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COMPARISON OF SURGICAL OUTCOMES IN INVOLUTIONAL ENTROPION AFTER LATERAL TARSAL STRIP PROCEDURE VERSUS CONVENTIONAL EVERTING SUTURES PROCEDURE

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ABSTRACT

Objective: To compare Surgical Outcomes in Involutional Entropion after Lateral tarsal strip procedure and Conventional everting Sutures procedure. **Methods:** This randomized controlled trial was conducted at the Department of Ophthalmology, Allied Hospital, Faisalabad, over six months. A total of 304 eyes (152 in each group) with primary involutional lower eyelid entropion were randomized to undergo LTS or CES. The primary outcome was surgical success, defined as complete resolution of entropion on postoperative day 1. Demographic and clinical characteristics were recorded, and subgroup analyses were performed. **Results:** The mean age was 60.2 ± 7.1 years, with 58.6% males. Day 1 success was achieved in 97.0% of eyes overall, with a higher rate in CES (100.0%) compared to LTS (94.1%), $p = 0.002$. Subgroup analysis demonstrated CES superiority across age groups, both genders, laterality, and in patients without ocular comorbidities. Symptom-based stratification also favored CES in multiple categories, including absence of blurry vision, presence of severe discomfort, and absence of redness (all $p < 0.05$). No major intraoperative or immediate postoperative complications occurred. **Conclusion:** CES demonstrated superior immediate anatomical correction compared to LTS in involutional entropion, with consistent benefits across clinical subgroups. While LTS remains valuable in recurrent or laxity-dominant cases, CES may be preferred for primary, uncomplicated presentations requiring rapid rehabilitation. Long-term studies are warranted to assess recurrence rates and durability.

INTRODUCTION

An imbalance between the external and internal forces acting on the lower eyelid can lead to malpositions such as entropion (inward turning of the eyelid) or ectropion (outward turning of the eyelid). Both conditions disrupt the normal position and function of the eyelid, causing ocular surface irritation and reducing its ability to protect the eye. If left untreated, these eyelid malpositions may result in a range of complications, including recurrent conjunctival and corneal inflammation, conjunctival neovascularization (abnormal blood vessel growth), corneal abrasions, or even corneal perforation. In severe or chronic cases, this can ultimately lead to permanent vision loss[1]. Classically, involutional entropion is attributed to three primary anatomical changes: horizontal laxity of the lower eyelid, overriding of the preseptal orbicularis oculi muscle, and disinsertion or attenuation of the lower eyelid retractors[1]. The surgical correction of involutional entropion is directed toward addressing the underlying anatomical defects, namely horizontal eyelid laxity, orbicularis oculi muscle override, and lower eyelid retractor disinsertion or attenuation[2]. The selection of a surgical technique for lower eyelid malposition should be guided by the predominant underlying anatomical abnormality, such as horizontal eyelid laxity, orbicularis oculi muscle override, lower eyelid retractor dehiscence, and/or anterior lamella shortening. Multiple surgical approaches have been proposed for the correction of involutional entropion[3]. Commonly described procedures include the lateral tarsal strip (LTS), everting sutures, inferior retractor plication, and Bick's procedure[4–7].

The management of involutional entropion using lid everting sutures is considered a simple, effective, long-lasting, and cost-efficient procedure that is generally free from the local complications often associated with incisional surgery[4]. The lateral tarsal strip (LTS) technique was originally introduced to address lower eyelid laxity. It effectively counteracts both vertical retraction and horizontal eversion, thereby restoring normal eyelid anatomy and function—particularly in cases involving abnormal positioning of the lower eyelid and lateral canthus. Owing to its broad range of indications, LTS has become the most widely used method for correcting lower eyelid laxity, including involutional ectropion[8].

One retrospective study involving 85 eyelids in 67 patients reported a 95% success rate for the lateral tarsal strip (LTS) procedure[8], whereas another study documented a 100% success rate for the everting suture technique[9]. The present study aims to compare the surgical outcomes of LTS and conventional everting sutures in the management of involutional entropion. The findings will help identify the procedure with superior efficacy, which may then be recommended for future clinical practice.

METHODOLOGY:

This randomized controlled trial was conducted at the Department of Ophthalmology, Allied Hospital, Faisalabad, over a period of six months following approval of the synopsis. The sample size of 304 eyes (152 in each group) was calculated using the WHO sample size calculator, keeping a level of significance of 5%, a power of 80%, an anticipated success proportion of 95% in Group A, and 100% in Group B. A non-probability consecutive sampling technique was employed.

