± 0.0516
Chen et al, 2025 ³⁵	STC preseptal skin-muscle flap; if necessary, excessive fat resection; external transcutaneous fixation	Barton	G I: 9 G II: 47 G III: 41	G 0: 9 (100%) G 0: 46 (97.9%); G I: 1 (2.1%) G 0: 35 (85.4%); G I: 7 (7.2%)
Xu et al, 2024 ²²	TC preseptal; external transcutaneous fixation combined with nasal alar base filling	Hirmand	G I: 28 G II: 69 G III: 10	G 0: 28 (100%) G 0: 60 (86.95%); G I: 9 (13.05%) G 0: 8 (80%); G I: 2 (20%)
Liu et al, 2022 ²⁵	TC preseptal for G1; transcutaneous for other patients; fixation method not specified	Not specified	G I: 163 G II: 259 G III: 313 G IV: 178	Overall success rate: 97.81%
Cheng et al, 2021 ⁴³	TC retroseptal; fabrication of fan-shaped thin fat flap for transposition; external transcutaneous fixation	TTD measurement with caliper	Mild TTD: 422 Moderate TTD: 492 Severe TTD: 70	TTD 0 mm: 400 (94.78%), TTD <5 mm: 22 (5.21%) TTD 0 mm: 449 (91.26%), Mild TTD: 43 (8.74%) TTD 0 mm: 59 (84.29%), Mild TTD: 11 (15.71%)
Chen et al, 2021 ⁴⁴	TC preseptal; external transcutaneous fixation	Hirmand	G I: 71 G II: 146 G III: 9	G 0: 66 (93.0%); G I: 5 (7.0%) G 0: 124 (84.9%); G I: 22 (15.1%) G 0: 6 (66.7%); G I: 2 (22.2%); G II: 1 (0.5%)
Chang et al, 2020 ⁴⁵	TC preseptal; excision of redundant skin and suspension of orbicularis muscle	Modified Barton		<i>External fixation</i> G 0: 35 (16.6%); G I: 121 (57.3%); G II: 50 (23.7%); G III: 5 (2.4%) Improvement: 191 (90.5%) No improvement 20 (9.5%) Excellent outcome: 70 (33.2%) <i>Internal fixation</i> G 0: 149 (44.6%); G I: 148 (44.3%); G II: 36 (10.8%); G III: 1 (0.3%) Improvement: 323 (96.7%) No improvement: 11 (3.3%) Excellent outcome: 196 (58.7%)
Wang et al, 2020 ³³	TC preseptal; internal fixation to soft tissues	Barton	Grade I: 22 Grade II: 43 Grade III: 14	G 0: 19 (86.4%); G I: 3 (13.6%) G 0: 36 (83.7%); G I: 7 (16.3%) G 0: 5 (71.4%); G I: 1 (14.3%); G II: 1 (14.3%)
Youn et al, 2014 ⁴⁸	TC retroseptal; internal periosteal fixation	Barton	<i>FT</i> G I: 17 G II: 40 G III: 14 <i>Septal rest</i> G I: 5 G II: 28 G III: 16	<i>FT</i> G 0: 12 (70.59%); G I: 5 (29.41%) G 0: 22 (55%); G I: 18 (45%) G 0: 3 (21.43%); G I: 9 (64.28%); G II: 2 (14.29%) <i>Septal reset</i> G 0: 4 (80%); G I: 1 (20%) G 0: 22 (78.57%); G I: 6 (21.43%) G 0: 10 (62.5%); G I: 6 (37.5%)

All studies except 1 are about TC interventions. eb-tt-z, sagittal vector from the tear trough point to the under-eye bag point; mc-ftt-z, sagittal vector from the most distal point of the tear trough to the medial canthus; mc-tt-z, sagittal vector from the tear trough point to the medial canthus; pi-tt-z, sagittal vector from the tear trough point to the lower eyelid margin; SVF-gel, stromal vascular fraction-gel; TTD, tear trough deformity (mild TTD [<19 mm]; moderate TTD [$19\text{--}40$ mm]; severe TTD [>40 mm]).

