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A Comparative Analysis of the Clinical Outcomes of Two Surgical Techniques for the Treatment of Senile Lower Eyelid Entropion with Trichiasis

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Abstract

This study investigates the clinical efficacy of different surgical methods for treating senile entropion with trichiasis of the lower eyelid and their effectiveness in alleviating symptoms.A total of 54 cases of elderly patients with senile entropion and trichiasis of the lower eyelid were included as study subjects. They were divided into a control group (30 cases, 46 eyes) treated with eyelid skin and orbicularis oculi muscle excision, and an observation group (24 cases, 40 eyes) treated with orbicularis oculi muscle shortening combined with marginal inversion suture.The clinical efficacy of the two groups was compared, and improvements in ocular symptoms were assessed using specialized scales.Results: Both groups demonstrated high surgical efficacy with no statistically significant difference ($P>0.05$). The observation group exhibited higher tear film breakup time (BUT) and tear meniscus height (TMH), and lower corneal fluorescein staining (CFS) and ocular surface disease index (OSDI) scores compared to the control group. These differences were statistically significant ($P<0.05$).The incidence of postoperative complications was low in both groups, with no statistically significant differences ($P> 0.05$).For elderly patients with lower eyelid entropion, the procedure of orbicularis oculi muscle shortening combined with marginal inversion suture can achieve definitive clinical efficacy and significantly alleviate ocular discomfort.

Keywords: senile entropion of the lower eyelid, Orbicularis oculi muscle, Shortening of the orbicularis oculi muscle Ocular surface function, Correction effect

1. Introduction

1.1 Research Background

Senile entropion of the lower eyelid, also known as involutional entropion, is an ocular condition caused by aging of the lower eyelid tissues, with a prevalence of approximately 2.1% among the elderly population[1]. Entropion refers to the inward rolling of the eyelid margin toward the eyeball. At a certain degree of inversion, the eyelashes also turn inward, causing trichiasis in patients with entropion.Lower eyelid entropion with trichiasis often results in symptoms such as redness, tearing, foreign body sensation, and eyelid spasms. In severe cases, it may lead to infection, corneal ulcers, and subsequent vision loss [2]. Temporary conservative treatments, including topical lubricants, adhesive tape applied to the lower eyelid, and botulinum toxin, can only provide symptomatic relief. Surgical intervention remains the primary treatment method.

1.2 Anatomy of the Lower Eyelid

The eyelids are divided into the upper and lower eyelids by the palpebral fissure. The nasal side of the fissure is the medial canthus, while the temporal side is the lateral canthus. Both the upper and lower eyelids have protrusions on their nasal ends, with small openings on the inner side of the protrusions called puncta, which are connected to the canaliculi and serve as their starting points.The layers of the lower tarsal plate, from the outside inward, are: the skin layer, subcutaneous loose connective tissue layer, pre-tarsal orbicularis oculi muscle layer, fibrous layer, and tarsal conjunctiva layer[3]. The orbicularis oculi muscle is a superficial muscle encircling the upper and lower eyelids centered on the palpebral fissure, covering the eyelids and periocular region. It is divided into three parts: pre-tarsal, orbital, and pre-septal orbicularis oculi muscle.The pre-tarsal orbicularis oculi muscle is closely attached to the superficial part of the tarsal plate below it and consists of deep and superficial heads.The deep head originates 4 mm behind the posterior lacrimal crest and the lacrimal sac fascia, with medial attachments on the tarsal plates of the upper and lower eyelids.When contracted, it pulls the eyelid inward and backward, causing the eyelid to cover the protruding eyeball.The superficial head of the pre-tarsal orbicularis oculi muscle is attached to the anterior lacrimal crest and the anterior limb of the medial canthal ligament.The superficial fibers also surround the canaliculi, and their contraction shortens the canaliculi, facilitating the flow of tears into the lacrimal sac.Functionally, the involuntary closure of the eyelids is primarily mediated by the limited fibers of the pre-tarsal orbicularis oculi muscle.The orbital orbicularis oculi muscle is located on the outermost part of the eyelid, extending upward to the brow ridge and attaching to the frontalis and corrugator muscles.On the nasal side, the muscle extends from the supraorbital notch across the nasal side, descending to the infraorbital foramen and continuing along the infraorbital rim, extending temporally to the temporalis muscle.Clinically, the thick and coarse fibers of the orbital orbicularis oculi muscle play an important role in both voluntary and active closure of the eyelids.