Patients of both genders, aged between 35 and 70 years, diagnosed with primary involutional lower eyelid entropion, were included. The diagnosis was made clinically based on the presence of one or more symptoms, including blurry vision, severe discomfort, foreign body sensation, redness, itching, burning, excessive tearing, or discharge. Patients with concomitant medical problems, on-going anticoagulant therapy, bleeding diathesis, or a history of previous eyelid surgery were excluded.

After approval from the institutional ethical review committee, eligible patients were enrolled after fulfilling the inclusion and exclusion criteria. Written informed consent was obtained from all participants or their guardians. Demographic and clinical data, including age, gender, laterality, presenting symptoms, and associated ocular diseases, were recorded on a predesigned proforma. Patients were allocated into two groups using the lottery method. Group A underwent correction of involutional entropion by the lateral tarsal strip procedure, while Group B underwent correction using the conventional everting sutures procedure. All surgeries were performed by a single experienced ophthalmic surgeon under local anaesthesia. Postoperatively, patients were followed weekly for three weeks, and surgical outcome was assessed in terms of success rate, defined as complete resolution of lower eyelid malposition (entropion) on the first postoperative day. Data were entered and analyzed using SPSS version 25. Quantitative variables, such as age and duration of symptoms, were presented as mean ± standard deviation. Qualitative variables, such as gender, laterality, symptoms, associated ocular diseases, and surgical success, were presented as frequencies and percentages. The chi-square test was applied to compare surgical success between the two groups. Effect modifiers, including age, gender, symptoms, duration of symptoms, and associated ocular diseases, were controlled through stratification, followed by post-stratification chi-square testing. A p-value ≤ 0.05 was considered statistically significant.

RESULTS:

In this study, 304 patients were equally distributed between the LTS and CES groups. The majority of patients in both groups were aged 51–70 years (77.0%), and there was no significant difference in age distribution (p=0.785[c]). Males were slightly more prevalent overall (58.6%), with no significant gender difference between groups (p=0.641[c]). Laterality was also balanced, with right eye involvement in about 55% of cases (p=0.908[c]). Among associated ocular diseases, "none" was the most common (60.2%), followed by cataract (25.7%), with a statistically significant difference between groups (p=0.026[c]). Symptom distribution was generally similar between groups, except for "foreign body sensation" which was identical (69.7%) in both groups (p=1.000[f]), and no baseline symptom variable showed a statistically significant difference.(Table 1)

Table 1: Baseline Characteristics of Patients by Surgical Group

Variable	Category	Group A: LTS (n=152)	Group B: CES (n=152)	Total (n=304)	p-value
Age group (years)	35–50	36 (23.7%)	34 (22.4%)	70 (23.0%)	0.785[c]
	51–70	116 (76.3%)	118 (77.6%)	234 (77.0%)	
Gender	Male	91 (59.9%)	87 (57.2%)	178 (58.6%)	0.641[c]
	Female	61 (40.1%)	65 (42.8%)	126 (41.4%)	
Laterality	Right	83 (54.6%)	84 (55.3%)	167 (54.9%)	0.908[c]
	Left	69 (45.4%)	68 (44.7%)	137 (45.1%)	
Associated ocular	None	96 (63.2%)	87 (57.2%)	183 (60.2%)	0.026[c]

diseases	Cataract	35 (23.0%)	43 (28.3%)	78 (25.7%)	
	Diabetic retinopathy	5 (3.3%)	15 (9.9%)	20 (6.6%)	
	Glaucoma	7 (4.6%)	5 (3.3%)	12 (3.9%)	
	AMD	9 (5.9%)	2 (1.3%)	11 (3.6%)	
Symptoms	Blurry vision	60 (39.5%)	59 (38.8%)	119 (39.1%)	0.906[c]
	Severe discomfort	79 (52.0%)	86 (56.6%)	165 (54.3%)	0.420[c]
	Foreign body sensation	106 (69.7%)	106 (69.7%)	212 (69.7%)	1.000[f]
	Redness	102 (67.1%)	98 (64.5%)	200 (65.8%)	0.629[c]
	Itching	83 (54.6%)	69 (45.4%)	152 (50.0%)	0.108[c]
	Burning	63 (41.4%)	48 (31.6%)	111 (36.5%)	0.074[c]
	Excessive tearing	73 (48.0%)	80 (52.6%)	153 (50.3%)	0.422[c]
	Discharge	43 (28.3%)	38 (25.0%)	81 (26.6%)	0.517[c]

Note: [c] Chi-square test applied; [f] Fisher's Exact test applied. Categorical variables are presented as n (%). p-values < 0.05 are considered statistically significant.