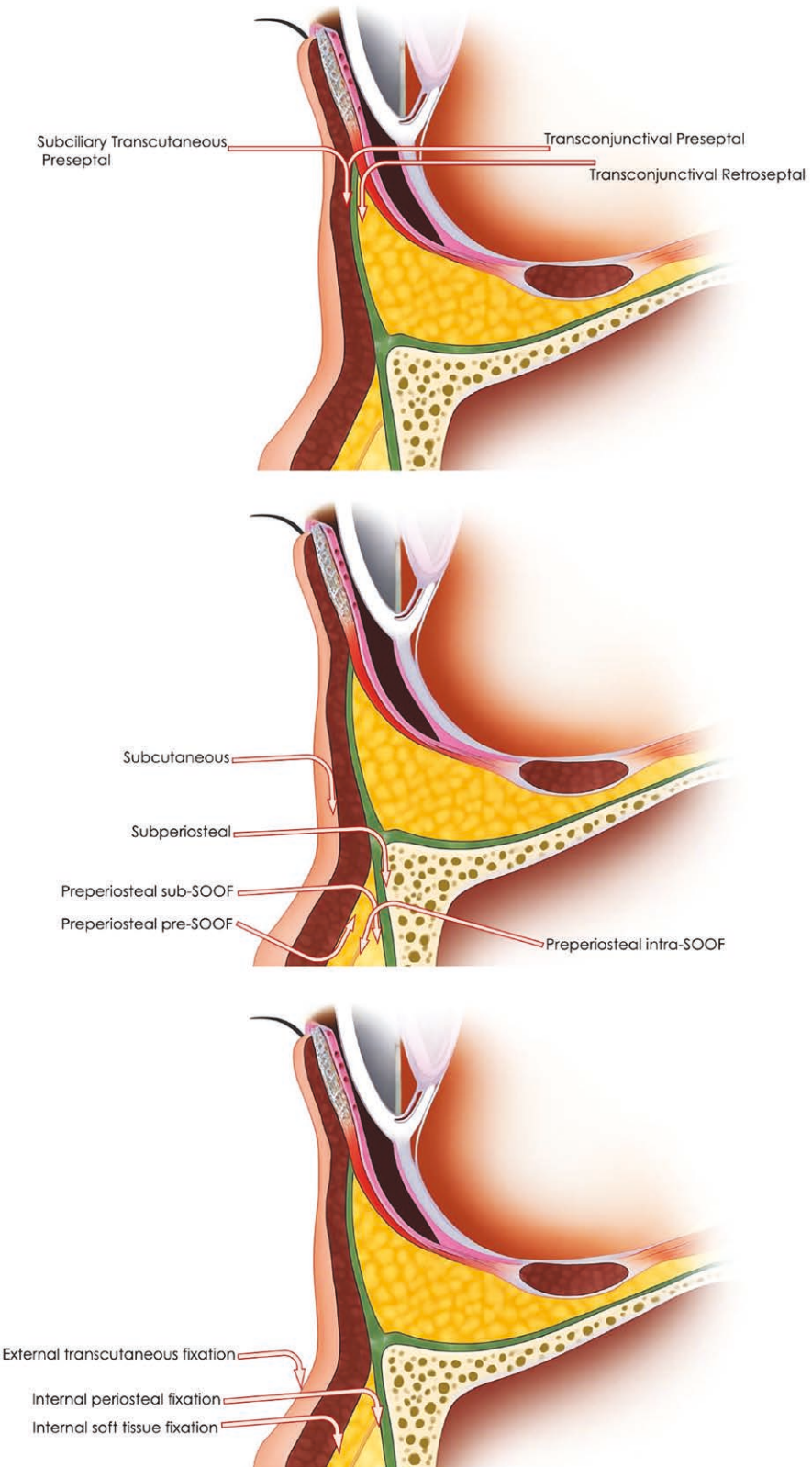


Fig. 2. ChatGPT-generated figure demonstrating (A) STC and TC surgical access incisions and preseptal and retroseptal dissection planes, various pocket dissections for FT (B), and different fat fixation methods (C).