1.3 Pathogenesis of Lower Eyelid Entropion with Trichiasis

The normal position of the eyelid is maintained by a combination of gravity, eyeball support, eyelid retractors, medial and lateral canthal ligaments, and the orbicularis oculi muscle.Degenerative changes in eyelid tissue structure caused by aging disrupt this mechanical balance, leading to the occurrence of lower eyelid entropion.The causes of lower eyelid entropion include relaxation of the lower eyelid retractors, laxity of the medial and lateral canthal ligaments, overriding of the orbicularis oculi muscle, and a reduction in orbital fat volume and its displacement [4].

Vertical Imbalance of Mechanical Forces

Vertical mechanical imbalance is mainly caused by the relaxation or rupture of the lower eyelid retractors.Studies have found that 95% of patients with degenerative lower eyelid entropion exhibit varying degrees of lower eyelid retractor rupture, compared to only 45% in the control group[5]. Additionally, rupture of the lower eyelid retractors weakens the vertical support of the tarsal plate, thereby increasing the risk of eyelid margin inversion.

Horizontal Imbalance of Mechanical Forces

Horizontal mechanical imbalance is primarily caused by the laxity of the medial and lateral canthal ligaments, resulting in reduced horizontal support of the eyelid[6]. Research indicates that 79% of patients with degenerative lower eyelid entropion exhibit significant horizontal laxity[7]. Horizontal laxity can be assessed through the snap-back test and traction test, where the former evaluates the degree of medial and lateral canthal ligament laxity, and the latter assesses eyelid tension[8].

Sagittal Imbalance of Mechanical Forces

Sagittal mechanical imbalance is caused by the overriding of the orbicularis oculi muscle, with posterior force exerted by the muscle during eye closure causing the eyelid margin to invert inward.This mechanism is particularly pronounced in Asian patients.

Other Contributing Factors

Other contributing factors include eyeball retraction, orbital fat reduction, and downward displacement, which further exacerbate the occurrence of lower eyelid entropion [9][10].

1.4 Diagnosis of Lower Eyelid Entropion with Trichiasis

Patients primarily present with photophobia, tearing, foreign body sensation, and ocular discomfort. Severe cases may develop corneal damage and vision impairment [11][12]. Slit-lamp examination reveals eyelid margin inversion and trichiasis, accompanied by conjunctival congestion and corneal epithelial damage[13][14][15]. Understand the patient's basic information, including age, physical condition, and any chronic diseases, and exclude hereditary disorders and trauma-induced entropion. For patients with temporary lower eyelid entropion or those with uncertain diagnoses, diagnostic tests such as the provocation tests reported by Tonk and Meyer[16], and Kennedy et al. [17]. May be used for confirmation.

1.5 Grading of Lower Eyelid Entropion and Trichiasis

Based on the severity of the condition, it is classified into mild, moderate, and severe. Mild cases exhibit a small number of eyelashes turning into the conjunctiva, moderate cases involve eyelash inversion affecting up to two corneal quadrants, while severe cases present with extensive fluorescein staining and significant corneal damage.

1.6 Preoperative Examination

Assess the patient's overall health, including routine tests for heart, lung, liver function, and blood counts, to rule out contraindications for surgery. Preoperative ophthalmic examination should include visual acuity, intraocular pressure, fundoscopy, and anterior segment photography.The level of the lower eyelid must be assessed to rule out retraction or elevation.

When the patient gazes in the primary position, the normal lower eyelid margin lies along the corneal limbus.The distance from the corneal light reflex to the central lower eyelid margin is termed the Marginal Reflex Distance (MRD), with a normal value of 5 mm [18][19][20]. Preoperative evaluation of the laxity of the medial and lateral canthal ligaments is necessary. The degree of laxity can be assessed by pulling the lower eyelid to separate it from the globe (Hill test).If the lower eyelid can be pulled more than 8-10 mm, it indicates lower eyelid laxity.When the lower eyelid is released, it should immediately return to its original position (rebound test). This suggests good tension in the lower eyelid. If the eyelid slowly returns to its original position, it indicates poor tension.In the normal or tense medial canthal ligament, the lacrimal punctum should not move outward.The laxity of the lateral canthal ligament can be assessed by pulling the lower eyelid medially.The normal lateral canthus does not deform, but if the lateral canthal ligament is lax, pulling can cause an almond-shaped deformation.The choice of surgical method depends on the laxity of the lower eyelid and the medial and lateral canthal ligaments[21][22][23].

