



Tarsorrhaphy with Sutureless Amnion Transplantation: Practical Management of Ocular Surface Pathologies

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Abstract

Objectives: The objective of the study was to evaluate the technique of tarsorrhaphy combined with sutureless amniotic membrane transplantation in the treatment of resistant ocular surface pathologies.

Methods: In this study, the post-operative results of patients who underwent tarsorrhaphy combined with sutureless amniotic membrane between May 2016 and July 2021 were evaluated. In this technique, we have placed the amniotic membrane on the ocular surface, and then simple tarsorrhaphy has been performed. We used this technique in our six patients during COVID-19 pandemic period at the bedside. The outcomes of corneal epithelial healing, visual acuity, pain score, patient tolerance, and adverse events were evaluated.

Results: Fourteen patients (eight females and six males) were included in the study. The mean age of the patients was 65.7 years (range 9–96 years). The mean follow-up period was 9 months (range 6–12 months). In all cases, epithelial defect healed completely and it was seen that this new technique facilitated resolution of pain and inflammation and promoted epithelialization in our 14 cases with resistant ocular surface pathologies. Post-operative pain score was significantly lower than pre-operative pain score ($p < 0.05$).

Conclusion: Our results demonstrate that tarsorrhaphy with sutureless amniotic membrane accelerates the ocular surface healing process and increases the efficiency of amniotic membrane. This method has an important advantage that it can be performed at bedside. Patients and ophthalmologists need such an innovative treatment which is effortless, effective, and practical especially for the pandemic period.

Keywords: Amniotic membrane, ocular surface pathology, tarsorrhaphy

Introduction

The management of the ocular surface disorders poses a clinical challenge for ophthalmologists. Amniotic membrane transplantation has been found as one of the treatments for ocular surface reconstruction in corneal pathologies such as acute burns, persistent epithelial defects, corneal ulcers, and bullous keratopathy (1-4). Amniotic membrane has anti-inflammatory and anti-scarring effects and contains growth

factors that promote epithelial wound healing on the ocular surface (5-7). Amniotic membrane transplantations are typically performed using sutures or adhesives, but many complications associated with sutures have been reported (2-6). Therefore, the search for sutureless techniques has increased (4-7). Tarsorrhaphy is the closure of the eyelids with surgical approach which acts by decreasing the palpebral fissure width (8). Tarsorrhaphy is an effective surgery for

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corneal reepithelialization and symptomatic relief in patients with persistent corneal epithelial defects (9,10).

In this study, we evaluate the efficacy of tarsorrhaphy with sutureless amniotic membrane transplantation in treatment-resistant ocular surface pathologies. To the best of our knowledge, there have been no published studies reporting the safety and efficacy profile of the use of the sutureless amniotic tarsorrhaphy technique. The present study has evaluated and found this new method as a safe, effective, and practical technique.

Methods

This study was approved by the ethical committee (Adana City Training and Research Hospital Clinical Research Ethics Committee 19-34-444) and informed consent was obtained from each patient (or patient's parents when the patient was younger than 18), and all research adhered to the tenets of the Declaration of Helsinki. This study was performed between May 2016 and July 2021, and the patients with treatment-resistant ocular surface pathologies were included in the study. All of the patients had been treated with non-surgical modes of management such as lubricating drops, autologous serum, and eye-patching and bandage contact lens. When there was no response to these treatments, tarsorrhaphy with sutureless amniotic membrane transplantation was considered for each patient, regardless of time, depending on the condition of their corneas. Fourteen patients were enrolled in the study. Demographic data were acquired from the patient charts.

There was neurotrophic keratitis in seven patients. While three patients had stromal keratitis with resistant epithelial defect, two patients had facial paralysis and lagophthalmos, one patient had symblepharon and corneal-conjunctival epithelial defect, and one patient had recurrent corneal ulcer. The corneal epithelial defect and pain score were evaluated by comparing pre-operative findings to post-operative 1st-month results. The symptoms of foreign body sensation, lacrimation, and photophobia were also recorded at visits. Pain score index was recorded on a scale from grade 0–4 (Grade 0 –No pain, Grade 1- Mild pain, Grade 2 - Moderate pain, Grade 3 - Severe pain, and Grade 4 - Unimaginable pain)(11).