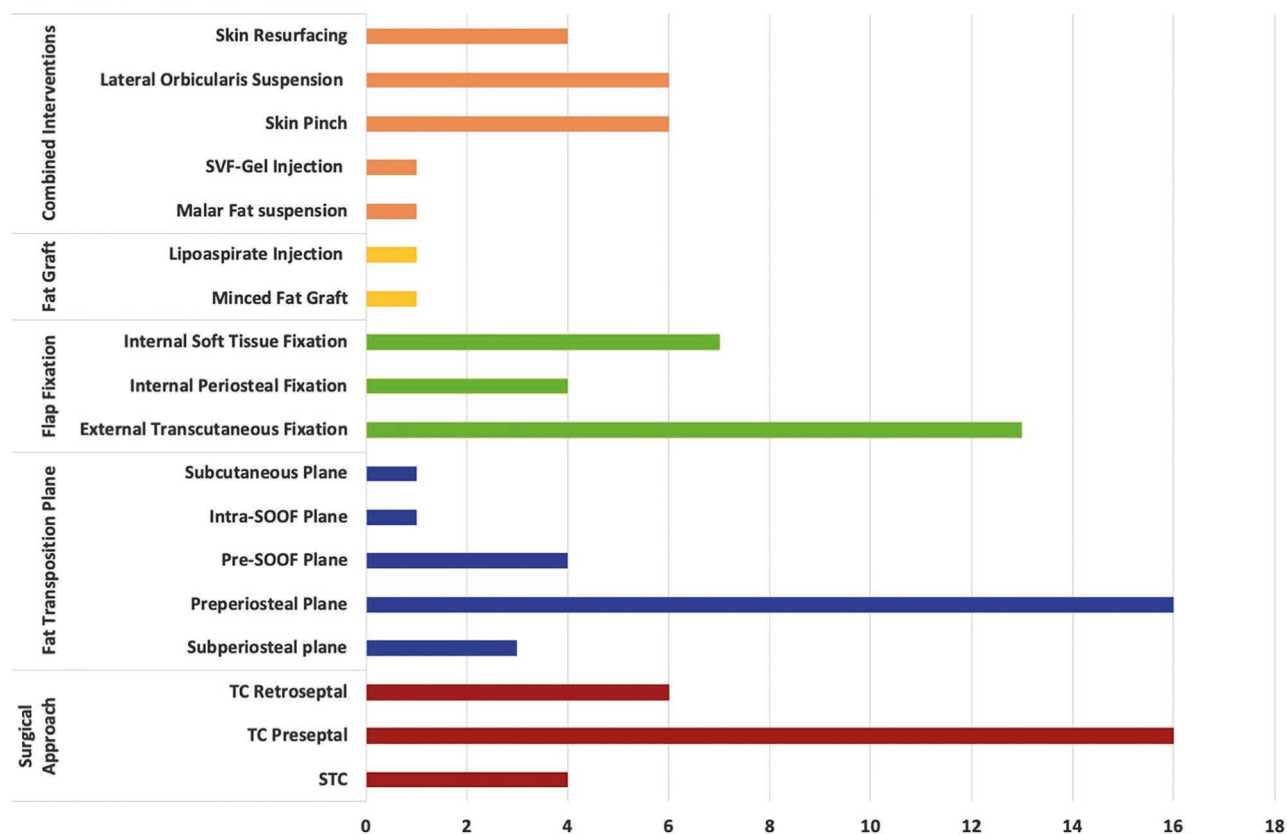


Fig. 3. Sixteen different interventions performed in various combinations across the 24 studies retrieved for review. SVF-gel, stromal vascular fraction-gel.

Table 4. Pooled Patients' Reported Outcome Relative to Surgical Access Incision and FT

Patients' Reported Outcome	STC* (179 Patients), n (%)	TC† (553 Patients), n (%)	P
Highly satisfied	69 (38.55)	386 (69.80)	
Satisfied	62 (34.64)	80 (14.46)	
Moderately satisfied		4 (0.72)	
Mildly satisfied	1 (0.56)	8 (1.44)	
Highly satisfied and satisfied	131 (73.19)	466 (84.26)	0.87602855

*STC patients' reported outcome

†TC patients' reported outcome

extended subperiosteal dissection has been described to correct TTD with transposition of medial and central "herniated" infraorbital fat caudal to the orbital rim. Its theoretical major benefit is providing the most direct access to fat pads while preserving the orbital septum.^{10,29,58}

FT with this approach is challenging and associated with a steep learning curve.^{12,24,59} Except for good infraorbital foramen visualization through a fairly avascular plane, it provides limited exposure of fat pads and other structures. It is also associated with difficulty in maneuvering instruments and positioning FT in the appropriate orientation, as well as securing midface soft tissues to stable landmarks.^{2,14,55,60} Though the maxillary periosteum near the levator alaeque nasi muscle origin is fairly loose, allowing easy FT, the subperiosteal space is invariably rigid. The required extended dissection causes prolonged periods of postoperative edema.^{61,62} The technique may not be

adequate to achieve redefined blepharoplasty aesthetic goals because the tear trough and orbicularis retaining ligaments, which constitute the anatomical basis of aging lid-cheek junction deformity, are not released.^{24,55}

