Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Medicine

Evaluation Outcomes and Complications of Temporary Suture Tarsorrhaphy (TST) in Cases of Impending Corneal Ulcer Perforation

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DOI: 10.36347/sjams.2023.v11i12.004 | **Received:** 28.10.2023 | **Accepted:** 02.12.2023 | **Published:** 06.12.2023

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Abstract **Original Research Article**

***Introduction*:** A corneal ulcer, a defect of the corneal epithelium involving the underlying stroma, is a potentially vision-threatening ocular emergency. Even with prompt treatment patients can suffer significant morbidity with complications including corneal scarring or perforation, development of glaucoma, cataracts or anterior and posterior synechiae, and vision loss. ***Objective*:** to evaluate outcomes and complications of temporary suture tarsorrhaphy(TST) in cases of impending corneal ulcer perforation. ***Methods*:** In this retrospective study was carried out at Department of Ophthalmology, Ad-din Akij Medical College, Khulna and Eye Hospital, Khulna, Bangladesh from January to June 2022. All cases of fungal keratitis that had undergone TST after evaluationwere included. Patients with a minimum follow up of 3-monthpost tarsorrhaphy were included in the study. Information reviewed included patient age and sex, visual acuity (VA) at presentation, size andlocation of the ulcer, indication for TST, durationof signs and symptoms before TST, time toepithelial healing after TST, complications associated with non-healing corneal ulcer,complications of TST, number of TST needed and the duration of follow up. ***Results*:** During the 12 months study period, 300 cases were planned for TST out of which 90 patients (30.0%) fulfilling the inclusionand exclusion criteria were included for the study. There were not any cases of both eye involvement. Mean age of the patients in this study was 50.34± 14.56 years (range 20—85 years) with a male-to-female ratio of 2.22:1. Only 3 patients (2.52%) had a VA of more than 6/60, 31 patients(34.44%) had VA between 6/60 to counting finger-close to face (CF-CF) and 57(63.33%)had hand movement (HM) to perception of light(PL) at first visit. The patients presented to the cornea service 3 to 45 days (mean 19.34±10.62 days) after the onset of symptoms, with only 7.57% of the patients presenting within 1 week.Out of 90 patients, 64 patients (71.11%) developed healing ulcer and 26(28.9%) developed non-healing ulcer within 2 weeks. Among 26 non healing cases, 1 patient presentedwith corneal perforation with endophthalmitis and had to undergo evisceration whereas 25 patients resulted in corneal perforation only and TST with intensive medical therapy was continued as before. After 4 weeks, among these perforated cases 15 (16.66%) developed healing ulcer and only 10 (11.11%) had to undergo evisceration. Altogether 12 patients (13.33%) had to undergo evisceration whereas 86.67% of the patients healed by corneal scarring. Indications for evisceration weretotal corneal sloughing in 7(7.77%) patients, corneal perforation with endophthalmitis in 1 (1.11%) patient and choroidal detachment (CD)along with perforation and endophthalmitis in4 (4.44%) patients. In our study, there were 6 (6.66%) patients withdiabetes mellitus (DM) and 2 (2.22%) cases of hypertension (HTN). Among 8 diabetic patients, 6 patients were freshly diagnosed with highblood glucose and 2 patients were diagnosed previously with good glycemic control. Out of 90 patients who came for follow-up at 3 months, 47 patients (52.22%) had BCVA improved by 2or more lines, which was statistically significant($P<0.05$). ***Conclusion*:** This study concludes that temporary suture tarsorrhaphy could be a useful option for management of corneal ulcers with impending perforation in eye centers with limited resources settings and high disease burden with good anatomical and functional outcome.

Keywords: Corneal ulcer, Impending perforation, Temporary suture tarsorrhaphy.