On day 1 post-surgery, success was achieved in 97.0% of all patients, with a higher rate in the CES group (100.0%) compared to the LTS group (94.1%), which was statistically significant (p=0.002[f]). (Table 2)

Table 2: Primary Surgical Outcome (Day 1 Success) by Group

Outcome	Group A: LTS (n=152)	Group B: CES (n=152)	Total (n=304)	p-value
Successful	143 (94.1%)	152 (100.0%)	295 (97.0%)	0.002[f]
Not successful	9 (5.9%)	0 (0.0%)	9 (3.0%)	

Note: [c] Chi-square test applied; [f] Fisher's Exact test applied. Categorical variables are presented as n (%). p-values < 0.05 are considered statistically significant.

Subgroup analysis showed that day 1 success was significantly associated with several variables. In age-stratified analysis, patients aged 35–50 years (p=0.045[c]) and 51–70 years (p=0.023[c]) had higher success rates in CES. Significant associations were also observed for both males (p=0.027[c]) and females (p=0.036[c]), as well as right (p=0.022[c]) and left eye involvement (p=0.044[c]). Among ocular comorbidities, absence of disease (p=0.018[c]) was linked with higher CES success; other subgroups such as cataract, glaucoma, and AMD did not show significance, while diabetic retinopathy had 100% success in both groups. Symptom-based stratification showed that absence of blurry vision (p=0.012[c]), presence of severe discomfort (p=0.009[c]), presence of foreign body sensation (p=0.007[c]), absence of redness (p=0.004[c]), absence (p=0.026[c]) or presence (p=0.038[c]) of itching, presence of burning (p=0.028[c]), presence of excessive tearing (p=0.017[c]), and absence of discharge (p=0.011[c]) were significantly associated with higher success in the CES group.(Table 3)

Table 3: Association of Primary Surgical Outcome (Day 1 Success) by various variables

Variable	Groups	Group A: LTS (n, %)	Group B: CES (n, %)	Total	p-value
Age Group	35–50	32 (88.9%)	34 (100.0%)	66	0.045[c]
	51–70	111 (95.7%)	118 (100.0%)	229	0.023[c]
Gender	Male	86 (94.5%)	87 (100.0%)	173	0.027[c]
	Female	57 (93.4%)	65 (100.0%)	122	0.036[c]
Laterality	Right	78 (94.0%)	84 (100.0%)	162	0.022[c]
	Left	65 (94.2%)	68 (100.0%)	133	0.044[c]
Associated Ocular Disease	None	90 (93.8%)	87 (100.0%)	177	0.018[c]
	Cataract	34 (97.1%)	43 (100.0%)	77	0.265[c]
	Diabetic Retinopathy	5 (100.0%)	15 (100.0%)	20	NA
	Glaucoma	6 (85.7%)	5 (100.0%)	11	0.377[c]
	AMD	8 (88.9%)	2 (100.0%)	10	0.621[c]
Blurry Vision	Absent	86 (93.5%)	93 (100.0%)	179	0.012[c]
	Present	57 (95.0%)	59 (100.0%)	116	0.082[c]
Severe Discomfort	Absent	70 (95.9%)	66 (100.0%)	136	0.096[c]
	Present	73 (92.4%)	86 (100.0%)	159	0.009[c]
Foreign Body Sensation	Absent	44 (95.7%)	46 (100.0%)	90	0.153[c]
	Present	99 (93.4%)	106 (100.0%)	205	0.007[c]
Redness	Absent	43 (86.0%)	54 (100.0%)	97	0.004[c]
	Present	100 (98.0%)	98 (100.0%)	198	0.164[c]
Itching	Absent	65 (94.2%)	83 (100.0%)	148	0.026[c]
	Present	78 (94.0%)	69 (100.0%)	147	0.038[c]
Burning	Absent	86 (96.6%)	104 (100.0%)	190	0.059[c]
	Present	57 (90.5%)	48 (100.0%)	105	0.028[c]
Excessive Tearing	Absent	75 (94.9%)	72 (100.0%)	147	0.053[c]
	Present	68 (93.2%)	80 (100.0%)	148	0.017[c]
Discharge	Absent	103 (94.5%)	114 (100.0%)	217	0.011[c]
	Present	40 (93.0%)	38 (100.0%)	78	0.097[c]

Note: [c] Chi-square test applied; [f] Fisher's Exact test applied. Categorical variables are presented as n (%). p-values < 0.05 are considered statistically significant.

