ECRONICON OPEN ACCESS

EC OPHTHALMOLOGY
Mini Review

Keeping an Eye on Corneal Abrasions

Felicia Marino, Jasmine Okafor, James F Keane and Leonard B Goldstein*

A.T. Still University, USA

***Corresponding Author:** Leonard B Goldstein, Assistant Vice President for Clinical Education Development, ATSU Academic Affairs, A.T. Still University, Mesa, AZ, USA.

Received: April 11, 2023; **Published:** May 20, 2023

Abstract

The World Health Organization states that Major Depressive Disorder (MDD) is a leading cause of disability, affecting about 300 million people worldwide, and is expected to be the leading burden of disease by 2030. Pharmacological therapy for depression is only effective for 74% of patients. The ineffectiveness of therapy, in addition to the overprescribing of antidepressants, has pushed research to explore the gut-brain-microbiota axis and evaluate it as a therapeutic option when addressing mental health. We have conducted a review of the PubMed databases focusing on the past decade, with consideration to the physiological make-up of depression, serotonin, gut-brain axis, and the pros and cons associated with them. We also considered the influence of the COVID-19 and its long-term effects associated with depression and gut microbiome. Studies have established how unhealthy microbiota results in lower serotonin levels, which are seen in patients with MDD. Similarly, research has uncovered various bacteria, hormonal influences, target pathways, and lifestyle changes, which have been shown to improve the health of the gut, increase serotonin levels, and provide an overall positive influence on the patient's wellbeing. Gaining further understanding of the gut's microbiome and effects of treatment, such as bacteriophage therapy, will help clarify the role of the gut in MDD and allow researchers to optimize the gut's overall health with the goal of providing a more comprehensive, effective treatment for patients affected by MDD. As research continues and understanding of how the gut communicates with the brain comes to fruition, treatment of MDD will stand a higher chance of yielding healthy guts and happy people.

Keywords: *Major Depressive Disorder (MDD); Eye; Corneal Abrasions; Gut's Microbiome*

Introduction

One excruciatingly painful and frequently occurring eye injury is corneal abrasion. If it is minor, healthy corneal cells quickly fill the defect and avoid complications such as infection and secondary vision damage. However, if it affects the deeper corneal tissue, the patient may need active intervention, and healing may take one [1] to two [2] days [9], and up to five [5] if larger surface areas are involved [13].

More than one-fourth (1/4) of ocular emergencies in a tertiary eye hospital were reported to have a diagnosis of corneal abrasion [2]. General treatment strategies for corneal epithelial defects are either application of topical antibiotics, the temporary use of bandage contact lenses, or topical analgesics.

An estimated twenty percent (20%) of the population suffers from an eye trauma during their lifetime. The rate of eye injuries in the United States is estimated to be over one million annually. These increasingly high numbers illustrate the need for a better understanding of corneal healing mechanisms, and the development of efficient ways to accelerate and improve wound healing [10].

Background

To understand how corneal abrasion pain is treated, it is important to first consider the mechanism behind the pain. The cornea is made up of five [5] layers, each being supplied with sensation from nerve fibers originating in the ophthalmic division of the trigeminal nerve [5]. Pain is sensed through the polymodal nociceptors on the endings of these fibers and are fired in response to noxious mechanical, thermal, or chemical stimuli [5]. In addition, these receptors can cause a reflex tear production, blinking, or release of trophic factors in an attempt to maintain the integrity of the ocular surface [5]. Increased peripheral activity from these receptors, from events like corneal abrasions, can lead to sensitization that can cause even smaller stimuli, such as light or moving air, to be perceived as intense pain [5]. This can be accompanied by swelling (endobulbs) and sprouting (neuromas) at the terminal ends which can cause spontaneous neuropathic pain [5].

Healthy cells from minor corneal abrasions will avoid these complications because they can regenerate more quickly. However, it can take longer for a larger injury to heal, leaving the cornea susceptible to infection or changes in refraction from permanent scarring [13]. Treatment modalities aim to protect the cornea during this extended period of time.

Topical antibiotics

Prophylactic topical antibiotics remain the first-line treatment for corneal abrasions in attempts to prevent infection and damage that follows [13]. Antibiotic ointment is recommended over drops because it lasts longer [1], is more lubricating [13] and is the least expensive [1]. Examples of antibiotic ointments used for corneal abrasions are erythromycin, and gentamicin [3]. This treatment method is associated with a lower risk of developing an ulcer [13] and is especially indicated in contact lens wearers and immunocompromised patients [7]. In both of these groups, an antipseudomonal agent is used [7] and daily contact lens wearing is avoided until the abrasion has healed [1]. Arguments against the use of topical antibiotics point to the low infection rates of untreated corneal abrasions, at 0.7%, and the potential to cause toxic or allergic reactions from the medication [7].

Pressure patches and bandage contact lenses

Traditionally, pressure patches were thought to be a reliable method for the treatment of corneal abrasions. By acting as a physical barrier, pressure patches would reduce mechanical injury from eye rubbing and pain from blinking [4]. Unfortunately, the eye patch itself was found to be a major cause of pain in forty-eight percent (48%) of patients [4] and had effects that hindered the healing process. Patches induced heat and moisture, depleted oxygen delivery [4] and had the potential to mask worsening infection [7]. The ability of patches to trap infection or fungal matter contraindicated their use with abrasions from organic material [4]. In addition, patching results in the loss of binocular vision, which can induce amblyopia, contraindicating their use in children [4]. Furthermore, groups of patients that healed without a patch were shown to have higher compliance, less pain, better vision, and significantly faster healing than patched groups [8]. Today, protective eyewear is recommended as a sufficient form of physical protection to the eye and adnexa [13].