INTRODUCTION

A corneal ulcer, a defect of the corneal epithelium involving the underlying stroma, is a potentially vision-threatening ocular emergency. [1] Even with prompt treatment patients can suffer significant morbidity with complications including corneal scarring or perforation, development of

glaucoma, cataracts or anterior and posterior synechiae, and vision loss. Untreated bacterial keratitis may result in endophthalmitis and subsequent loss of the eye. [2] The incidence of ulcerative keratitis varies from 20.2 in 100000 per year in developed countries [3] to 799 in 100000 per year in developing countries [4]. Over the past few decades, earlier diagnosis, a better understanding of the pathogenesis and the availability of potent antimicrobial drugs have improved the chances for medical control of infectious keratitis [5]. However, virulent and resistant forms of infectious bacteria, fungi and Acanthamoeba can still cause keratitis to worsen, even with maximum medical therapy [6]. The most common etiology of corneal ulcers is infectious, with bacterial pathogens responsible for a majority of the cases [7]. Ulcers start as keratitis (inflammation of the cornea) after a break in the corneal epithelium allows bacteria to enter. These breaks are most commonly due to contact lens wear, corneal abrasions, and other ocular trauma [7]. All this medically uncontrolled microbial keratitis may eventually lead to corneal perforation, infectious scleritis, and secondary endophthalmitis [8]. Tarsorrhaphy is the closure of the eyelids, either temporarily or permanently. Lids can be closed temporarily with tape, adhesive glue, levator paralysis by botulinum toxin injection or sutures, with or without a bolster [9]. A tarsorrhaphy decreases the evaporation rate of tears by decreasing the palpebral fissure width. In addition, immobilization of the lid over the epithelial defect by the tarsorrhaphy decreases the traumatic effect of the moving lids on the healing epithelium [9]. Tarsorrhaphy also gives mechanical support to the cornea which tends to perforate due to thinning. A half-open eye allows more oxygen to get to the corneal epithelium than a totally closed or patched eye. Allowance for the administration of eye drops, retention of partial eyesight, and examination of the cornea by having the patient adduct the eye are other advantages of tarsorrhaphy [9]. However, the shortage of corneal donors and trained corneal specialist, low socio economic status of the patients [4] and countries with high burden of disease such as in Bangladesh [4] has rendered TPK as a costly and inconvenient modality, especially in high disease burden eye hospitals with limited capacities and resources where there is no Eye Bank. On the other hand, temporary suture tarsorrhaphy (TST) is an easier, cost-effective technique which often helps to buy time for TPK. This study evaluates the outcomes of TST in impending corneal ulcer perforation in a high volume resource limited center at eastern region of Bangladesh. The specific objectives of the study are to evaluate the demographic profile, epithelial healing in relation with time, anatomical success rate and complications of TST.

MATERIALS AND METHODS

In this retrospective study was carried out at Department of Ophthalmology, Ad-din Akij Medical College, Khulna and Eye Hospital, Khulna, Bangladesh from January to June 2022 All cases of fungal keratitis that had undergone TST after evaluation were included. Patients with a minimum follow up of 3-month post tarsorrhaphy were included in the study. Information reviewed included patient age and sex, visual acuity (VA) at presentation, size and location of the ulcer, indication for TST, duration of signs and symptoms before TST, time to epithelial healing after TST, complications associated with non-healing corneal ulcer, complications of TST, number of TST needed and the duration of follow up.

The inclusion criteria were smear positive fungal keratitis with ulcer size of more than 5mm horizontally and vertically involving central and/or paracentral cornea. Corneal infiltration with impending corneal perforation were taken. The exclusion criteria were cases of mixed microbial keratitis, perforated corneal ulcer, endophthalmitis and scleritis during presentation.

All cases had a microbiologic evaluation consisting of microscopic examination of the smears using potassium hydroxide and Gram stain. Smear positive fungal cases were managed with topical natamycin (5%) 2 hourly, fluconazole (0.30%) 2 hourly, atropine (1%) TDS, single course of oral ketoconazole (200mg) BD along with oral acetazolamide 250mg TDS and NSAIDS. Patients with impending perforation were advised for TPK and advised for referral when the donor cornea was not available. The patients who refused for referral citing various reasons were planned for TST.

