Original Article

Prevention of Exposure Keratopathy with Sahaf Wet Chamber

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Purpose: To assess the efficacy of sahaf wet chamber in preventing exposure keratopathy in patients with lagophthalmos.

Material and Methods: Seventy patients of lagophthalmos were included in the study from outdoor in ophthalmology department Mayo hospital, King Edward Medical University Lahore from 1st January 2013 to 31st December 2013 awaiting definitive surgical intervention. Sahaf wet chamber (transparent polyurethane dressing opsite with antibiotic ointment) were changed every 24 hours. The corneal flourescein stains were performed and exposure keratopathy assessed daily till the time of surgery. The criteria of efficacy was improvement or progression of exposure keratopathy.

Results: None of 70 patients (0%) had progression of exposure keratopathy. The time on eye care every day was 3 min ± 1 min.

Conclusion: Sahaf wet chamber is more effective, time saving, easy to apply and cost effective technique in reducing the incidence of corneal damage in patients with lagophthalmos awaiting definitive treatment. It can easily be done as an OPD procedure.

Key Words: Exposure keratopathy, wet chamber, lagophthalmos

Proper eyelid closure and a normal blink reflex are essential to maintain a stable tear film and a healthy corneal surface.[1] Patients affected with lagophthalmos are unable to fully close their eyelids and have symptoms of dry, irritated eyes. Common and sight threatening morbidities of lagophthalmos are corneal exposure, dryness, desiccation and subsequent keratopathy which may progress to corneal ulceration and infectious keratitis. So timely diagnosis and prompt management can save this sight threatening condition. The reported incidence for exposure keratopathy ranges from 20 to 42%[2] within a relatively short time, ranging from 2 to 7 days that signifies the importance of effective intermediate treatment method in lagophthalmos patients awaiting definitive treatment in wards or homes.

Since lubrication[3], moist chambers and polyethylene covers[4] are most common temporary methods for preventing exposure keratopathy in lagophthalmos patients, they have got limitations. Only lubrication has higher chances of exposure Keratopathy as nursing staff has to be alert all the time for frequent instillation and are time consuming, moist chamber goggles are difficult to apply during sleep and for adults only .Polyethylene covers can be ripped off and torn by infants and uncooperative patients. In our study we have tried sahaf wet chamber (polyurethane cover opsite with antibiotic ointment) a new method to prevent exposure keratopathy that is applicable in all age groups and readily available, easy to apply, compliant and highly efficacious in preventing exposure keratopathy.

MATERIALS AND METHODS

Patients were recruited from outdoor ophthalmology department Mayo hospital Lahore from 1st January 2013 to 31st December 2013. Inclusion criteria were patients with all age groups with lagophthalmos (lids not covering the entire cornea) that were prone to

exposure keratopathy prior to definitive treatment or have some grade of exposure keratopathy as shown in table. Exclusion criteria were surgery in less than 24 hours after hospital admission as patients in study were given trial of sahaf wet chamber for at least 48 hours to 5 days).

The outdoor patients meeting the inclusion criteria were simply recruited in the study. All patients received a standard eye cleansing regime of washes to the external eye with normal saline and drying of surrounding area with sterile gauze before every treatment (Fig 1). Antibiotic ointment was instilled inside the eye (Fig 2). Patients had pieces of Opsite (polyurethane) cut to cover the eye from eye brows to the cheek bone (Fig 3). The opsite was changed every 24 hours. Patients completed the study when their turn for definitive treatment (surgery, tarsorraphy, gold weight implant) arrived but minimum time in study was 48 hours (Table 1).

The cornea was assessed by instillation of flourescein and viewing with cobalt blue light using an indirect ophthalmoscope and 20 D lens daily. Grading of exposure keratopathy was done and any improvement or progression was noted.

Mean age of the patients was 27.5 years. Total patients were 70. Out of which 45 were males while 25 were females. None of the patient had progression of disease after Sahaf Wet Chamber. 43% of the patients of Grade 1[13] were improved to normal corneal epithelium[13] (Table 2, 3, 4).

DISCUSSION

The cornea is made of stratified, non-keratinized epithelium that relies on tears for nutrients and water. Tear film is constantly spread over the corneal

RESULTS

Table 1: Etiology of lagophthalmos.

Etiology	Cases	Average Age of the Patients (Years)
Trauma	12	23
Burn	10	27
Ectropion	10	60
Ptosis with poor bells	10	5
Tumor	08	58
Coloboma	07	0.5
Facial Palsy	06	25
Thyroid eye disease	04	50
Xeroderma pigmentosa	03	9

Table 2: Severity of ocular surface disease grading[13]

Grade I	Punctate epithelial erosions (PEEs) involving the inferior third of the cornea
Grade II	PEEs involving more than the inferior third of the corneal surface
Grade III	Macroepithelial defect (MED)
Grade IV	Stromal whitening in the presence of epithelial defect (SWED)
Grade V	Stromal scar
Grade VI	Microbial keratitis[13]

Table 3: Distribution of exposure keratopathy.

No. of Cases (n = 70)	At the Time of Recruitment	No.	All the Conclusion		Progression / Improvement
Wet chamber (n = 50)	No exposure keratopathy	30	No exposure keratopathy 30		0% progression
	Grade I	10	No exposure keratopathy 10		100% improvement
	Grade II	7	Grade I 4	No exposure keratopathy 3	100% improvement
	Grade III	3	Grade III 3		0% progression

Table 4: Progression and improvement of exposure keratopathy.