1.7 Commonly Used Surgical Methods for Correcting Senile Lower Eyelid Entropion

Modified Orbicularis Oculi Muscle Shortening Combined with Eyelid Margin Inversion Suture Technique:

(1) Preoperative incision line design: The patient lies supine and is instructed to look upward. A skin incision is marked with methylene blue, 1.5-2.0 mm from the lower eyelash margin, parallel to the lower eyelid margin, extending downward at a 120° angle toward the lateral canthus. The incision length can extend 6-10 mm depending on the skin laxity, parallel to the natural skin fold at the outer canthus.

(2) Anesthesia: Topical application of 0.4% oxybuprocaine hydrochloride eye drops (Benoxine) for conjunctival anesthesia, followed by local infiltration anesthesia with a mixture of 2% lidocaine and 75% ropivacaine in equal proportions, adding 0.1% epinephrine, with approximately 1-1.5 ml injected on each side.

(3) Make a skin incision following the methylene blue markings, separating the subcutaneous tissue up to 4-5 mm from the lower eyelid margin. Fully expose the muscle layer and separate a 6-8 mm wide segment of the orbicularis oculi muscle. Using two forceps, fold the muscle at the lower eyelid center and instruct the patient to perform open/close eye movements. Measure the length of relaxed orbicularis oculi muscle and trim 4-6 mm of excess muscle. Use 6-0 absorbable sutures for double-loop suturing, and fix the shortened lower edge of the orbicularis muscle to the corresponding lower eyelid retractor with one suture for stability.

(4) Postoperative care: Both groups of patients received topical application of Tobramycin-Dexamethasone eye ointment (Dexalif), with a pressure bandage applied for 24 hours, followed by cold compress with an ice pack. Dressings were changed the following day, and sutures were removed one week postoperatively.

Eyelid Skin and Orbicularis Oculi Muscle Flap Excision Surgery

(1) Preoperative incision line design: The patient lies supine and is instructed to look upward. A skin incision is marked with methylene blue, 1.5-2.0 mm from the lower eyelash margin, parallel to the lower eyelid margin, extending downward at a 120° angle toward the lateral canthus. The incision length can extend 6-10 mm depending on the skin laxity, parallel to the natural skin fold at the outer canthus.

(2) Anesthesia: Topical application of 0.4% oxybuprocaine hydrochloride eye drops (Benoxine) for conjunctival anesthesia, followed by local infiltration anesthesia with a mixture of 2% lidocaine and 75% ropivacaine in equal proportions, adding 0.1% epinephrine, with approximately 1-1.5 ml injected on each side.

(3) Perform a skin incision along the methylene blue markings. Separate the subcutaneous tissue up to 4-5 mm from the lower eyelid margin. Use electrocautery to cut the orbicularis oculi muscle up to the tarsal plate. Fully separate the orbicularis oculi muscle flap anterior to the orbital septum. Instruct the patient to look upward and open their mouth while pulling the orbicularis oculi muscle flap upward and outward. Determine and trim excess muscle, and simultaneously remove excess eyelid skin.

(4) Postoperative care:Both groups of patients received topical application of Tobramycin-Dexamethasone eye ointment (Dexalif), with a pressure bandage applied for 24 hours, followed by cold compress with an ice pack. Dressings were changed the following day, and sutures were removed one week postoperatively.

Lower Eyelid Retractor Repositioning Surgery

(1) Preoperative incision line design: The patient lies supine and is instructed to look upward. A skin incision is marked with methylene blue, 1.5-2.0 mm from the lower eyelash margin, parallel to the lower eyelid margin, extending downward at a 120° angle toward the lateral canthus. The incision length can extend 6-10 mm depending on the skin laxity, parallel to the natural skin fold at the outer canthus.

