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Review Article

Role of bandage contact lens in corneal disorders: A review

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ABSTRACT

Cornea undergoes repeated injury by external atmosphere and frequent blinking of lids. Thus proper healing atmosphere is of utmost importance. BCL provides protection, promotes healing by migration of epithelial basement membrane cells. It also minimises the irritation of corneal nerve endings thus minimises pain. It also helps in providing a tectonic support to the outer coat of eye ball in case of impending perforating ulcers, acts as a barrier between tarsal conjunctiva and suture knots. Role of BCL after refractive surgery is very important as it promotes epithelisation and helps in preventing irritation and rubbing.

However BCL should be carefully used in dry eye disease and frequent follow up is mandatory to detect early signs of microbial keratitis, and signs of corneal hypoxia.

1. Introduction

Cornea is the anterior $1/6^{th}$ of outer fibrous coat of eye with rich nerve supply. It undergoes repeated insults both from external atmosphere and due to frequent blinking. Corneal pathologies are often very painful and leads to poor visual acquity. The shearing effect of frequent blinking of lids hampers the there epithelization of cornea which is the basis of healing, thus causes pain. Use of a BCL provides a safe environment for cornea to repithelize and prevent the nerve endings from the repetetive shearing force, thus pain subsides.

The concept of bandaging the eye and to protect the cornea came from first century A.D when Celsus applied a protective honey soaked linen to bare sclera after removal of pterygium to prevent symblepharon.[1,2] BCL were first introduced in 1970 after development of hydroxyethyl methacrylate (HEMA) by otto wichterle.[2] Gasset and kaufman in 1970 also applied BCL for promoting epithelisation and pain management.[3] The basic aim of applying a BCL is to protect the cornea from repeated trauma and thus facilitating its healing.

The nomenclature of BCL suggests, its prime function is to protect the cornea. The BCL assist in regeneration of basement membrane and restoration of tight epithelial stromal adhesion. Differents materials were used in past for BCL (hydrogels, collagen shields, gas permeable sceral lenses, silicone hydrogels, HEMA) due to high oxygen permeability and FDA approval for long and extended wear, silicone hydrogel lenses are the most common type being currently used in ophthalmic practice throughout the world.

Depending on the ocular condition and ocular pathology BCL may be used for variable extended periods thus appropiate material for appropiate duration must be taken care of. The BCL when applied on pathologic eye for extended periods tend to have lipid depositions on it. Thus proper cleaning and proper vigilant follow ups are required to rule out any complications related to wearing of contact lenses. Moreover there may be mechanical trauma to the cornea due to misfit of the BCL itself.[4]

1.1. Indications of bandage contact lenses

BCL may be used for various ocular conditions like protecting corneal epithelium, provide comfort, tectonic

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support, sealing small corneal ruptures, post surgical and in dry eyes to maintain hydration and to increase drug delivery. Many more indications are surfacing day by day.

2. Protection

The anterior surface of cornea is regular and all the epithelial cells are bounded by tight junctions. Recurrent epithelial erosions are a typical sequella of epithelial basement membrane (basal lamina) insult or trauma or are secondary to anterior basement membrane dystrophy, anterior basement membrane degeneration or stromal dystrophy. In conditions like ectropion, entropion, lagophthalmous, trichiasis , dystrichiasis,tarsal scars, palpebral follicles and papillae, post surgical suture knots, exposed sutures, recurrent corneal erosions, persistent epithelial defects, proper protection and rest to the corneal epithelium is required. In these conditions BCL becomes the second line of treatment after use of ointments, lubricatings or hyperosmotic agents does not yield desired results.[2,5] BCL also helps in acheiving better visual acquity in these conditions due to its ability to provide a regular smooth anterior refracting surface as opposed to irregular surface in diseased condition.[5] Moreover after application of BCL the medications may be continued as before as it enhances the drug delivery to the eye because of cappilary actions and longer retaintivity.