TC incision certainly has some appeal even if it offers limited ability to tighten the anterior lamella.^{8,13–16,63,64} Though described as making fat excision easier, ironically, inadequate fat removal is often the most reported complication of this approach due to limited exposure, specifically of the lateral compartment, that may be particularly difficult to retrieve.^{8,11,60,65} Fat excision may be performed comparably with STC and TC incisions. In a comparison of the same patient, with STC fat removal from 1 side and TC from the other, Wong and Mendelson¹⁰ reported comparable outcomes. It is important to note that with STC, the scar was not problematic for patients. Furthermore, whenever skin pinch

Table 5. Pooled Reported Complications Relative to Surgical Access Incision and FT

Complication	STC (182 Patients), n (%)	TC (2266 Patients), n (%)	STC and TC Combined (913 Patients), n (%)
Ectropion	3 (2.6)	1 (0.04)	
Temporary lower lid malposition			12 (1.3)
Transitory blurring of vision		1 (0.04)	
Dry eye		5 (0.2)	
Diplopia		1 (0.04)	
Transient dry eye syndrome			37 (4)
Conjunctival edema and chemosis		8 (0.35)	
Residual skin laxity	1 (0.5)		
Residual fat	2 (1)	1 (0.04)	
Undercorrection of eyelid bags and TTD	2 (1)	19 (0.8)	
Hematoma	2 (1)	7 (0.3)	
Delayed resolution of edema and ecchymosis, induration, and granuloma	2 (1)	68 (3)	
Poor-quality scars requiring secondary surgery			18 (2)
Numbness		7 (0.3)	
Hyperpigmentation		1 (0.04)	
Mild oozing of blood on the first postoperative week		5 (0.2)	
Infection and suture abscess		3 (0.1)	
Total	12 (6.6)	127 (5.6)	67 (7.3)
P: 0.06378577			

excision and canthal suspension are indicated, the advantage of a nonvisible scar with TC blepharoplasty is lost. On the contrary, adding a skin incision to the TC incision may seem counterintuitive.

With TC preseptal dissection, fat excision or transposition requires orbital septum transgression. This approach has a similar outcome and risk profile to retroseptal subperiosteal dissection,^{1,8,28,51} indicating that the impact of middle lamella scarring has been overemphasized. “Isolated” orbital septal scars are not likely related to eyelid retraction. No statistically significant difference in lid retraction has been observed comparing excision of the septum versus no manipulation. Lid malposition may still occur with TC blepharoplasty and can be just as much of an issue as with STC blepharoplasty.^{6,55,64,66} It is most likely due to multilamellar scarring secondary to transgressing the functional orbicularis muscle from the front or the lid retractors from behind.⁵⁵ Lower lid malposition that occurs following STC lamellar manipulation is mostly observed in patients with preoperative orbicularis weakness or increased lid laxity and is primarily associated with a negative vector orbital-malar relationship, which is documented as an important risk factor.^{67,68} It can be most effectively prevented by maintaining lateral canthal support, orbicularis muscle tone, and tarsoligamentous sling integrity, and by correcting eyelid laxity.^{20,56,69}

Proper lateral canthal tightening and lower lid muscle suspension procedures have become the mainstay of STC lower lid surgery in virtually all patients.^{7,17,20,56,70} This has greatly reduced the incidence of previously reported eyelid malposition and canthal angle rounding.^{2,3,8,16,71} Currently, a comparably low 0.4% incidence of symptomatic lid malposition is being reported with both TC and STC approaches.^{72,73} This further negates the claimed advantage of TC blepharoplasty.

Muscle denervation is cited as one of the causes of STC blepharoplasty eyelid malposition.²⁰ The claim that wide orbicularis muscle dissection contributes to complications and results in partial denervation with unbalanced contraction has been proven to be ill-founded. Subciliary skin-muscle flap surgery does not cause any significant orbicularis muscle denervation.⁵⁵ A study about blepharoplasty with separation of skin and muscle did not demonstrate any significant postoperative changes in compound muscle action potential. Detailed anatomical description of muscle innervation and investigation with electroneurography has shown that the buccal and medial branches of the zygomatic facial nerve remain untouched by surgery and innervate the muscle efficiently.^{59,74,75}

Effective FT requires extensive orbital fat release and advancement without tension.³⁴ It also requires secure fixation, which is often difficult to perform.⁴² Various flap preparation and fixation techniques either transcutaneously or in situ with internal sutures have been described.^{33,37,42–45}

Several modifications of TC blepharoplasty, including preseptal dissection plane, suprapariosteal, SOOF premaxillary and prezygomatic, intra-SOOF, and suborbicularis or subcutaneous planes for easier FT, have been reported, each with some advantages and inherent complications.^{2,10,12,14,21,24,50,61} Subcutaneous FT violates anterior lamellar structures and may potentially increase the risk of lower lid retraction.⁷³ It is unclear how this approach would be superior to what can be performed with STC blepharoplasty.

