

SILK VISION AND SURGICAL CENTER

Chemical related eye injuries are one of the leading causes for emergency room visits in the U.S. These injuries most frequently occur in the workplace, in the home environment or as a means of assault. Often the patients are young adults in the prime of their working careers with devastating personal and economic affects. In this newsletter we review the management and treatment strategies for these cases in hopes of improving clinical outcomes.

Any foreign chemical to the eye can be damaging but the effect of alkaline and strong acids cause the most injury to the eye. While weak acids often precipitate with the proteins in the cornea and do not penetrate the eye, strong acids and alkalines rapidly overcome this barrier and significantly alter the neutral pH of the eye resulting in rapid vision loss. Although there are many ways of staging these injuries I find it easier to separate these cases into acute stage (first 3 weeks after injury), subacute stage (3 to 12 weeks after injury) and chronic stage (3 months after the injury).

Typically during the acute stage patients can present with intense pain, photophobia, increased intraocular pressure and decreased vision. The severity of the injury can range from mild inflammation to severe destruction of the ocular surface depending on the duration, nature, and pH of the chemical. It is during this critical time that the eye be thoroughly irrigated with any neutral solution readily available (i.e. water, soda, milk) and any foreign particles removed. Ideally patients should be treated with aggressive topical steroids (1 drop of 1% topical prednisone every 1 to 2 hours) in hopes of limiting the destructive effects of the inflammation. We also use a topical antibiotic and cycloplegia for patients with an epithelial defect and photophobia.

During the subacute stage patients with mild injuries often do very well. Their vision returns to normal and they can quickly taper off of their medications. However patients with moderate to severe injuries will need to continue the use of topical prednisone and slowly be tapered off. A common error is to not use enough steroids early on and to taper them too quickly for fear of delaying wound healing. In our clinic we try to correlate the patients' symptoms, vision, iop, and degree ocular surface injury and try to customize a regimen that controls the inflammation. This regimen usually consists of topical steroids, preservative free artificial tears, topical Beta blockers or oral Diamox for iop control. We also eliminate ones that can further irritate the eye such as prolonged use of topical antibiotics or prostaglandins. In severe cases where inflammation cannot be controlled with topical medications, an amniotic membrane is of great help. Its' strong anti-inflammatory properties helps provide a great platform for conjunctiva and corneal wound healing.



Fig. 1 Severe chemical injury with early corneal neovascularization.



Fig. 2 Alkali burn. Note the severe conjunctival reaction and stromal opacification.

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In severe cases the eye sustains massive injury to both the cornea and conjunctival limbal stem cells. It is during the chronic stage of these injuries that opacification of the cornea occurs with conjunctivalization of the anterior surface. In addition to decreased vision, patients often complain of pain and discomfort. Also at this stage the ocular surface can breakdown resulting in epithelial defects which leads to a higher risk of infection. Fortunately new treatment strategies are available. For monocular injuries conjunctival limbal stem cell autografts can be used in which as little as three clock hours of healthy tissue from the uninjured eye can be used for transplantation to the injured eye. These patients do very well with excellent vision and corneal clarity and because the tissue is from the same patient, there is no concern about graft rejection or need for long term immunosuppression.

Bilateral injuries are more difficult to manage because of the need to use allogeneic tissue for transplantation. This requires the patient to be on lifelong immunosuppression agents. In the past these patients needed to be frequently monitored for blood dyscrasias and infections by a team of physicians and had to be constantly on guard for graft rejection. However in recent years our experience has grown as more and more patients undergo organ transplants in the U. S. Also with newer immunosuppressives agents, outcomes have significantly improved with better vision and less serious side effects. New bioengineering techniques to culture and expand patients' own corneal limbal stem cells are also being developed and may one day prove to be a much safer alternative and treatment of choice.

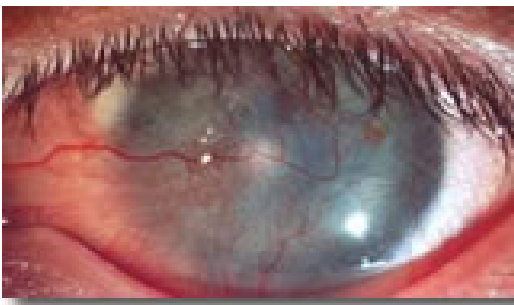


Fig. 3 Longstanding chemical injury with conjunctivalization of the cornea.



Fig. 4 Same patient as Fig. 3 after limbal stem cell transplant.

We are fortunate in our field to have a limited number of true emergencies. Chemical injuries are certainly one of the most important and frequent. Like all emergencies the most critical period is during the first few minutes and hours after injury. Irrigation and neutralization of the pH followed by aggressive anti-inflammatory and glaucoma management are the keys to a successful outcome.

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