(2) Anesthesia: Topical application of 0.4% oxybuprocaine hydrochloride eye drops (Benoxine) for conjunctival anesthesia, followed by local infiltration anesthesia with a mixture of 2% lidocaine and 75% ropivacaine in equal proportions, adding 0.1% epinephrine, with approximately 1-1.5 ml injected on each side.

(3) Perform a skin incision along the methylene blue markings. Separate and expose the orbicularis oculi muscle flap. Continue separating the muscle flap to the infraorbital rim, then transect the orbital septum horizontally to expose the medial, central, and lateral fat pads. Excise the fat pads with scissors while clamping their blood supply, and cauterize the wound to achieve hemostasis. Locate the lax or detached lower eyelid retractor resulting from fat pad excision, and use 6-0 sutures to reattach it to the inferior margin of the tarsal plate. Reinforce the orbital septum with sutures.Adjust the tension of the sutures according to the relative positions of the eyelid, eyelashes, and eye. Remove the corneal protector and confirm that the postoperative lower eyelid margin aligns with the lower corneal margin and that the patient's eyelashes curve outward.

(4) Postoperative care: Both groups received topical application of Tobramycin-Dexamethasone eye ointment (Dexalif), a pressure bandage for 24 hours, followed by cold compress with an ice pack. Dressings were changed on the next day, and sutures were removed one week postoperatively.

Skin Relaxation Removal Combined with Orbicularis Oculi Muscle Shortening

(1) Preoperative incision line design: The patient lies supine and is instructed to look upward. A skin incision is marked with methylene blue, 1.5-2.0 mm from the lower eyelash margin, parallel to the lower eyelid margin, extending downward at a 120° angle toward the lateral canthus. The incision length can extend 6-10 mm depending on the skin laxity, parallel to the natural skin fold at the outer canthus.

(2) Anesthesia: Topical application of 0.4% oxybuprocaine hydrochloride eye drops (Benoxine) for conjunctival anesthesia, followed by local infiltration anesthesia with a mixture of 2% lidocaine and 75% ropivacaine in equal proportions, adding 0.1% epinephrine, with approximately 1-1.5 ml injected on each side.

(3) Make a skin incision along the methylene blue markings, reaching the orbicularis oculi muscle surface. Dissect downward along the muscle surface at the incision site, performing hemostasis during the dissection process.After separating the orbicularis oculi muscle, invert the flap downward to fully expose the muscle. Perform horizontal blunt dissection along the muscle fibers slightly above the infraorbital rim. Divide the muscle in the center and overlap the fibers according to the patient's muscle laxity, adjusting the overlap to avoid excessive tightness or looseness.

(4) Postoperative care: Patients received topical application of Tobramycin-Dexamethasone eye ointment (Dexalif), a pressure bandage for 24 hours, followed by cold compress with an ice pack. Dressings were changed the following day, and sutures were removed one week postoperatively.

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1.8 Postoperative Observation Indicators

Surgical outcomes: The lower eyelid returns to its normal state, with no contact between the eyelashes and the eyeball. The inner lip of the eyelid and the lacrimal punctum closely adhere to the ocular surface, indicating successful correction. Persistent entropion with eyelashes contacting the cornea or conjunctiva denotes under-correction, while significant eyelid-globe separation (>1 mm) signifies over-correction.Ocular surface function: Conduct ocular surface examinations at baseline, 1 week, 1 month, and 3 months postoperatively to evaluate ocular surface function, including tear film breakup time (BUT), tear meniscus height (TMH), corneal fluorescein staining (CFS) score, and Schirmer's test (SIT). Ocular symptoms: Assess ocular symptoms preoperatively, and at 1 week, 1 month, and 3 months postoperatively using the Ocular Surface Disease Index (OSDI). Higher scores indicate more severe symptoms.Complications: Record the occurrence of complications within 3 months postoperatively for both groups.

1.9 Surgical Risks

Recurrence: The greatest risk in entropion surgery is recurrence, which can arise due to the following factors:The degenerative changes in the eyelid are progressive. While surgery restores the imbalance of ligaments and connective tissues at the time, ongoing aging may disrupt this balance over time, leading to recurrence.Scar contracture: Scar tissue, formed through remodeling of granulation tissue, is a natural part of wound healing. The contraction phase of scar healing can limit movement, and excessive contraction may increase horizontal tension, potentially causing entropion within 1–3 weeks postoperatively[24][25].

