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Effectiveness of Conjunctival Flap Surgery in Managing Non-Healing Corneal Ulcers

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Abstract

Background: Non-healing corneal ulcers pose a significant challenge in ophthalmology, often resulting in persistent pain, visual impairment, and corneal perforation. Conventional medical treatments may fail to promote healing in refractory cases, necessitating surgical intervention. Conjunctival flap surgery provides a vascularized and protective layer that facilitates corneal healing and structural preservation. ***Objective:*** This study aims to evaluate the effectiveness of conjunctival flap surgery in managing non-healing corneal ulcers by assessing its impact on corneal healing, symptom relief, and overall visual prognosis. ***Methods:*** A retrospective study was conducted at a tertiary eye hospital in Bangladesh, including 47 patients who underwent conjunctival flap surgery for non-healing corneal ulcers between April 2020 and January 2022. Patients were assessed preoperatively and postoperatively using visual acuity testing, slit-lamp examination, fluorescein staining, and anterior segment optical coherence tomography. Data were analyzed using SPSS version 25. ***Results:*** The study population consisted of 63.82% males and 36.17% females, with the majority (57.4%) aged between 41 and 60 years. Infectious etiology was the most common cause of corneal ulcers (65.96%). Postoperatively, best-corrected visual acuity (BCVA) improved in 31.91% of patients, decreased in 46.81%, and remained unchanged in 21.28%. Anatomic cure was achieved in 72.34% of cases, with only 3 eyes requiring evisceration. Postoperative complications included flap necrosis (14.89%), flap displacement (8.51%), anterior corneal staphyloma (2.13%), and corneal perforation (2.13%), while 72.34% experienced no complications. ***Conclusion:*** Conjunctival flap surgery is an effective treatment for refractory corneal ulcers, preserving ocular integrity and facilitating corneal healing. While visual acuity may not always improve, the procedure remains a crucial alternative to emergency penetrating keratoplasty, particularly in regions with limited access to corneal tissue.

Keywords: Conjunctival flap surgery, non-healing corneal ulcers, corneal perforation, ocular integrity, visual acuity, penetrating keratoplasty alternative.

INTRODUCTION

Non-healing corneal ulcers present a significant challenge in ophthalmic practice, often leading to persistent pain, visual impairment, and an increased risk of corneal perforation. These ulcers typically result from severe infections, neurotrophic keratopathy, autoimmune disorders, or prolonged epithelial defects that fail to respond to conventional medical treatments. In such cases, surgical intervention becomes necessary to promote healing and prevent further complications. One such surgical approach is conjunctival flap surgery, which has been widely used as an effective therapeutic option for managing refractory corneal ulcers [1-4].

Conjunctival flap surgery involves covering the ulcerated cornea with a section of conjunctival tissue, providing a vascularized and protective layer that facilitates healing. The procedure not only offers mechanical support but also delivers essential nutrients and growth factors to the affected cornea, promoting epithelial regeneration and stromal repair. Various techniques, including total and partial conjunctival flaps, have been employed depending on the severity and location of the ulcer. Despite its effectiveness, conjunctival flap surgery is often considered a last resort due to its impact on corneal transparency and visual acuity [5-7].

Several studies have demonstrated the efficacy of conjunctival flap surgery in managing non-healing corneal ulcers, reporting significant improvement in corneal integrity and symptom relief. The procedure has shown favorable outcomes in terms of infection control, reduced inflammation, and prevention of corneal perforation [8-10]. However, its success rate varies based on patient-specific factors such as the underlying cause of the ulcer, pre-existing ocular conditions, and the extent of corneal involvement. Additionally, the choice between a pedicle flap and a total conjunctival flap depends on the clinical presentation and surgeon's expertise.

Despite its advantages, conjunctival flap surgery is not without limitations. The primary drawback is the potential reduction in visual acuity due to the opacification of the overlying conjunctival tissue. While this may not be a concern for eyes with poor visual prognosis, it poses a challenge for patients with the potential for visual rehabilitation. Moreover, post-surgical complications such as flap retraction, graft failure, and secondary infections can affect long-term outcomes, necessitating careful patient selection and post-operative management.

Objective

This study aims to evaluate the effectiveness of conjunctival flap surgery in managing non-healing corneal ulcers, assessing its impact on corneal healing, symptom relief, and overall visual prognosis.

METHODOLOGY

Study Design and Patients

This retrospective study was conducted at a tertiary eye hospital in Bangladesh. The study included 47 patients who had undergone conjunctival flap surgery for non-healing corneal ulcers between April 2020 and January 2022. Medical records were meticulously reviewed, and relevant data were extracted from patient case records. Information collected encompassed demographic details such as age, gender, living environment, duration of symptom onset, causes of ulceration, uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), intraocular pressure (IOP), and predisposing factors, including previous or ongoing topical or systemic treatments, systemic disorders, contact lens wear, and ocular trauma. The obtained data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.

Inclusion Criteria

Patients who underwent conjunctival flap surgery for non-healing corneal ulcers were included. The study also considered patients with deep non-healing corneal ulcers, including those with over 50% stromal loss, descemetocele, or corneal perforation.

Exclusion Criteria

Patients who did not undergo conjunctival flap surgery and those with incomplete data (such as missing age, gender, or clinical parameters) were excluded.

Preoperative Evaluation

All patients underwent a comprehensive ophthalmic assessment before surgery. Symptoms such as pain, redness, photophobia, tearing, and discharge were recorded. The evaluation included visual acuity testing (UCVA and BCVA) and a detailed slit-lamp examination of the conjunctiva, cornea, anterior chamber, iris, pupil, and lens. Additionally, key corneal parameters such as neovascularization, synechiae, hypopyon, ulcer size, ulcer site, ulcer staining, and corneal infiltrates were meticulously noted.