Statistical analysis of the data was conducted using the Statistical Packages for the Social Sciences software (SPSS 18.0). Descriptive statistics were used. Quantitative variables were expressed as mean and standard deviation while qualitative variables were presented as percentages. Among the categorical variables, the Chi-square test was applied. A value of $p < 0.05$ was considered to be statistically significant.

Surgical Technique

All of the surgical procedures were performed under local anesthesia and were followed between 6 and 12 months. The cryopreserved amniotic membrane graft (2.5×2.0 or 2.0×1.5 cm) had been used in a single or multiple layers to cover the corneal stromal or epithelial defect. Before the surgery, corneal staining with fluorescein examination for corneal epithelial defects was performed (Fig. 1). After topical and infiltra-

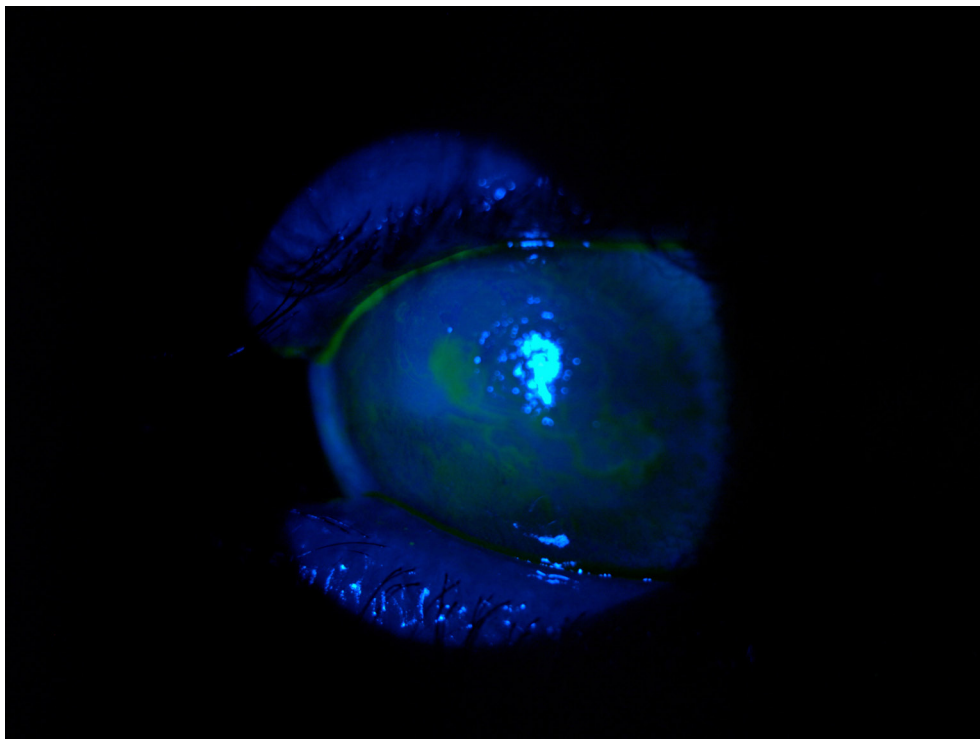


Figure 1. Examination of corneal staining with fluorescein before surgery.