Diagnosis at Time of Admission (n = 70)	No. of Patients (n = 70)	Percentage of the Patients at Time of Admission (%)	Results after 72 Hours Application of Sahaf Wet Chamber	Outcome (Percentage)
No Exposure keratopathy	30	43	No progression of disease	No progression of diseases in all 30 patients (100%)
Grade I	30	43	Improved to normal cornial epithelium (n = 30)	Progression to next grade (0%) Improved to normal cornial epithelium (100%)
Grade II	7	10	Improved to normal cornail epithelium (0) Improved to Grade I all patients (n = 7)	Improved to normal cornail epithelium (0.0%) Improved to Grade I all patients (100%)
Grade III	3	4	Improved to normal cornail epithelium (0) Progression to Grade IV (0)	Improved to normal cornial epithelium (0.0%) Progression to Grade IV (0.0%)

epithelium by lids. Tears lubricate the ocular surface, providing oxygen to the cornea and washing away noxious stimuli and potential pathogens. Eyelid closure and blinking contribute to replenishing and spreading the tear film across the cornea and preventing tear film evaporation and keratopathy.[9] The process of tear evaporation changes the temperature of the conjunctival sac, making it unfavorable for bacterial growth.[10]

While asleep, lid closure protects the cornea by keeping it moist. Eyelid closure is an active process that requires contraction of orbicularis oculi and inhibition of levator palpebrae superioris. Lagophthalmos is inability to close the lids that can be due to heavy sedation, trauma, eyelid burns[6], developmental defects (congenital colobomas)[7-8], nocturnal lagophthalmos[11] paralysis or use of paralytics that inhibit these processes. When the lids are not completely closed, tear film is not uniformly spread over the corneal epithelium so epithelium gets desiccated and shed off leading to corneal ulcers. The resulting desiccation and corneal epithelial damage allows bacteria to adhere to damaged epithelial cells with exposed collagen before migration into the stroma[12]. Without an intact epithelium, the patient is more susceptible to microbial keratitis. Microbial keratitis can lead to complications including abscess formation, acute perforation, scleritis, and endophthalmitis, causing rapid visual loss.

Suggestions that have been made for protecting the ocular surface temporarily include taping the eyes closed with transparent tape, eyelid closure, moisture

Fig 1: Patient with exposure keratopathy

Fig 2: After putting antibiotic ointment

Fig 3: After applying dressing

chamber, covering the eyes with gauze, lubricants, cyanoacrylate glue blepharorrhaphy[5], and normal saline irrigation of the eye. A moisture chamber refers to using a substance such as polyethylene covers, swimming goggles or polyurethane covers to completely seal-off the eye from the environment. In extreme cases, closure by tarsorrhaphy has been suggested, but it makes examination of the eyes difficult, is cosmetically ugly and hampers active use of the eye. The urgency and extent of treatment for keratopathy depends on the degree of ocular surface exposure[13]

Several studies have directly compared eye care practices. Lenart et al.[14] studied 50 patients who each had one eye that received artificial tear ointment every 4 hours while the fellow eye was passively closed by nurses when it was noted to be open. Among the 50 patients, there were nine abrasions in the passively closed eyes, compared with two abrasions in the ointment eyes (p=0.004). Similarly, Ezra et al[15]. Compared eye toilet with Geliperm (hydrogel dressing, Geistlich Pharma, Wolhusen, Switzerland) and Lacrilube (artificial tear ointment, Allergan, Inc., Irvine, CA). Of the 24 patients in the eye toilet group, 13 (53%) had some degree of exposure keratopathy; Out of 10 patients in the Geliperm group, nine (90%) had exposure keratopathy; and of the 13 patients in the Lacrilube group, two (15%) had exposure keratopathy. They concluded that Lacrilube is more effective at preventing keratopathy in this population than eye toilet ($p = 0.04$) or Geliperm ($p = 0.001$). The other method for preventing exposure keratopathy is prosthetic replacement with ocular surface ecosystem device which provides a liquid bandage to protect the cornea from eyelid interaction and desiccation in addition to improving vision.[16]

The tegaderm[17] (3M) and opsite (polyurethane) covering creates a moist chamber providing a barrier against tear film evaporation and exposure to air currents. It also keeps the eye clean and closed by providing a physical barrier to organisms. Its transparency facilitates frequent observation and monitoring of cornea but as polyurethane covers are thinner than 3M they are more transparent, tightly adherent and also conforms itself to uneven surfaces around the eye unlike tegaderm which leaves spaces.

Additional considerations for wet chamber use for clinical practice include the ease of application, time saving, cost effectiveness, tightly adherent polyurethane material, easily applicable in all age groups, effective to cover large lid defects (colobomas,

trauma), transparent and very compliant technique as you have to apply it once daily compared to 2 hourly lubrication and 12 hour change of moist chambers and polyethylene covers[2]. Polyethylene (3M) covers are non-elastic and thick transparent membrane that can be removed by uncooperative patients with little effort and not able to fill small gaps and curves of surrounding skin whereas Opsite (polyurethane) is a thin transparent material that adapts its shape to the gaps and curves and is highly elastic so very effective in uncooperative patients by forming close chamber and limiting evaporation of water from cornea.

CONCLUSION

Polyurethane covers with ointment are effective in reducing the incidence of corneal damage in lagophthalmos patients and it deserves to be popularized in our community to prevent exposure keratopathy.

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