Appropriate counseling was done and informed consent was taken prior to the surgery. TST was performed by injecting local anesthesia (2% xylocaine) in the upper and lower lids. A Silk 4-0 suture was passed perpendicularly through the meibomian gland orifice of the lower lid and with a good tarsal purchase of 5 to 10mm horizontally taken out from another meibomian gland orifice. Same procedure was repeated in the upper lid and the suture was tied together externally with lashes and knots lying outside. The patients were then discharged from the hospital with topical natamycin (5%) 2 hourly, fluconazole (0.30%) 2 hourly, atropine (1%) TDS, single course of oral ketoconazole (200mg) BD along with oral acetazolamide 250mg TDS and NSAIDS and were asked to follow up after 2 weeks. Those cases that presented with loose or broken sutures on follow up were planned for repeat TST. TST was also continued on the patients who developed corneal perforation on subsequent visits.

The patients were called for follow-up after 2 weeks and evaluation for the corneal ulcer was done. As soon as the resolution of the infiltrate and maintenance of the structural integrity of the globe was achieved, the TST was removed and defined as anatomical success. Functional success was defined as VA more than 6/60 after achieving anatomical success. In cases of perforated

corneal ulcer with endophthalmitis not responding to 2 doses of intravitreal injection consisting of ceftazidime (2.25mg /0.1ml), vancomycin (1mg /0.1ml) and voriconazole (100 µg /0.1 ml) were eviscerated.

All data were entered in Microsoft Excel 2013 and analyzed using the Statistical Package for Social Sciences (SPSS) Version 20 software (IBM Corporation). For descriptive analysis mean, standard deviation, proportion, percentage and various diagrams were calculated/presented. For inferential statistics, parametric and non-parametric tests were carried out to find significant differences among the patients at 95.0% confidence where p value < 0.05.

RESULTS

During the 12 months study period, 300 cases were planned for TST out of which 90 patients (30.0%) fulfilling the inclusion and exclusion criteria were included for the study. There were not any cases of both eye involvement. Mean age of the patients in this study was 50.34± 14.56 years (range 20—85 years) with a male-to-female ratio of 2.22:1. Only 3 patients (2.52%) had a VA of more than 6/60, 31 patients (34.44%) had VA between 6/60 to counting finger-close to face (CF-CF) and 57(63.33%) had hand movement (HM) to perception of light (PL) at first visit. The patients presented to the cornea service 3 to 45 days (mean 19.34±10.62 days) after the onset of symptoms, with only 7.57% of the patients presenting within 1 week. During presentation, 28 (31.11%) patients were on topical antibiotics, 11 (12.22%) patients were on topical antibiotics and antifungal agents and seven patients (5.88%) were on topical antibiotics and steroids. 46 (51.11%) patients were using unknown medicines. Out of 90 patients, 64 patients (71.11%) developed healing ulcer and 26(28.9%) developed non-healing ulcer within 2 weeks. Among 26 non healing cases, 1 patient presented with corneal perforation with endophthalmitis and had to undergo evisceration whereas 25 patients resulted in corneal perforation only and TST with intensive medical therapy was continued as before. After 4 weeks, among these perforated cases 15 (16.66%) developed healing ulcer and only 10 (11.11%) had to undergo evisceration. Altogether 12 patients (13.33%) had to undergo evisceration whereas 86.67% of the patients healed by corneal scarring. Indications for evisceration were total corneal sloughing in 7(7.77%) patients, corneal perforation with endophthalmitis in 1 (1.11%) patient and choroidal detachment (CD) along with perforation and endophthalmitis in 4 (4.44%) patients. With this data, anatomical success rate was 86.68% which was statistically significant (Pearson chi-square: P=0.001). In all cases with healed ulcer, 55.55% developed epithelial healing at 2-4 weeks with mean duration of 23.24±12.09 days of TST. In our study, there were 6 (6.66%) patients with diabetes mellitus (DM) and 2 (2.22%) cases of hypertension (HTN). Among 8 diabetic patients, 6 patients were freshly diagnosed with high blood glucose and 2 patients were diagnosed previously with good glycemic control. Out of 8 patients with co-existing DM, 6 cases (75%) that were freshly diagnosed developed perforation. Among 6 cases of perforation 4 (66.66%) had to undergo evisceration whereas remaining 2 (33.33%) patients had the ulcer resolved resulting in a corneal scar. The two corneal ulcer patients with systemic HTN resolved completely. VA as shown in Table-1 suggests that most of the patients improved VA by 2 to 3 lines according to Snellen's chart at 3 months. Thus, functional success according to VA more than 6/60 was seen in 25 patients (27.77%). Out of 90 patients who came for follow-up at 3 months, 47 patients (52.22%) had BCVA improved by 2 or more lines, which was statistically significant (P<0.05). Among 90 cases of TST, 7 (7.77%) patients had to undergo repeated TST on 1st postoperative day due to premature tarsorrhaphy failure, which occurred due to an improper technique probably due to poor tarsal purchase during suturing. Only 1 (1.11%) patient developed eyelid margin distortion after 1 month. In all of the cases TST had to be repeated every 15 days due to loose or broken sutures. On average, the mean duration of TST was applied for 23.24+ 12.09 days.