tive anesthesia to lids, the base of corneal epithelial defect or stromal ulcer was debrided and poorly adherent epithelium surrounding the defect or ulcer was removed. Amniotic membrane graft was placed on the surface of cornea (Fig. 2), and then a simple surgical tarsorrhaphy had been done with 6-0 polypropylene suture into the upper and lower tarsal plate (Fig. 3). The tarsorrhaphy sutures were removed in the 1st month after the surgery. Corneal staining was evaluated with fluorescein (Fig. 4). This surgery did not require an operating microscope and took approximately 5–10 min. This gave us the option of a bedside procedure. Before COVID-19 pandemic, we applied this technique to our eight patients in the operating room. This technique can be performed at the bedside without the need for general anesthesia or operating room conditions. We used this technique in our six patients during COVID-19 pandemic period at the bedside. Figure 5 depicts a patient who underwent bedside amniotic membrane transplantation-tarsorrhaphy during the pandemic period, and Figure 6 shows an anterior segment image with 10× magnification. This strategy reduces the amount of time spent in close contact with patients during the pandemic period. Postoperatively moxifloxacin 0.5% (Vigamox®, Alcon, USA) 4 times a day and artificial tears 4 times a day were added to the treatment. After surgery, the patients were examined on the 1st and 7th days, then, monthly. Main outcome measures included surgical success, if the epithelium was closed within the 4 weeks after surgery.

Results

Fourteen patients were enrolled in the study including 6 men and 8 women. The mean age of the patients was 65.7 years (ranging between 9 and 96 years). In all of the patients, this



Figure 3. Surgical tarsorrhaphy had been done after amniotic membrane graft was placed.

technique was proven to provide sufficient and appropriate healing. There was no statistical difference between males and females in duration of epithelial healing. In all cases, ep-



Figure 2. Tarsorrhaphy sutures and the membranous structure which was amniotic membrane visible in the temporal quadrant were observed.

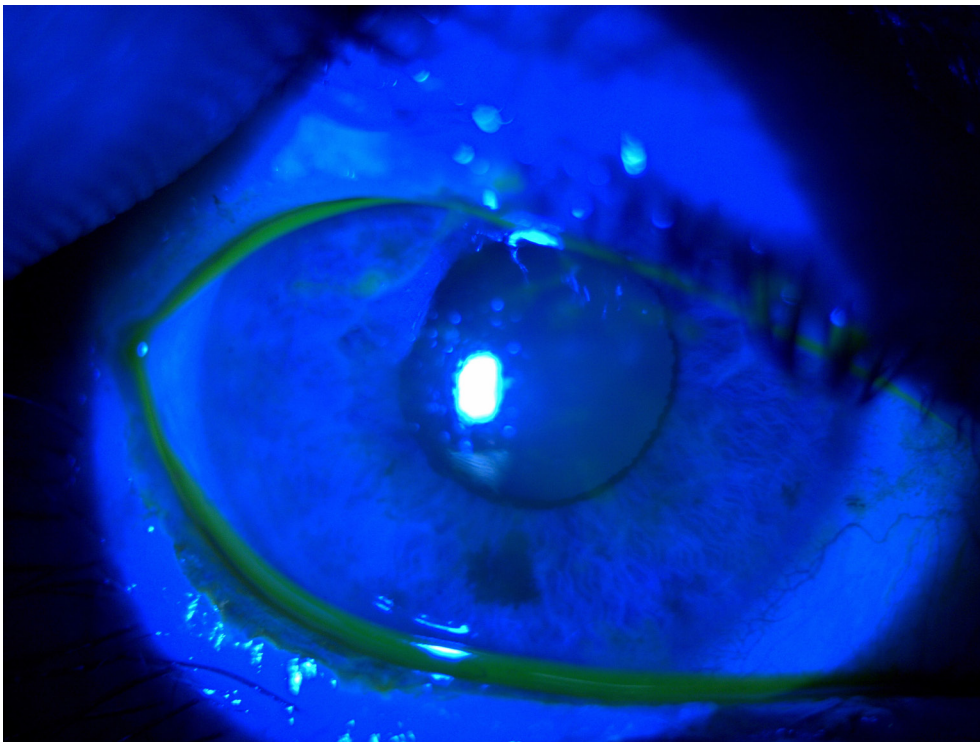


Figure 4. After sutureless amnion tarsorrhaphy, at 1th month cornea was evaluated with fluorescein.