Various fixation techniques have been described as well, reflecting difficulties encountered with FT regardless of dissection and transposition planes.^{14,33,42,45,46} Though the preperiosteal suborbicularis plane is mostly favored,¹⁶ extended TC approaches have not been widely

	Risk of bias domains							Overall
	D1	D2	D3	D4	D5	D6	D7	
Huahui Z, et al. [40]	✗	+	+	+	+	✗	-	✗
Zhang H, et al. [42]	✗	+	+	+	+	✗	-	✗
Lin C, et al. [81]	-	+	+	+	+	-	+	-
Chen J, et al. [35]	✗	-	+	+	+	✗	-	✗
Gu J, et al. [34]	✗	-	+	+	+	+	-	✗
Xu W, et al. [22]	✗	+	+	+	+	✗	-	✗
Abdelhamid Elhendawy M, et al. [45]	✗	+	+	+	+	✗	-	✗
Karimi N, et al. [32]	✗	+	+	+	+	✗	-	✗
Bernardini FP, et al. [52]	✗	-	+	+	+	✗	-	✗
Liu J, et al. [25]	✗	+	+	+	+	✗	-	✗
Wu L et al. [73]	✗	-	+	+	+	✗	-	✗
Jin Y, et al. [24]	✗	-	+	+	+	✗	-	✗
Majidian Ba M, et al. [14]	✗	+	+	+	+	✗	-	✗
Cheng L, et al. [37]	✗	-	+	+	+	✗	-	✗
Chen J, et al. [41]	✗	-	+	+	+	✗	-	✗
Chang CH, et al. [39]	✗	+	+	+	+	✗	-	✗
Wang R, et al. [33]	✗	+	+	+	+	✗	-	✗
Gao W, et al. [75]	✗	-	+	+	+	✗	-	✗
Ramesh S, et al. [44]	✗	-	+	+	+	✗	-	✗
Youn S, et al. [38]	✗	+	+	+	+	✗	-	✗
Massry GG, et al. [28]	✗	-	+	+	+	✗	-	✗
Liao SL, et al. [43]	✗	-	+	+	+	✗	-	✗
Momosawa A, et al. [36]	✗	+	+	+	+	✗	-	✗
Mohadjer Y, et al. [74]	✗	-	+	+	+	+	+	-

Domains:
D1: Bias due to confounding.
D2: Bias due to selection of participants.
D3: Bias in classification of interventions.
D4: Bias due to deviations from intended interventions.
D5: Bias due to missing data.
D6: Bias in measurement of outcomes.
D7: Bias in selection of the reported result.

Judgment
✗ Serious
- Moderate
+ Low

Fig. 4. Assessment of the risk of bias of reviewed studies using the ROBINS-I tool for assessing risk of bias in nonrandomized studies of interventions.⁸¹ ROBINS-I, risk of bias In non-randomized studies of interventions.

used because of the invariable lid margin anterior restriction and limited visualization, as well as uncertainty with midcheek surgical anatomy.^{10,55} Moreover, they are all associated with more bruising, prolonged edema, fat

granulomas, soft-tissue irregularities, and contour deformities.^{12,16,43} The technique also has its limitations due to advancement directional discrepancy for medial and lateral hollows, and distance discrepancy for the central

hollow. Fat trauma during flap preparation and possible upward retraction secondary to inadequate release and fixation are additional limitations.^{32,37} Whether the STC approach is better at overcoming these limitations cannot be ascertained due to the very limited studies retrieved for review.