Under-correction or over-correction: Common issues after entropion surgery, as eyelid aging is progressive. Surgeons are advised to favor mild over-correction to maintain ligament and connective tissue balance over the long term. Eyelid scarring: All surgeries, whether extensive or minor, induce scar tissue formation. However, elderly patients generally have reduced tissue repair capacity, and unless they have a predisposition to keloids, severe scarring is uncommon.Eyelid-globe separation: Caused primarily by insufficient horizontal tension of the eyelid. Continuous pressure bandaging for several days postoperatively can resolve this issue.Let me know if additional parts need further elaboration or adjustments. Cardiovascular Incidents: Elderly patients often have limited organ and tissue reserves. Preoperative anxiety and stress can lead to autonomic dysfunction, elevated blood pressure, and a higher risk of cardiovascular incidents compared to younger individuals. Medical personnel should address and improve patients' unhealthy psychological states through communication and reassurance. Elderly patients with a history of cardiovascular conditions should adhere to regular medication regimens and follow surgical contraindications strictly. Comprehensive preoperative evaluation and stabilization of internal medical conditions are essential to prevent intraoperative complications.

2. Method

2.1 A retrospective analysis was conducted on the clinical data of 54 elderly patients (86 eyes) diagnosed with senile entropion of the lower eyelid accompanied by trichiasis at the Department of Ophthalmology, Zhongxiang People's Hospital, from April 2021 to October 2023.

The patients were divided into two groups based on surgical methods: the observation group included 24 cases (40 eyes) (13 males and 11 females), and the control group included 30 cases (46 eyes) (16 males and 14 females).

2.2 Inclusion Criteria

(1) Meeting the clinical diagnostic criteria for senile lower eyelid entropion with trichiasis, specifically the vertical relaxation type; (2) Scheduled for orbicularis oculi muscle shortening combined with eyelid margin eversion suture or eyelid skin orbicularis muscle excision surgery; (3) Preoperative ocular symptom score (OSS) ≥ 3 points; (4) Patients voluntarily agreed to comply with the study protocol and signed an informed consent form.

2.3 Exclusion Criteria

(1) Patients with diabetes, hypertension, systemic autoimmune diseases, or malignant tumors; (2) Those with infections or other ocular diseases; (3) History of ocular surgery or trauma within the past three months; (4) Long-term use of eye drops; (5) Long-term wear of contact lenses.

2.4 Surgical Methods

All surgeries were performed by the same experienced surgeon to correct lower eyelid entropion with trichiasis, and patients were followed up for 3 to 12 months postoperatively.

(1) Preoperative incision design: Patients in both groups were placed in a supine position and instructed to look upward. Using methylene blue, a skin incision line was marked parallel to the lower eyelid margin, 1.5–2 mm from the lash root, extending temporally from the inferior lacrimal punctum. At the lateral canthus, the line turned approximately 120°outward and downward, extending 6–10 mm depending on skin laxity, roughly parallel to the canthal fold.

(2) Anesthesia: Topical anesthesia of the conjunctival sac was performed using proparacaine hydrochloride eye drops (Benoxinate). A mixture of 2% lidocaine and 75% ropivacaine hydrochloride with 0.1% epinephrine was used for local infiltration anesthesia, with approximately 1–1.5 mL injected per side.

(3) Surgical steps: In the observation group, orbicularis oculi muscle shortening combined with eyelid margin eversion suture was performed. An incision was made along the methylene blue-marked line on the lower eyelid skin, dissecting the subcutaneous tissue to a depth of 4–5 mm from the eyelid margin. The muscle layer was fully exposed, and a 6–8 mm wide bridge-like segment of the orbicularis oculi muscle was isolated. Two forceps were used to fold the muscle at the central lower eyelid while instructing the patient to perform eye-opening and closing movements to determine the length of the relaxed muscle. Excess muscle (4–6 mm) was excised from the middle of the segment to correct the entropion without causing eversion. The severed ends were laid flat and sutured with a double-loop suture using 6-0 absorbable thread. Additionally, the shortened muscle's lower edge was anchored with one stitch to the corresponding lower eyelid retractors for stabilization.