Figure 5. During the pandemic period in another patient with lagophthalmos, bedside application of the technique was seen.

ithelial defect healed completely without any intervention. Visual acuity improved in 14 eyes (100%). We also noted that sutureless amniotic membrane transplantation with tarsorrhaphy facilitated resolution of pain and inflammation and promoted rapid epithelialization in our 14 cases with resistant ocular surface pathologies. The symptoms of foreign body sensation, lacrimation, and photophobia were also relieved in all the patients. Pre-operative pain score was 2.5, post-operative pain score was 1.1, and the difference was statistically significant ($p < 0.05$). The mean follow-up period was 9 months (ranging between 6 and 12 months). During the follow-up period no recurrence of epithelial defects was observed in any of the patients.

Discussion

The amniotic membrane, which has been utilized for a variety of purposes in many different disciplines of medicine, has been employed in ophthalmology for more than 10 years to treat ocular surface disorders. In ophthalmological practice, the amniotic membrane is widely used to support corneal epithelialization, and for alleviation of inflammatory changes of the ocular surface (5-12). Clinical efficacies of amniotic membrane transplantation have been reported in several publications for a wide spectrum of ophthalmic indications (corneal ulcer, herpetic keratitis, bacterial keratitis, corneal lysis, exposure keratitis, neurotrophic keratitis, microperforation, Mooren's ulcer, and peripheral ulcerative keratitis) (6,13,14). Dekaris et al. (15) reported that amniotic mem-

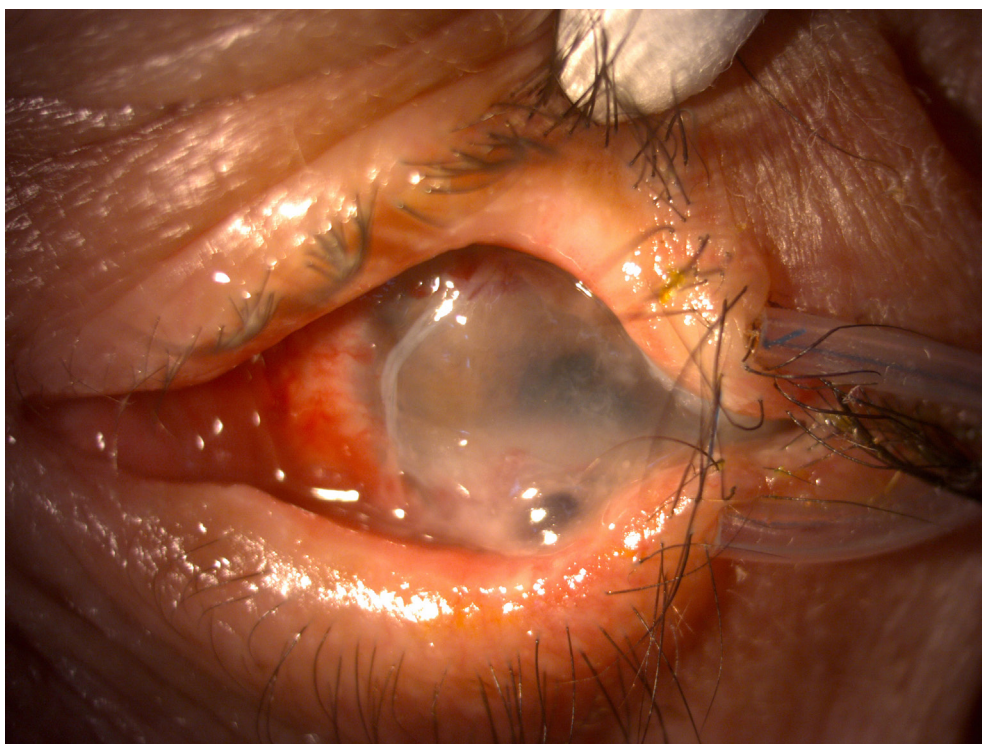


Figure 6. In the anterior segment photograph ($\times 10$), the amniotic membrane on the cornea and ocular surface and tarsorrhaphy on the lateral lid was observed.

brane transplantation facilitates healing of corneal epithelium. Persistent epithelial defects on the corneal graft unresponsive to conventional treatment can be effectively cured when covered with one or more amniotic membrane layers (15). In all eyes of fourteen patients, the amniotic membrane adherence was satisfactory with significant reduction of inflammation and symptomatic relief. This is an effortless and effective technique with good surgical outcomes.