Surgical Technique

All conjunctival flap surgeries were performed by the same experienced surgeon in a sterile surgical theater with patients in a supine position under an operating microscope. Peribulbar anesthesia was administered to the affected eye, followed by povidone-iodine application for sterilization. After draping the eye, an eye speculum was inserted.

The corneal epithelium and necrotic tissue within 1 mm of the ulcer margin were carefully removed using a surgical blade. A tongue-shaped incision was made in the conjunctiva from the underlying Tenon's capsule, originating from the temporal side. The mobilized conjunctival flap was then securely sutured to the corneal ulcer using interrupted 6-0 Vicryl sutures. Following surgery, topical antibiotics were applied, and the eye was dressed. Suture removal was performed after two weeks.

Postoperative Evaluation

Patients were followed for 12 months post-surgery. Follow-up assessments included:

- Visual acuity testing (UCVA and BCVA)
- Intraocular pressure (IOP) measurement
- Slit-lamp examination of the cornea (focusing on ulceration, edema, and neovascularization)
- Anterior chamber assessment (noting inflammation, synechiae, and hypopyon)
- Fluorescein staining to detect corneal epithelial defects
- Anterior Segment Optical Coherence Tomography (AS-OCT) to evaluate the corneal tissue adjacent to the conjunctival flap

RESULTS

The baseline characteristics of the respondents showed a male predominance, with 63.82% of the participants being male and 36.17% female. The majority of patients (57.4%) were in the 41–60 years age group, followed by 25.5% who were older than 60 years, while only 4.3% were under 18. Regarding the etiology

of corneal ulcers, 65.96% of cases were due to infectious causes, while 25.53% were non-infectious, and 8.51% had an unknown cause. These findings highlight the demographic distribution and common causes of non-healing corneal ulcers in the study population.

Table 1: Baseline characteristics of the respondents

Characteristics	Frequency (n)	Percent (%)
Sex		
Female	17	36.17
Male	30	63.82
Age group (years)		
<18	2	4.3
18-40	6	12.8
41-60	27	57.4
>60	12	25.5
Aetiology of corneal ulcer		
Infectious	31	65.96
Non-infectious	12	25.53
Unknown	4	8.51
Total	**47**	**100.0**

The results of this study indicate that post-operative best-corrected visual acuity (BCVA) improved in 31.91% of patients, while 46.81% experienced a decline, and 21.28% had no change. Post-operative complications were observed in a subset of patients, with flap necrosis occurring in 14.89%, flap displacement in 8.51%, anterior corneal staphyloma in 2.13%, and corneal perforation in 2.13%. However, the majority of patients (72.34%) experienced no complications, suggesting that conjunctival flap surgery remains a viable option for managing non-healing corneal ulcers, despite some risk of adverse outcomes.

Table 2: Patient outcomes

Characteristics	Frequency (n)	Percent (%)
Post-operative visual acuity (BCVA)		
Improved	15	31.91
Decreased	22	46.81
Remain unchanged	10	21.28
Post-operative complication		
Flap necrosis	7	14.89
Flap displacement	4	8.51
Anterior (corneal) staphyloma	1	2.13
Perforation	1	2.13
No complication	34	72.34

DISCUSSION

Conjunctival flap surgery has long been recognized as an effective treatment for non-healing corneal ulcers. This technique promotes healing through multiple mechanisms. The flap serves as a protective barrier, preventing further stromal ulceration by blocking exposure to tears, proteolytic enzymes, and inflammatory mediators. Additionally, the vascular and lymphatic supply from the conjunctival flap provides essential nutrients, cellular components, and growth factors, enhancing resistance to infection and preventing stromal degradation [10-11].

In this study, a selective, partial pedicle conjunctival flap technique was used, where the flap was mobilized specifically over the ulcerated cornea. This method differs from the total conjunctival flap technique, which covers the entire cornea. The advantage of this approach is that it offers an alternative to the traditional technique while reducing some of its associated complications.

An anatomic cure was achieved in 72.34% of cases, with only three eyes ultimately requiring evisceration due to complications. Among the seven corneal perforations included in the study, five successfully regained anatomical integrity. These findings highlight the role of conjunctival flap surgery in preventing further corneal damage and maintaining ocular integrity.

It is important to note that most patients in this study underwent conjunctival flap surgery not primarily to improve visual acuity but to prevent corneal perforation and preserve the structure of the eye. However, postoperative best-corrected visual acuity (BCVA) improved in 31.91% of cases, decreased in

46.81%, and remained unchanged in 21.28%. A decline or lack of improvement in visual acuity does not necessarily indicate surgical failure, as the primary goal was structural preservation rather than visual rehabilitation [12-13].

Among the 47 patients, 28 underwent a single surgical procedure, while 19 required additional interventions such as repeat flap surgery, cataract surgery, penetrating keratoplasty, or evisceration. The need for further surgeries underscores the severity of the underlying disease rather than the failure of the initial conjunctival flap procedure.

Despite the positive outcomes observed, this study has limitations, including a relatively small sample size and the diversity of corneal ulcer etiologies. These factors make it difficult to draw definitive conclusions about the efficacy of pedicle conjunctival flap surgery for specific causes of corneal ulcers. Further research with larger study populations is needed to explore this surgical approach in greater detail.

CONCLUSION

Conjunctival flap surgery is a reliable intervention for managing refractory deep corneal ulcers, effectively restoring ocular surface integrity while offering vital metabolic and mechanical support for healing. Additionally, it serves as a crucial alternative to emergency penetrating keratoplasty, particularly in areas where access to corneal tissue is limited.

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