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Bandage contact lens: A clinical study

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Abstract

Purpose: To evaluate the efficacy and safety of bandage contact lens in various corneal disorders.

Methods: Bandage contact lens was applied to patients who required corneal re-epithelialization promotion or pain reduction in various corneal disorders from January 2002 to April 2004 at Regional Institute of Ophthalmology, Thiruvananthapuram. Informed written consents were obtained. Bandage contact lens was applied in the diseased eye. Lens centration and movement was assessed with slit-lamp. Patients were evaluated the next day and then on weekly basis for improvement of ocular condition or occurrence of any complication. After 1 week the lens was carefully removed and cleaned with antibiotic drops. The lens was discarded in case of spoilage or in an event of any complication .The patients were followed depending on their clinical case and usage was stopped on successful outcome. Patients were also put on topical medications according to the case.

Results: Immediate pain relief was achieved in almost all patients. Complete corneal re-epitelialization was achieved in about a week. Two patients developed corneal edema and therefore had to discontinue the bandage contact lens. One patient did not tolerate the contact lens and left the study.

Conclusion: The results showed that bandage contact lens was rather safe, efficient and performed well in treatment of various corneal disorders. However it should be used with caution and closely monitored for any complications.

Keyword: Bandage Contact Lens, Corneal Re-epithelialization, Pain Reduction.

Introduction

The concept of an eye bandage was attributed to Celsus[(1)] in the first century A. D. when he was reported to use a honey soaked bandage to an eye to prevent symblepharon formation after removal of a pterygium. Muller F. A (1887),[(2)] developed a thin, blown – glass shell to protect an eye from the drying effects of lagophthalmos, thus using a contact lens as a therapeutic device. Kaufman and Gasset (1869)[(3)] experimented with a contact lens glued to a de-epithelialized Bowman's membrane with a cyanoacrylate glue. This was found to be of some value in selected cases of bullous keratopathy.

During recent years significant advances have been made in the development of contact lens polymers. These polymers have allowed for a more physiologic interaction between the cornea and contact lens. As a result, a large variety of contact lenses are available for optical and bandage purposes. Hydrophilic contact lenses as bandages have found use as a protective device for the cornea, as a pressure bandage to relieve pain, to promote corneal healing, to improve vision during the healing process and as a delivery mechanism for drugs. Bandage lenses are used primarily to promote epithelial healing, thereby preventing stromal ulceration and melting. The main causes of epithelial defects are corneal dystrophies, endothelial dysfunction, neurotrophic keratopathy and corneal ulcers which may be traumatic, infectious or inflammatory. The duration of bandage lens wear in corneal epithelial disease depends on the rapidity with which the cornea heals. It is usually advisable to leave the contact lens in place for 1 to 3 months after epithelial healing is complete to achieve better adhesion between the epithelial cells and the basement membrane.[(4,6,8,14)] Pain reducing effect of bandage contact lens is been effectively used in many painful ocular conditions like bullous keratopathy, post corneal glueing, suture irritation following open globe injuries.[(3)]

The use of bandage lenses in is also associated with a number of complications like increased risk of microbial keratitis, corneal edema, lens loss and spoilage and peripheral vascularization.[(10)] These complications can be reduced to a certain extent by careful selection of patients, regular follow –up and concurrent application of topical medications and this aspect has been focus of attention in our study. The use of bandage contact lens in treating various pathological conditions is a saga of success story carefully built up by many dedicated ophthalmologists to the cause of ophthalmology. The present study is only an attempt to revalidate the already documented facts and to add something new in a humble way to that story.

Materials and Methods

This cross sectional study was conducted between January 2002 to April 2004 in Ophthalmology department at Regional Institute of Ophthalmology, Thiruvananthapuram. After obtaining written informed consent, bandage contact lens was applied in patients requiring corneal re-epithelialization (not responding to conventional treatment) promotion or pain reduction in various corneal disorders.

The patients were categorized into 2 groups:

Group I: Corneal re-epithelialization promoting effect in

Acute corneal disorders:

1) Non –healing epithelial defect following chemical injury
2) Post-surgery - penetrating keratoplasty
3) Corneal ulcer with impending perforation

Chronic corneal disorders:

1) Peripheral ulcerative keratitis with thinning
2) Neurotrophic keratopathy
3) Recurrent corneal erosion

Group II:

Pain reduction effect

1) Bullous keratopathy
2) Post corneal glueing
3) Filamentary keratitis
4) Sutured corneal wound

Inclusion criteria:

1) At least 18 yrs. of age.
2) Understands the language of the informed consent, willing to give consent and to comply to the follow-up schedule.