(4) Postoperative care: Both groups received topical tobramycin-dexamethasone eye ointment (Tobradex) applied locally. Bandage pressure was applied for 24 hours, followed by cold compresses with ice packs. Dressing changes were performed the next day, and sutures were removed one week postoperatively.

(5) Postoperative observation indicators: The surgical outcomes of the two groups were compared. Efficacy criteria were as follows: Cure – the lower eyelid margin adhered closely to the ocular surface, with eyelashes turned outward and not contacting the eyeball, indicating restoration of normal anatomy. Improvement – the lower eyelid margin adhered to the ocular surface, with eyelashes turned upward and not contacting the eyeball, indicating near restoration of normal anatomy. Ineffective – failure to meet the above criteria, with the eyelid margin not restored to its normal position.The total effective rate was calculated as the sum of the cure and improvement rates. Ocular surface function [tear film breakup time (BUT), tear meniscus height (TMH), corneal fluorescein staining (CFS) score, and Schirmer's test (SIT)], ocular symptoms [ocular surface disease index (OSDI)], and complications were assessed. Data were analyzed using SPSS to draw conclusions.

2.5 Statistical Analysis

Statistical analysis was conducted using SPSS 25.0 software. Continuous data that conformed to normal distribution and homogeneity of variance were expressed as mean±standard deviation ($\bar{x}\pm s$). Comparisons between groups were performed using the t-test, and repeated measures analysis of variance was applied for repeated measures data. Pairwise comparisons within groups were conducted using the least significant difference (LSD) test, while inter-group pairwise comparisons utilized the LSD-t test. Categorical data were presented as [n(%)], and group comparisons were conducted using the χ^2 test. A p-value of < 0.05 was considered statistically significant.

3. Results

Compare the surgical correction outcomes, ocular surface function [tear film breakup time (BUT), tear meniscus height (TMH), corneal fluorescein staining (CFS) score, and Schirmer's test (SIT)], ocular symptoms [Ocular Surface Disease Index (OSDI) score], and complications between the two groups.

3.1 1week postoperatively, there was no statistically significant difference in the surgical correction outcomes between the two groups (P>0.05),shown in Table 1:

Table 1. Comparison of correction outcomes between the two groups［n(%)］

Group	Number of Eyes	Good Correction n (%)	Insufficient Correction n (%)	Over correction n (%)
Observation Group (n = 24)	40	37 (92.50)	2 (5.00)	1 (2.50)
Control Group (n = 30)	46	42 (91.30)	3 (6.52)	1 (2.17)

3.2 Comparison of BUT (Tear Film Breakup Time) between the Two Groups at Different Time Points

Compared with the preoperative values, BUT (tear film breakup time) increased at 1 week, 15 days, and 2 months postoperatively in both groups (P<0.05). At 1 week and 15 days postoperatively, there was no statistically significant difference in BUT between the control group and the observation group (P>0.05). However, at 2 months postoperatively, BUT in the observation group was significantly higher than that in the control group (P<0.05), shown in Table 2:

Table 2. Comparison of BUT (tear film breakup time) between the two groups at different time points（$\bar{x}\pm s$)

Group	Number of Eyes	Preoperative	1Week Postoperative	15Days Postoperative	2Months Postoperative
Observation Group (n = 24)	40	4.52± 0.38	7.18 ±1.15*	8.23 ±1.15*	8.86±1.30*
Control Group (n = 30)	46	4.63± 0.55	7.24 ±1.21*	8.14 ±0.82*	8.25±1.32*
t-value		1.247	1.361	1.732	3.473
p-value		0.246	0.208	0.106	<0.001

*ρ＜0. 05，Compared with the preoperative values.