DISCUSSION:

This randomized controlled trial demonstrated that conventional everting sutures (CES) achieved a higher immediate postoperative success rate than lateral tarsal strip (LTS) in correcting involutional entropion (100.0% vs. 94.1%, p=0.002). While both techniques are established, the magnitude and consistency of CES advantage across subgroups in our data suggest that for early functional restoration, CES may be superior.

From a biomechanical perspective, CES directly counteracts orbicularis muscle override without the need for extensive dissection or lateral canthal modification, potentially explaining its higher Day 1 success. In contrast, LTS addresses horizontal laxity and lateral canthal instability — pathophysiological elements that may not dominate in all cases of involutional entropion. This difference in primary targets may explain why studies with longer follow-up often favor LTS, as it

mitigates late recurrence by reinforcing horizontal eyelid support [5,10,11].

The discrepancy between our short-term CES superiority and the durable outcomes reported for LTS in studies such as Hou et al[8], Ezzeldin[10], and Kopecký et al[11] reflects differing surgical priorities. Our trial's endpoint focused on immediate anatomical correction, whereas these studies often assess success over months or years. When recurrence is a critical endpoint, as in Rubino et al[12] and Sen et al[13], LTS's stabilizing effect on eyelid mechanics may outweigh its slower early recovery.

Our subgroup analysis further supports the hypothesis that CES performance is relatively unaffected by age, sex, or laterality — suggesting that in cases without severe horizontal laxity, patient demographics exert minimal influence on early outcome. This contrasts with findings from Lin et al[2] and Wozniak-Roszkowska et al.[3], where anatomical variation and comorbidity profiles were linked to surgical choice and prognosis. The absence of such effect in our series may be due to exclusion of complex or previously operated lids, creating a more homogeneous population.

Technical considerations also inform interpretation. CES is quick, technically straightforward, and requires minimal tissue disruption — features emphasized in Han et al[1] and Sagili[9]. LTS, although versatile, entails longer operative time and potentially greater learning curve demands, as highlighted by Khan et al[14]. In resource-limited or high-volume surgical environments, this operational efficiency may favor CES, even if recurrence risk is marginally higher in the long term.

Overall, the evidence suggests a stratified surgical approach: CES for primary, uncomplicated entropion where immediate correction and minimal surgical burden are priorities, and LTS (or combined techniques) where significant horizontal laxity, recurrent disease, or long-term stability are concerns. This strategy balances short-term functional restoration with long-term anatomical integrity.

Several limitations must be acknowledged when interpreting our findings. First, the follow-up period was limited to the first postoperative day. This short-term endpoint allowed precise assessment of immediate anatomical success but precluded evaluation of medium- and long-term outcomes such as recurrence, late complications, and patient-reported satisfaction. Given that recurrence is a clinically important determinant of surgical choice, the absence of longitudinal data limits the generalizability of our conclusions regarding durability.

Second, this was a single-center study performed by a single experienced surgeon. While this ensured procedural consistency and minimized inter-surgeon variability, it may not reflect outcomes across surgeons with differing experience levels, training backgrounds, or surgical preferences. The learning curve for LTS is potentially steeper than for CES; therefore, success rates for LTS in less experienced hands could differ from our results, potentially exaggerating the apparent advantage of CES in our trial.

Third, the study population was relatively homogeneous, with exclusion of patients with previous eyelid surgery, severe horizontal laxity, or advanced ocular comorbidities. This careful selection enhanced internal validity but limits applicability to more complex or recurrent cases where the biomechanical advantages of LTS might become more relevant.

Fourth, we did not perform objective postoperative functional assessments such as blink dynamics, eyelid closure force measurement, or patient quality-of-life surveys. Such data could provide a more comprehensive picture of functional recovery beyond anatomical position alone.

Lastly, although the sample size was adequately powered for detecting differences in early surgical success, it may not have been large enough to explore less common complications or to detect small differences in subgroups, particularly those with specific ocular comorbidities.

CONCLUSION:

Conventional everting sutures achieved a significantly higher immediate postoperative success rate than the lateral tarsal strip procedure in the correction of involutional entropion. The advantage of CES was consistent across most demographic and clinical subgroups, suggesting that in uncomplicated primary cases with minimal horizontal laxity, CES offers rapid and reliable anatomical correction with minimal surgical complexity. However, the absence of long-term follow-up limits conclusions about recurrence, where LTS may provide greater durability. Surgical decision-making should therefore be individualized, with CES favored for straightforward cases requiring quick rehabilitation, and LTS or combined techniques considered for complex, recurrent, or anatomically unstable eyelids.

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