Exclusion criteria:

1) Patients with active infection
2) Patients with extremely poor hygiene
3) Poor lid hygiene
4) Severe dry eyes
5) Uveitis

Bandage contact lens used for the study was HEMA (Hydroxyethylmethacrylate) with 38.6% water content. Plano lens were used. Before subjecting the patient to treatment of bandage lens, a detailed clinical history and thorough slit-lamp evaluation of anterior segment was done. After instillation of local anaesthetic drops, bandage contact lens was applied. Lens centration and movement parameters were assessed under slit-lamp. Patients were instructed to continue topical medications and report immediately if there is pain or fogginess of vision. Follow-up was done at day 1, day 3, day 5, day 7 and then on weekly basis for 2 months and then further follow-up depending on the ocular condition. Admitted patients were reviewed on daily basis till discharge and then as per schedule. After 1 week, bandage contact lens was removed, soaked in antibiotic solution and re-applied after cleaning. The bandage contact lens was discarded after successful outcome or any permanent treatment depending on the ocular indication. The time to complete epithelialization and absence of pain were recorded in each case.

Results

51 patients were considered for the study of which 2 patients discontinued bandage contact lens as they developed corneal edema, 1 patient did not tolerate the contact lens, 3 patients developed lens deposits and 5 patients reported with lens loss. 48 patients completed the study.

Table 1: Corneal re-epithelialization promotion in acute and chronic corneal disorders (Group 1)

Group 1	No. of cases
Chemical injury	13
Post-surgery	3
Impending corneal ulcer perforation	2
Neurotrophc keratopathy	4
Recurrent corneal erosion	7
Peripheral ulcerative keratitis	1

Table 2: Pain reduction effect (Group 2)

Group 2	No. of cases
Bullous keratopathy	8
Post corneal gluing	2
Filamentary keratitis	5
Sutured corneal wound	3

Table 3: Re- Epithelialization promotion (Group 1)

Group I	No of cases	Age in years mean (Range)
Chemical injury	13	25 (24-67)
Post-surgery	3	61 (20-76)
Impending corneal ulcer perforation	2	49
Neurotrophc keratopathy	4	49 (23-72)
Recurrent corneal erosion	7	47 (28-67)
Peripheral ulcerative keratitis	1	38

Table 4: Pain Reduction effect (Group 2)

Group 2	No of cases	Age in years mean (Range)
Bullous keratopathy	8	50 (26-76)
Post corneal gluing	2	29
Filamentary keratitis	5	30 (25-65)
Sutured corneal wound	3	35 (24-72)

Table 5: Re- Epithelialization promotion (Group 1)

Group 1	No of cases	Complete epithelialization in days mean (Range)
Chemical injury	13	5 (3-7)
Post-surgery	3	5 (4-7)
Impending corneal ulcer perforation	2	7
Neurotrophc keratopathy	4	10 (8-15)
Recurrent corneal erosion	2	2 (2-3)
Peripheral ulcerative keratitis	1	14

Table 5: Complications following insertion of bandage contact lens

Type	Number of eyes
Lens loss	5
Lens deposits	3
Corneal edema	2
Lens intolerance	1

Discussion

Bandage contact lens are now been increasingly used for various corneal disorders to either facilitate epithelial healing process or pain reduction. The present study evaluated its effectiveness and safety in corneas which are already compromised. Patient selection for bandage lens wear was critical. So only those patients who were willing to comply with the follow up schedule were only included in the study. Chemical injuries constituted a major proportion of patients in our study. Inspite of the usual conventional management, majority of patients develop non healing epithelial defects which not only cause patient discomfort but pave the way for corneal ulceration and thereby blindness. In such instances bandage contact lenses may be employed which allow the epithelium to heal reducing discomfort and at the same time also maintain visual acuity. The present study revealed that the lens was effective in acid and alkali burns as concluded by Kaufman H E[15,23] and co-workers. Active infectious corneal disease is a contraindication for a bandage lens. However when the infectious process has been controlled but corneal epithelial defect persists, a bandage contact lens may be used. The present study found bandage lens to be effective in the above circumstances as concluded by Aquavella J V,[5] Cavanagh HD,[7] Williams R and Buckley R J.[16]