3.3 Comparison of TMH (Tear Meniscus Height) between the Two Groups at Different Time Points

Compared with the preoperative values, TMH (tear meniscus height) increased at 1 week, 15 days, and 2 months postoperatively in both groups (P<0.05). At 1 week and 15 days postoperatively, there was no statistically significant difference in TMH between the control group and the observation group (P > 0.05). However, at 2 months postoperatively, TMH in the observation group was significantly higher than that in the control group (P<0.05), shown in Table 3:

Table 3. Comparison of TMH (tear meniscus height) between the two groups at different time points (x̄± s, mm)

Group	Number of Eyes	1Week Postoperative	15Days Postoperative	2Months Postoperative	Preoperative
Observation Group (n= 24)	40	0.13±0.04*	0.16±0.03*	0.35±0.05*	0.06±0.03
Control Group (n=30)	46	0.15±0.03*	0.17±0.04*	0.31±0.04*	0.06±0.04
t-value		1.634	1.434	3.645	0
p-value		0.061	0.164	<0.001	1.02

*ρ＜0. 05，Compared with the preoperative values.

3.4 Comparison of CFS (Corneal Fluorescein Staining) Scores between the Two Groups at Different Time Points

Compared with the preoperative values, CFS (corneal fluorescein staining) scores decreased at 1 week, 15 days, and 2 months postoperatively in both groups (P<0.05). At 1 week and 15 days postoperatively, there was no statistically significant difference in CFS scores between the control group and the observation group (P>0.05). However, at 2 months postoperatively, the CFS scores in the observation group were significantly lower than those in the control group (P<0.05),shown in Table 4:

Table 4. Comparison of CFS (corneal fluorescein staining) scores between the two groups at different time points (x̄±s, min)

Group	Number of Eyes	Preoperative	1Week Postoperative	15Days Postoperative	2Months Postoperative
Observation Group (n = 24)	40	2.58±0.31	1.58±0.57*	1.07±0.36*	0.58±0.24*
Control Group (n = 30)	46	2.68±0.58	1.47±0.58*	1.06±0.34*	0.84±0.16*
t-value		0.249	0.356	0.473	6.302
p-value		0.896	0.726	0.486	<0.001

* ＜0. 05，Compared with the preoperative values.

Table 5. Comparison of SIT (Schirmer's test) scores between the two groups at different time points. (x̄± s, mm /5min)

Group	Number of Eyes	Preoperative	1Week Postoperative	15Days Postoperative	2Months Postoperative
Observation Group (n = 24)	40	6.51±1.23	8.42±1.54*	8.68±1.48*	9.52±1.32*
Control Group (n = 30)	46	6.63±1.24	8.51±1.38*	8.41±1.52*	9.47±1.40*
t-value		0.342	0.275	0.132	2.688
p-value		0.535	0.734	0.658	0.003

* ρ＜0. 05，Compared with the preoperative values.

3.5 Comparison of SIT (Schirmer's Test) Results between the Two Groups at Different Time Points

Compared with the preoperative values, SIT (Schirmer's test) values increased at 1 week, 15 days, and 2 months postoperatively in both groups (P<0.05). At 1 week and 15 days postoperatively, there was no statistically significant difference in SIT values between the control group and the observation group (P > 0.05). However, at 2 months postoperatively, SIT values in the observation group were significantly higher than those in the control group (P<0.05), shown in Table 5.

3.6 Comparison of OSDI (Ocular Surface Disease Index) Scores between the Two Groups at Different Time Points

Compared with the preoperative values, OSDI (Ocular Surface Disease Index) scores decreased at 1 week, 15 days, and 2 months postoperatively in both groups (P<0.05). At 1 week and 15 days postoperatively, there was no statistically significant difference in OSDI scores between the control group and the observation group (P>0.05). However, at 2 months postoperatively, OSDI scores in the observation group were significantly lower than those in the control group (P<0.05),shown in Table 6.

Table 6. Comparison of OSDI (Ocular Surface Disease Index) scores between the two groups at different time points ($\bar{x}\pm$ s, min)

Group	Number of Eyes	Preoperative	1Week Postoperative	15Days Postoperative	2 Months Postoperative
Observation Group (n = 24)	40	17.45±2.65	10.45±1.37*	8.81±0.84*	6.23±1.42*
Control Group (n = 30)	46	17.14±2.45	10.50±1.45*	9.07±1.32*	7.54±1.36*
t-value		0.142	0.421	1.605	5.164
p-value		0.8	0.607	0.081	<0.001

* ρ＜0. 05，Compared with the preoperative values.