FT may not entirely eliminate the risk of orbital hollowing. At times, it may be inadequate due to restricted fat volume and pedicle length particularly for full correction of the central V deformity located too inferior to be effaced by a pedicle flap.^{32,38,43} Furthermore, if orbital fat is not sufficiently released, it can lead to uneven distribution, postoperative asymmetry, or incomplete correction, creating new or worsened depressions and negatively affecting the aesthetic outcome.³⁸

Volume augmentation by autologous fat grafting may be an alternative option.^{2,9,52} “Fat pearls” harvested from excess herniated fat pads have been used since the 1980s concomitantly with STC blepharoplasty. Grafting of resected fat is claimed to be safe and effective in some selected patients. It allows more flexibility of distribution in any desired pattern and location with precise volume enhancement, and is relatively easy to learn and perform. It provides not only a biologically superior source of fat graft but also obviates the need for an additional harvesting site.^{10,18,30,32,73,76–78}

The effectiveness of FT or grafting of only excised orbital fat has been questioned. The average weight of orbital fat that can be dissected for transposition or for subsequent grafting may be far less than what is needed. Micro-autologous fat transplantation from aspirated abdominal or medial thigh fat has been described as a more suitable alternative.^{5,38,78}

Despite good outcomes, the survival of fat grafts, whether excised orbital fat or lipoaspirated from other areas, is not always predictable with highly variable take between 20% and 90%. Visible nodulation and fibrosis are potential complications not to be underestimated.^{14,37,78} It has been reported that the combination of orbital FT and stromal vascular fraction-gel injection provides superior correction of TTD in cases of insufficient orbital fat.³⁸ Regardless, it is important to note that the outcome may not be adequate if it falls short of release of retaining ligaments.³² Combined orbital FT and fat grafting may effectively overcome limitations of individual applications and maximize their advantages.³⁸

Patients have varying degrees of aging changes, and thus, 1 procedure cannot fit all.⁵ Surgeons should be able to balance techniques to deliver a customized aesthetic result.⁴⁷ The decision regarding the particular technical approach depends on clinical findings with special consideration of the sagittal cornea-bony orbital relationship.¹¹ TC is not a substitute for STC blepharoplasty.¹⁶

Although merits of both techniques are widely debated, regardless of arguments in favor of one or the other, lower blepharoplasty can be safely and efficiently performed with both.^{3,31,49} STC blepharoplasty remains a time-honored technique.^{20,51} Despite claims that fat pads may be equally exposed with both TC and

STC approaches,¹¹ STC allows better visualization with more space to perform the required multiple maneuvers. It maximizes cosmetic outcomes even if it may result in more aggressive remodeling with an external scar.^{20,37,55,71} It is the preferred method for an increasingly aging population in whom lower lid-tightening, shortening, or canthoplasty is necessary, or whenever orbicularis oculi hypertrophy necessitates muscle excision.¹⁵ Furthermore, with the STC approach, simultaneous SOOF relocation and midface lift may be performed together with lateral canthopexy/canthoplasty and septal reset.^{16,17,54,57,79} Compared with transtemporal midface lift with lower lid skin pinch, LLB with FT can yield similar successful improvement in lower lid and midface contour.⁸⁰ Combined with SOOF elevation, it allows greater ability for lid-cheek junction blending and results in gratifying midface rejuvenation.^{29,54}

LIMITATIONS

In addition to inherent variability in the design of studies retrieved for analysis, major limitations of this review include the wide variability in clinical presentations and degrees of lower eyelid skin laxity, fat herniation, sagging of facial tissue, or TTD, in addition to variation in parameters used to measure and determine outcome, criteria for aesthetic improvement, and patients' satisfaction.^{36,39} Moreover, the techniques in the reviewed studies included a variety of surgical manipulations, making the determination of outcome attributed to FT rather difficult, preventing accurate comparison and determination of the efficacy of various techniques. Most studies provided a low level of evidence and carried a high risk of bias due to confounding factors, lack of blinded outcome measurement, and selective reporting of results (Fig. 4).⁸¹ Furthermore, 16 studies (66.66%) were about TC blepharoplasty involving relatively young Asian patients (mean age range: 27.7–50.6 y), likely reflecting the prevalence of specific lower lid anatomy and aesthetic preferences, limiting generalization to Western populations.

CONCLUSIONS

LLB may be safely performed with both STC and TC access incisions. Orbital fat excision or FT can be executed with both, yielding comparable outcomes. The TC approach is suitable for relatively young patients in whom skin excision or canthal support is not needed. The outcome of TC fat excision and/or transposition may be easily enhanced in these patients with fat grafting and noninvasive skin tightening. Whenever a cutaneous incision is required for any reason, STC is probably more suitable. In some patients, FT may not be adequate. Fat grafting would be more applicable.

Despite the wide popularity of LLB, the body of LLB literature is unfortunately very scarce and lacks rigorous reporting of outcomes and complications, greatly limiting the identification of the optimal approach. This deficiency needs to be seriously addressed. Further studies are needed

to clarify the advantages of either approach, as well as the best option for blending the lid-cheek junction, and to identify which patients may benefit most from these treatments.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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