Bandage lenses are also extremely effective in treating certain complications of corneal transplantation. Leakage of aqueous humour from suture tracks may be controlled with a contact lens with or without pressure patching. Irritation caused by sutures after corneal transplantation may result in excessive mucoid discharge and small tissue melts around nylon suture knots. A bandage lens combined with other therapies may help. They are also useful in accelerating healing of corneal epithelial defects after vitrectomy.[23] In cases of corneal ulcer with impending perforation, bandage lenses can give structural support and help in healing process thereby preventing vision threatening perforation and also buy time for future keratoplasty procedures. In our study we had two cases of impending perforations which healed following contact lens application. Hirst L W et al (1982)[13] effectively employed bandage contact lens in treatment of corneal perforation and descemetocele. In certain chronic corneal conditions like recurrent corneal erosions and neurotrophic keratitis, where patients present with repeated acute symptoms of pain, watering and photophobia due to corneal epithelial defects, bandage lens not only provides prompt relief of symptoms but also promote epithelial healing thereby ameliorating their condition.

Pain reduction effect was also observed in many conditions like bullous keratopathy, post corneal glueing, filamentary keratitis and suture irritation following open globe injuries of cornea. Bullous keratopathy occurs due to the diseased corneal endothelium which causes stromal and epithelial edema. This results in the formation of microcysts and bullae which on constant rubbing by lids rupture and result in severe pain and foreign body sensation. Bandage contact lens reduces the interaction of lids with cornea and irritation of the exposed corneal nerves thus reducing the pain. The present study revealed similar findings compared to those of Leibowitz H M,[4] Cavanagh H D,[8] Hovding G[14] and Kaufman H E.[15] The bandage lens can be used to temporarily to help control symptoms of band keratopathy with overlying epithelial erosions as studied by Williams R, Buckley RJ[16] and Hayworth NAS, Asbell RA.[22]

The use of bandage contact lenses for mechanical protection in trichiasis and entropion, Thygeson's superficial punctuate keratopathy,[9] superior limbic keratoconjunctivitis,[12] mooren's ulcer,[19] pellucid and terrien's marginal corneal degeneration,[20,21] traumatic corneal abrasions and as drug delivery devices has yielded very good results. However, increased use is also associated with increasing bandage lens related complications. The commonest complication in our study was lens deposits and lens loss as reported by Arora et al.[24] This can be due irregularity of corneal surface in majority of these conditions. Another complication encountered was corneal edema in 2 patients due to hypoxia. The reason is that bandage lenses by design demonstrates less movement to prevent the healing epithelial cells from being sloughed off due to movement of the lens itself.[25] This in turn affects the oxygenation of cornea leading to hypoxia.

The water content of the lens is also of paramount importance since the amount of oxygen that diffuses through the lens is directly and exponentially related to lens hydration. In general, the greater the water content of the contact lens, the greater the oxygen supply to the cornea.[11] The major limitation in our study was that we used HEMA lens with 38.6% water content. This could probably explain the increased number of corneal edema cases in our study. This complication can be reduced with more recent contact lenses like the fluorosilicone hydrogel lenses. The other complication was tight fit in one patient resulting in discomfort to the patient. The present study did not have any case of infectious keratitis as a complication because of close follow up of patients with cleaning of lenses at weekly intervals and also replacing the lenses if damaged along with concurrent application of topical medications.

Recently, collagen shield consisting of thin film of sterile non cross- linked porcine sclera collagen as corneal bandage has become available for short – term protection of the cornea after surgery, trauma or in cases of non-traumatic corneal surface disorders. The collagen shield consists of a thin (0.0127 – 0.71mm) film of sterile non-cross linked porcine sclera collagen. The diameter is 14.5mm, the base curve is 9mm, and the power is plano. Three types of shields are available, which may last from 24 -72 hours on the eye.

Conclusion

The following conclusions were drawn from the study:

1. Bandage contact lens was rather safe, efficient and performed well in treatment of various corneal disorders.
2. It should be used with caution and closely monitored for any complications.
3. Strictly maintain careful follow-up and appropriate therapies when using these lenses.
4. Pain reduction was immediate following insertion of bandage contact lens in all cases studied.

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