Table-1: Visual outcomes at 1 month and 3 months (N=90)

	VA at presentation	BCVA 1 month	BCVA 3 months
>6/24	0	0	11
6/36	1	4	6
6/60	2	2	15
5/60	1	8	8
3/60	2	4	12
2/60	8	18	6
1/60	15	9	4
CFCF	15	6	9
HM	30	25	22
PL	45	28	11
NPL	0	15	15

DISCUSSION

The occurrence of corneal perforation can be related to a chronic course, delayed management, inappropriate diagnosis and management, and thus surgical intervention is required more frequently [10]. In our study, we only selected fungal corneal ulcer because fungal ulcers are more prevalent in our region [6, 11, 12]. The tropical climate of plains may also have contributed to this high prevalence. Another reason could be related to the use of topical corticosteroids, often prescribed by local level health practitioners for red eye (16.6%) before visiting to the hospital [11]. Mean age of the patients in our study was 51.34± 15.56 years with the majority of the patients (63.87%) in their fourth to sixth decades of life. This age group is socioeconomically active and morbidity would affect entire families. Sitoula *et al.,* [13] reported that the mean age of the patients with corneal ulcer to be 44 ± 16 years in their study which was conducted at eastern region of Bangladesh. Similarly, Puri and Shrestha [11] stated that the majority of their patients (71.20%) belonged to the age group of 26 to 55 years. Numerous studies have reported gender difference in the prevalence of corneal ulcer as males are mostly involved in outdoor activities than females and seek medical services more than females do [6, 11]. Our finding also suggests a similar trend (M:F = 2.22:1). In our study, Only 3 patients (2.52%) had a VA of more than 6/60, 31 patients (34.44%) had VA between 6/60 to counting finger-close to face (CF-CF) and 57(63.33%) had hand movement (HM) to perception of light (PL) at first visit. The patients presented to the cornea service 3 to 45 days (mean 19.34±10.62 days) after the onset of symptoms, with only 7.57% of the patients presenting within 1 week. Many patients seek medical care at an advanced stage of the disease when treatment at local clinics has failed. This may be the reason that they usually present late in our hospital. During presentation, 28 (31.11%) patients were on topical antibiotics, 11 (12.22%) patients were on topical antibiotics and antifungal agents and seven patients (5.88%) were on topical antibiotics and steroids. 46 (51.11%) patients were using unknown medicines. This success rate was comparable with other procedures which are described for the management of impending corneal perforation in literature. In a study conducted by Garg *et al.,* [14] they performed application of N-Butyl Cyanoacrylate Tissue Adhesive in Fungal Keratitis in which 24.20% cases were diagnosed as treatment failure. In a study of analysis of conjunctival flap surgery in fungal keratitis, total of 3 study patients experienced postsurgical complications of corneal perforation (1 patient) and purulent exudate spreading (2 patients) out of 16 patients. Nizeyimana *et al.,* [15] For impending perforation, TPK or lamellar keratoplasty are considered as a standard treatment [16]. Altogether 12 patients (13.33%) had to undergo evisceration whereas 86.67% of the patients healed by corneal scarring. Indications for evisceration were total corneal sloughing in 7(7.77%) patients, corneal perforation with endophthalmitis in 1 (1.11%) patient and choroidal detachment (CD) along with perforation and endophthalmitis in 4 (4.44%) patients. With this data, anatomical success rate was 86.68% which was statistically significant (Pearson chi-square: P=0.001). Bajracharya and Gurung,[17] Regarding therapeutic success rate of lamellar keratoplasty, in a comparative study between therapeutic deep anterior lamellar keratoplasty (TDALK) and TPK, a success rate of 84.60% was achieved in the TDALK group and 8% in the TPK group out of 26 and 100 patient respectively. Comparing