3. Pain relief

Cornea is the most densly innervated tissue in human body. Free nerve endings on the corneal surface make it most pain sensitive organ. Thus any pathology of cornea is aften associated with pain. Thus pain management in cornea clinic is utmost important. Minimising pain is another important indication of BCL. To name a few conditions are bullous keratopathy, filamentary keratitis, postoperative penetrating keratoplasty, persistent epithelial defect, recurrent corneal abrasions.

In bullous keratopathy the pathology lies in decompensated corneal endothelium due to which corneal edema occurs resulting in epithelial blister formation due to frequent blinking movement of eye lids and rubbing the blisters ruptures and causing pain, irritation and foreign body sensation. BCL protects the free nerve endings and reinforces the damaged tissues, thus minimises the pain. Although DSEK or penetrating keratoplasty is the definitive management but for temporary management of pain and foreign body sensation BCL may be used along with hyperosmotic agents.[2]

Untill recently, for patients with large epithelial defect due to injury or abrasion due to any other cause, patching was main stay of treatment. With application of BCL the concept of eye patching took a backstage as it may facilitate vegetative growth in case of injuries to cornea. However after application of BCL frequent and vigilant follow up is mandatory. The authors of the Wills Eye Manual caution, however, that prophylactic topical antibiotics should be used concurrently and that daily follow-up care is mandatory.[6] Another advantage of BCL over eye patching is that in former case the topical medications can be instilled contionously like antibiotics anti fungals and lubricatings which help in earlier healing as compared to later. However in BCL users use of cycloplegics is warranted because they relieve pain and underlying pathology may be supressed. Moreover with use of cycloplegics, cornea may become dry overnight and hamper the healing response.[7] With use of BCL the drug delivery is increased to the corneal surface as stated earlier.

4. Healing

BCL remains the main supportive stay of treatment after refractive surgeries like photo refractive keratectomy (PRK), LASIK, epiLASIK, LASEK, phototherapeutic keratectomy (PTK), corneal flaps, lamellar grafts. They enhance healing by preventing exposure and constant irritation by rubbing.

BCL may be used in case of persistent epithelial defects, sterile corneal ulcers, neurotrophic keratitis, exposure keratitis, chemical burns , basement membrane diseases.

5. Sealing

Role of BCL in small corneal rupture less than 2mm with clean margin is proven. These sort of corneal ruptures are not sutured now a days. Biological glues are applied and BCL is placed which is sufficient to seal the wound and prevents the patient to undergo surgical trauma.

BCL may act as a splint or sealant for leaky wounds after cataract surgery particularly phaco emulsification, bleb leakage after glaucoma filtering surgery, penetrating keratoplasty. Application of BCL after phacoemulsifaction also improves in symptoms of dry eye syndrome and increases the tear film stability.[8]

6. Maintainance of corneal hydration

Role of BCL in dry eye syndrome is controversial as it may further aggravate the condition. But patients who need continous instilation of medications like lubricatings, the use of BCL is of great help. Patients suffering from lagophthalmos and subsequent exposure leading to dry lustureless cornea benefits a lot from application of BCL as it prevents evaporation of tears and stabilizes the corneal tear film thus preventing the dryness.

6.1. Structural stability and protection in irregular cornea

In cases of irregular cornea, patients often need rigid lenses to obtain clear vision. These rigid lenses in due course rubs the cornea and forms corneal abrasions and scars.so the concept of piggyback lens came to the picture as soft BCL protects the cornea and the rigid lenses are placed over BCL to give structural support to regain good visual acquity. These are particularly helpful in patients of keratoconus, keratoglobous.

7. Contraindications

As such there are no absolute contraindications of BCL but its use is warranted in cases of severe dry eyes as it may worsen the condition by preventing healing. Futher use of BCL for extended duration may lead to increased chances of microbial keratitis, frequent follow up is needed. Use of BCL for extended duration may lead to anoxia or hypoxia of corneal epithelial cells but with improvement in materials of BCL bioavailability of oxygen is improved, however routine checkups are mandatory to detect early signs of corneal hypoxia.

8. Conflict of interest

None.

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