Another form of physical protection that has been shown to treat ocular conditions is the use of bandage contact lenses. In extensive corneal traumas, bandage contact lenses provide a barrier by sitting on the cornea and preventing increased sensations of pain from blinking [12]. Unlike pressure patching, binocular vision is maintained and no removal is required for eye drop application [12]. Bandaged patients report to be more comfortable and in less pain than those who are patched [12]. Bandage contact lenses have also been used to lessen acute pain after surgeries like Photorefractive Keratectomy (PRK) by accelerating healing processes such as reepithelialization [6]. However, with any contact lens use, it is wise to be aware of the risk of infectious keratitis [1].

Topical analgesics and anesthetics

Aside from preventing infection and further injury, it is necessary to ensure pain is controlled while managing corneal abrasions. Topical nonsteroidal anti-inflammatory drugs (NSAIDs) like ketorolac and diclofenac [7], have been found to provide greater relief than other methods like patching [4]. Using topical NSAIDs can reduce the number of oral analgesics and narcotics taken and may get patients back to work faster [13]. Although pain relieving, the benefit of NSAIDs must be weighed with the risks. Ketorolac may cause delayed wound healing [13] and diclofenac has been seen to cause epithelial breakdown [13]. Caution must be used in those who bleed easily or wear contact lenses [13].

Another form of topical pain control is topical anesthetics, such as tetracaine and proparacaine. These have been found to provide great relief without complication when used in small doses for a short duration (24 - 48 hours), which is when pain is most intense [7]. However, topical anesthetics also carry the ability to delay healing by inhibiting mitosis, causing corneal erosion [11] and corneal scarring [4]. In other light, decreasing corneal sensation can be quite harmful. Masking pain of an emerging infection [7] or progression to an ulcer [11] could prolong the time it would take for a patient to seek care. For these reasons, topical anesthetics are still widely discouraged after initial examination [13].

Conclusion

Familiarity with management of corneal abrasions can make a difference in outcomes. The window of healing where treatment is most effective is short, so it is crucial to act fast in avoiding sensitization, infection, and further injury. Administering antibiotics can prevent the wound from becoming infected and progressing to ulcer, scarring, and visual deficit. Protecting the eye with glasses alone is sufficient in most cases while pressure patches tend to impede the healing process. Bandage contact lenses can be used with caution postoperatively in controlled procedures like PRK. Finally, topical analgesics and anesthetics work well to facilitate eye exams and diminish acute pain, but can disrupt wound healing with chronic use.

Bibliography

1. Buttaravoki P. "Corneal Abrasion". *Minor Emergencies* 16 (2007): 74-77.
2. Docherty G., *et al*. "Prospective Analysis of Emergency Ophthalmic Referrals in a Canadian Tertiary Teaching Hospital". *Canadian Journal of Ophthalmology* 53 (2018): 497-502.
3. Fisher L and Dorsch J. "Red Eye". *Conn's Current Therapy* (2023): 524-529.
4. Fowler GC. "Corneal Abrasions and Removal of Corneal or Conjunctival Foreign Bodies". *Pfenninger and Fowler's Procedures for Prim Care* 200 (2020): 1338-1344.
5. Goyal S and Hamrah P. "Understanding Neuropathic Corneal Pain- Gaps and Current Therapeutic Approaches". *Seminars in Ophthalmology* 31.1-2 (2016): 59-70.
6. Grentezelos MA., *et al*. "Efficacy of 2 Types of Silicone Hydrogel Bandage Contact Lenses after Photorefractive Keratectomy". *Journal of Cataract and Refractive Surgery* 35 (2008): 2103-2108.
7. Guluma K and Lee JE. "Ophthalmology". *Rosen's Emergency Medicine: Concepts and Clinical Practice* 61 (2018): 790-819.
8. Kaiser PK. "A comparison of pressure patching versus no patching for corneal abrasions due to trauma or foreign body removal: Corneal Abrasion Patching Study Group". *Ophthalmology* 12 (1995): 1936-1942.

9. Le Sage N., *et al*. "Efficacy of Eye Patching for Traumatic Corneal Abrasions: A Controlled Clinical Trial". *Annals of Emergency Medicine* 38 (2001): 129-134.

10. Ljubimov AV and Saghizadeh M. "Progress in Corneal Wound Healing". *Progress in Retinal and Eye Research* 49 (2016): 17-45.

11. Swaminathan A., *et al*. "The Safety of Topical Anesthetics in the Treatment of Corneal Abrasions: A Review". *The Journal of Emergency Medicine* 49 (2015): 810-815.

12. Triharpini NN., *et al*. "Comparison Between Bandage Contact Lenses and Pressure Patching on the Erosion Area and Pain Scale in Patients with Corneal Erosion". *The Asia-Pacific Journal of Ophthalmology* 4.2 (2015): 97-100.

13. Wilson SA and Last A. "Management of corneal abrasions". *American Family Physician* 70 (2004): 123-128.

Volume 14 Issue 5 May 2023