3.7 Comparison of Complications between the Two Groups

At 2 months postoperatively, no serious complications were observed in either group. In the observation group, there was 1 case of mild hematoma, while the control group had 1 case of mild ectropion. There was no statistically significant difference in the complication rates between the two groups (P>0.05).

4. Discussion

The results of this study further validate the advantages of orbicularis oculi muscle shortening combined with eyelid margin eversion suture in treating senile lower eyelid entropion with trichiasis, particularly in improving ocular surface function and alleviating ocular discomfort.Improvement in Ocular Surface Function: Lower eyelid entropion with trichiasis typically leads to ocular surface dysfunction, such as reduced tear film breakup time (BUT) and accelerated tear evaporation, which in turn causes symptoms like dryness and foreign body sensation. The study found that orbicularis oculi muscle shortening combined with eyelid margin eversion suture effectively restores the normal structure and function of the eyelid, improves the contact surface between the eyelid margin and the eyeball, and optimizes the distribution and retention time of the tear film.The results showed that the observation group performed significantly better than the control group in indices such as BUT and tear meniscus height (TMH), which is consistent with findings in other studies , demonstrating the unique advantages of this surgical method in improving ocular surface function. Postoperative Complication Rates: This study shows that the complication rates for both surgeries were low, with no statistically significant differences, indicating high safety for both methods. Elderly patients, due to physiological degeneration, have slower postoperative recovery and are more prone to complications. However, complications were well-controlled in both surgical methods, which is consistent with findings from several related studies .In Clinical Individualized Treatment: Although the efficacy of both surgical methods is comparable, individual patient differences still require the selection of the most appropriate surgical approach based on specific conditions.For patients with significant eyelid skin laxity and pronounced lower eyelid entropion, orbicularis oculi muscle shortening combined with eyelid margin eversion suture may be more suitable, as it not only corrects entropion but also enhances eyelid support by shortening the orbicularis oculi muscle, further improving ocular surface function. For patients with mild eyelid laxity, simple excision of the eyelid skin and orbicularis muscle may be sufficient.Limitations and Future Research Directions: This study had a small sample size, and the participants were from a single region, which may introduce selection bias, thus limiting the generalizability of the findings.Future multicenter, large-sample randomized controlled trials will help further validate the conclusions of this study. Additionally, the follow-up period in this study was short, and the long-term efficacy and recurrence rates were not assessed. Future research should focus on long-term postoperative outcome tracking and further explore surgical options and individualized treatment plans for different patient types.In conclusion, orbicularis oculi muscle shortening combined with eyelid margin eversion suture demonstrates excellent efficacy in treating senile lower eyelid entropion with trichiasis, particularly in improving ocular surface function and alleviating ocular discomfort. Future research should continue to explore the long-term efficacy and potential clinical indications of this surgical method, aiming to provide more precise and personalized treatment options for patients with senile lower eyelid entropion and trichiasis.

5. Conclusion

This study compared the efficacy of eyelid skin orbicularis muscle excision and orbicularis oculi muscle shortening combined with eyelid margin eversion suture in treating senile lower eyelid entropion with trichiasis, leading to the following key conclusions.Similar Surgical Efficacy: Both surgical methods effectively treated senile lower eyelid entropion with trichiasis and significantly alleviated ocular symptoms. No significant difference in postoperative effectiveness was observed between the groups, indicating comparable outcomes in correcting entropion and trichiasis.Improvement in Ocular Surface Function: Orbicularis oculi muscle shortening combined with eyelid margin eversion suture was significantly superior to eyelid skin orbicularis muscle excision in improving ocular surface function. The observation group outperformed the control group in indices such as tear film breakup time (BUT), tear meniscus height (TMH), corneal fluorescein staining score (CFS), and ocular surface disease index (OSDI) score, demonstrating its greater advantage in alleviating dryness and foreign body sensation.Low Complication Rates and High Safety: The complication rates for both surgeries were low, with no statistically significant differences, indicating that both surgical methods have similar safety profiles and are both safe and effective treatments.In conclusion, orbicularis oculi muscle shortening combined with eyelid margin eversion suture is superior to eyelid skin orbicularis muscle excision in improving ocular surface function and alleviating ocular discomfort. Selecting the appropriate surgical approach based on the patient's specific condition helps achieve better treatment outcomes.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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