the results from our study with these standard treatments, TST offers a simple yet effective treatment modality which can be easily recommended due to the relative ease of procedure, high efficacy, cost effectiveness and the ability to delay an otherwise emergent specialized surgical repair. In our cases, 56.30% developed epithelial healing at 2-4 weeks with mean duration of 23.24 ± 12.09 days of TST. As we compare our study with amniotic membrane graft (AMG). Solomon *et al.,* [18] concludes that ocular surface inflammation was markedly reduced with complete epithelialization in 3 weeks, and stable corneal thickness was demonstrated within the first 2 months postoperative. Out of 8 patients with co-existing DM, 6 cases (75%) that were freshly diagnosed developed perforation. Among 6 cases of perforation 4 (66.66%) had to undergo evisceration whereas remaining 2 (33.33%) patients had the ulcer resolved resulting in a corneal scar. The two corneal ulcer patients with systemic HTN resolved completely. Patients with diabetic keratopathy have impairments of the epithelial basement membrane, epithelial wound healing, epithelial– stromal interactions, endothelial function and corneal nerve functions [19]. These all lead to delayed wound healing and results in severe complications. Out of 90 patients who came for follow-up at 3 months, 47 patients (52.22%) had BCVA improved by 2 or more lines, which was statistically significant (P<0.05). Among 90 cases of TST, 7 (7.77%) patients had to undergo repeated TST on 1st postoperative day due to premature tarsorrhaphy failure, which occurred due to an improper technique probably due to poor tarsal purchase during suturing. In this study, 62 patients (52.10%) had BCVA improved by 2 or more lines with functional success in 32 patients (26.89%). In the majority of the patients enrolled in the present study, the aim of TST was to prevent or stop corneal perforation and/or inflammation and to preserve the eyeball, rather than to improve the patient's vision. On the contrary, the improved or unchanged postoperative VA observed in the present study does indicate that TST along with intensive medical therapy was successful even in improving vision. By postponing definitive surgical procedures such as TPK or lamellar keratoplasty until the inflammation has subsided, the success rate may be promoted. Higher recurrences of infection in corneal grafts after TPK were associated with fungal keratitis, retro-iris and vitreous exudates, and increasing graft size [20]. Only 1 (1.11%) patient developed eyelid margin distortion after 1 month. In all of the cases TST had to be

repeated every 15 days due to loose or broken sutures. On average, the mean duration of TST was applied for 23.24+ 12.09 days. In this regard, TST may be an effective alternative. In case of conjunctival flap to maintain integrity, the conjunctiva covers the entire cornea, it obstructs any view of the anterior chamber, which increases the difficulty of monitoring disease progression. Furthermore, when patients with short fornices were subjected to the Gunderson's flaps technique, blepharoptosis as a complication of the technique was observed in some cases [15].

CONCLUSION

TST adjunct to medical therapy can be a promising alternative for the treatment of refractory fungal keratitis with good anatomical and functional success. In relation with time to epithelial healing, most of the cases healed within 1 month, which is comparatively shorter in relation to the chronic course of the disease. With only single case of lid margin distortion as a complication of this procedure, TST in impending corneal ulcer perforation is of paramount importance in those countries in which there is a shortage of corneal donors, low socio economic condition of patients and where corneal ulcer is very prevalent such as in developing countries like Bangladesh.

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