The Morgan® Lens
MorTan® Inc.
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Ocular Irrigation Fact Sheet #1

Treating Ocular Chemical Burns

Ocular chemical burns are most often the result of accidents at home or work, although a growing number are from deliberately inflicted injuries. Automobile airbags are also increasingly cited as a source of alkali burns.

Ammonia (ammonium hydroxide), lime (calcium hydroxide), and lye (sodium hydroxide) are the most common alkalis. Magnesium hydroxide, found in fireworks, may produce very serious chemical and thermal burns. Sulfuric acid, found in automobile batteries and toilet bowl cleaners, is the most common cause of acid burns.

Solvents such as gasoline, alcohol, and acetone, will degrade proteins and lead to epithelial desiccation and keratitis. Detergents and surfactants will emulsify lipids in cell membranes, causing surface damage and an increased risk for bacterial infection.

Contact lenses may actually act as a barrier from caustics. Do not delay irrigation in order to remove contact lenses. Lenses generally are more easily removed after a period of irrigation and should be discarded.

For References and Additional Information visit:
www.morganlens.com

Management:

Essentially all chemical eye injuries require the same treatment: prompt and prolonged irrigation until the pH returns to neutral. The obvious goal is the preserve eyesight, but if this is not possible, irrigation should still be performed in order to save enough healthy tissue to allow a corneal transplant.

It is critical that irrigation covers the whole surface of the globe and extends into the conjunctival fornices.

Irrigating Solutions:

Irrigation should not be delayed to obtain visual acuity or to determine the chemical agent. Irrigation should be started as soon as possible using any suitable (clean and non-toxic) solution. Although Normal Saline is commonly used, there is evidence that lactated Ringer's (Hartmann's Solution) is less irritating (due to a pH that is closer to that of tears) and possibly more effective (due to its buffering capacity). See MorTan's Fact Sheet on Ocular Irrigating Solutions for More information.

Studies have shown that lactated Ringer's instilled through a Morgan Lens is more tolerable for the patient. Tolerability is critical in order to irrigate a sufficient period of time.

Goldfrank's Toxicological Emergencies states that eyelids should be everted and the fornices swabbed unless the irrigation is done using a Morgan Lens.

Pain is not a good indicator:

Nearly 30% of ocular injuries are bilateral, supporting the theory of irrigating both eyes unless there is a compelling reason to treat only one. The degree of pain is not necessarily a good indicator of the severity of a chemical burn as the pain in one eye may mask the pain in the other. Also, alkali burns have been known to cause nerve damage, providing their own analgesic effect. Finally, with some caustics, the onset of pain may be delayed for hours.

Prompt and prolonged irrigation has the greatest influence on the outcome.

Continue until pH returns to normal:

It is generally accepted that irrigation should be continued until the pH of the eye returns to normal. This may require at least 30 minutes of irrigation for acid burns and 2 to 3 hours (or more) for alkali burns.

It should be assumed that the caustic is an alkali until proven otherwise. If the patient needs to be moved, irrigation should be continued throughout the transfer process.

Hydrofluoric Acid acts like an alkali, causing liquifactive necrosis and releasing fluoride ions. Some experts recommend irrigation with a 1% calcium gluconate solution (10cc calcium gluconate 10% per 100 cc normal saline)

To be effective, irrigation must be:
-started as soon as possible after the injury
-continued until pH returns to normal
-reach all parts of the eye

Some chemicals generate heat when mixed with water (or tears), so irrigation may also help by cooling the eye.

Acid:
pH less than 7.0

Base (alkali):
pH greater than 7.0

Both acids and bases are known as "caustics"

Acids should NEVER be neutralized with an alkali and vice-versa. Exothermic reactions or the production of a precipitate or gas may result, causing additional damage. Some reactions can generate considerable heat when mixed with water (or tears) causing thermal burns.