Amniotic membrane transplantation is conventionally performed using sutures, adhesive glues, or special devices such as ProKera. However, sutures are associated with a number of problems, including deterioration of ocular tissue, scar formation at suture sites, and persistent conjunctival irritation produced by the retained sutures (16). Recent studies offer many advantages of the sutureless approach and may facilitate the use of amniotic membrane grafting (17-21). Sutureless surgery has the following advantages: Reduced surgical time, tolerance with topical anesthetics, ease of post-operative care, lack of suture-related problems, and total cost savings. Although we did not use any adhesives our sutures in our technique, single-layer or multi-layer amniotic membranes remained attached as if sutured to the eye. Mimouni et al. (21) demonstrated that sutureless dehydrated amniotic membrane with bandage contact lens achieved resolution of persistent epithelial defects in 89% of eyes in their study with a significant improvement in vision. The dehydrated amniotic membrane was placed over

the center of the cornea covering entire epithelial defect, and after 2–5 min a sterile bandage contact lens was placed over the amnion (21). In this technique, like ours, sutureless amniotic membrane transplantation can be performed in the office. Recent studies using bandage contact lenses similar to this technique have been published (22,23). Choi et al. (22) reported their success rate as 77.8% (7/9) with bandage contact lens. They said that the causes of failure in two patients were amniotic membrane displacement and uncontrolled infection (22). Luccarelli et al. (23) named their new contact lens technique the “sutureless contact lens sandwich technique,” in which the amniotic membrane was placed between two contact lenses, with the inner contact lens cut centrally to form a ring. Their technique based on the suction effect due to the superposition of a bandage contact lens over the amniotic membrane-ring complex was found safe and effective treatment for persistent epithelial defects (23). It has been shown in the literature that sutureless placement of the amniotic membrane with a symblepharon ring provides very good anatomical and functional results in patients with ocular surface defects, but the cost of the symblepharon ring is its disadvantage (24,25). Autologous human fibrin glue has also been used successfully in sutureless amniotic membrane transplantation (26).

A tarsorrhaphy should always be considered in cases of persistent epithelial defects that fail to respond to medical treatment and/or non-surgical interventions (27). Tarsor-

rhaphy, in addition to reducing the continual impact on the corneal epithelium caused by blinking, stabilizes the sutureless amniotic membrane graft on the ocular surface, as we discovered in our study. This new technique brings two procedures together in a short time (5–10 min) even at the bedside without having to go to the operating room during the pandemic period. Our technique can be performed at the bedside without the need for general anesthesia, operating microscope or operating room conditions. This minimizes the delay in amnion membrane transplantation and is less invasive for the patient. This strategy also reduced ophthalmologist and patient visit times, which was significant, especially during this epidemic period. To the best of our knowledge, no study has previously evaluated the use of tarsorrhaphy with sutureless amniotic membrane transplantation. We present a new sutureless approach with tarsorrhaphy that provided significant clinical improvement in our all-resistant ocular surface pathology cases in pandemic period.

There are several limitations in this single institutional retrospective analysis of the sutureless amnion tarsorrhaphy technique. Primary inherent limitation is the retrospective nature of the study, which are associated selection biases. Furthermore, our small sample size might have affected statistics. As a result, the findings of our study should be regarded with caution because they are hypothesis-generating rather than conclusive. Despite inherent limitations, there is a gap in the literature about sutureless amnion tarsorrhaphy technique, and this study is important because this technique was performed on patients for the first time in the literature.

Conclusion

This new surgical approach the sutureless amniotic membrane transplantation with tarsorrhaphy may bring versatile dimensions to the management of ocular surface diseases. Controlled, randomized, multicenter, and long-term trials involving large numbers of patients are needed to substantiate the clinically relevant potential of sutureless amnion membrane transplantation with tarsorrhaphy in reconstructive surgery of the ocular surface.

Disclosures

Ethics Committee Approval: Adana City Training and Research Hospital Clinical Research Ethics Committee 2019-444-34.

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Conflict of Interest: None declared.

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