SPEAKER NOTES FROM THE MORGAN LENS POWERPOINT PRESENTATION
(these notes may be viewed by right clicking and selecting "Speaker Notes" on any PowerPoint slide)

Page 1--Slide Title: *Ocular Chemical Burns*

Quoted from "Prompt Irrigation of Chemical Eye Injuries May Avert Severe Damage", Frank R. Burns, MD, Occupational Health & Safety, April, 1989

Effective treatment MUST BE:

1. PROMPT: Be started as soon as possible--treatment should NOT await until arrival at the Emergency Department
2. PROLIFIC: Reach all regions of the eye, diluting the contaminant and washing away particulate matter
3. PROLONGED: Be continued uninterrupted for a sufficient period of time (for chemical burns, until the pH returns to neutral. Note that this may take hours).
Irrigation may be done using "water...beer, urine, or any other reasonably safe fluid." (Principles and Practices of Emergency Medicine, Third Edition, Schwartz, et.al.) MorTan recommends the use of lactated Ringer's (Hartmann's solution) due to a pH similar to that of tears and because of its buffering capacity.

Page 2-- Slide Title: *The Morgan Lens*

Ocular burns represent 7 to 10% of ocular trauma presented to EDs.
84% are chemical burns (acids to alkali ratio varies from 1:1 to 1:4 depending on study)
16% are thermal burns
15-20% of patients with facial burns exhibit ocular injury
In 1995, approximately 1/3 of corneal transplants were done on eyes that sustained chemical burns (even if eye cannot be saved, irrigation should be performed in an attempt to maintain enough healthy tissue to allow a corneal transplant).

Page 3-- Slide Title: *Uses of the Morgan Lens*

Background:
Acids are defined as proton donors (H+); their strength is based on how easily they give up the proton. The pH of acids vary from 0 to 7, and a very strong acid such as hydrochloric acid (HCl) has a pH of 1. An ocular acid burn produces coagulation necrosis (the eschar that forms then limits further penetration of acid).
Alkalis (also called bases) are proton acceptors (OH-); their strength is measured by how tightly they bind the proton. The pH ranges from 7 to 14, with a very strong base such as sodium hydroxide (NaOH) having a pH of 14. Produce liquefaction necrosis (which does NOT limit or slow penetration, therefore more damaging than acids).
Both acids and bases are called caustics. Concentrated forms of either may generate significant heat when diluted, resulting in thermal injury (most pronounced when small amount of fluid is present--as in the eye). Large amount of fluid (irrigation) dissipates heat in addition to diluting caustic.

Page 4 -- Slide Title: ***Alkali Burns (Bases)***

Ocular alkali burns are THE MOST SERIOUS OCULAR BURNS as they rapidly cause liquefactive necrosis (saponification of fatty acids of cell membranes with associated inflammatory response (release of proteolytic enzymes) which causes further damage). Damage continues as alkali rapidly penetrates through ocular tissues (5 to 15 minutes to reach anterior chamber).

Note that alkali burns may not be the most painful: the alkali can quickly penetrate the corneal stroma, interfering with sensory nerves. The nerve damage may actually produce an anesthetic effect as the alkali continues penetrating into the anterior chamber and retina, causing permanent blindness.

Automobile air bags are a growing source of alkali burns. A reaction of sodium azide inflates the bag, but also produces aerosolized powdered sodium hydroxide (a strong base). In addition, there may be inert powders (intended to keep the bag from sticking) that may cause irritation.

Sodium and Potassium Hydroxide--found in cleaners, Clinitest tablets (45-50%). Considerable heat generated when mixed with water (Clinitest tablets generate temperatures of nearly 160 degrees F when dissolved in 1.5 mL of water).
Calcium Hydroxide-found in household bleach and pool chlorination solutions.
Calcium oxide (lime)-caustic ingredient in cement; generates heat when mixed with water.
Ammonia--in cleaners and detergents.
Magnesium hydroxide and Phosphorus--found in sparklers and flares.

Page 5-- Slide Title: ***Acid Burns***

Hydrofluoric acid is a weak acid that produces liquefaction necrosis and therefore act more like an alkali (therefore burns are very serious). Found in glass etching compounds, rust removers, cleaners, manufacturing and refining.

Sulfuric acid generates considerable heat when diluted. Found in automobile batteries, cleaners (toilet bowl, drain, metal), manufacturing.

Nitric acid used in metal refining, electroplating, engraving, manufacturing.

Hydrochloric acid is found in cleaners (toilet bowl, metal), plumbing applications, laboratory chemicals.

Acetic acid is found in printing, disinfectants, hair care products. Vinegar is dilute acetic acid.

Formic acid is used in airplane glue and manufacturing.

Page 6-- Slide Title: *Irritants*

Not necessary to monitor pH with irritants.

Should irrigate until pain is gone (usually 20 to 30 minutes minimum).
Check for corneal abrasions and treat accordingly.

Page 7-- Slide Title: *Materials Necessary for Irrigation with the Morgan Lens*
note: as stated on the slide, the accessories shown below are not essential but make irrigation with the Morgan Lens more comfortable and convenient

Morgan Lens Delivery Set (a substitute for a standard I.V. delivery set):
-specialized I.V. delivery set (giving set)
-can be attached to two Morgan Lenses
-provides simultaneous irrigation of both eyes

Medi-Duct (a substitute for towels or "blue pads"):
-ocular fluid management system
-designed specifically for use with the Morgan Lens
-attached to face below irrigated eye
-wicks away irrigating fluids with super absorbent material
-allows for easy collection and disposal

Topical Anesthetic (if available):
-eases pain, reduces reflex squeezing action of lids (blepharospasm)
-may ease patient anxiety

Irrigating Solution (preferred over Normal Saline):
-lactated Ringer's (LR) recommended due to the similarity in pH to that of the eye
-Hartmann's solution is very similar to LR and may be used when available

pH paper (if available):
-allows medical staff to test pH level in eye(s)

Page 8-- Slide Title: *Insertion (Step One)*

-Instill topical anesthetic if available (blepharospasms--involuntary reflex action of squeezing eyelids shut--may be relieved with anesthetic, thereby helping with insertion).
-Attach Morgan Lens to Morgan Lens Delivery Set or syringe or I.V. tubing
-If possible, remove contact lenses, but **do not delay irrigation** if unable to remove contact lenses

Page 9-- Slide Title: ***Insertion (Step 2)***

-**START MINIMAL FLOW** of irrigating solution
-Have patient look down, insert lens under upper lid
-Have patient look up, retract lower lid, drop lens into place
-Release lower lid over lens
-Adjust flow to desired rate

Page 10-- Slide Title: ***Insertion (Step 3)***

Insertion, Step Three:
-Secure a fluid collection device such as the Medi-Duct to the side of the patient's face
-For chemical burns, continue irrigation until pH returns to normal

DO NOT RUN DRY

--*See Morgan Lens Instructional Chart for additional instructions or for treatment of other injuries.*

Page 11-- Slide Title: ***Removal***

Continue flow of irrigating solution until the lens has been removed—**DO NOT RUN DRY**

--See Morgan Lens Instructional Chart for additional instructions or for treatment of other injuries.

Page 12-- Slide Title: ***Irrigation Times***

If the offending agent is not chemically reactive (irritants, solvents, non-embedded foreign bodies, etc.), experts usually recommend using 1 liter of solution or approximately 30 minutes of irrigating time. For acids and alkalis, the measurement of conjunctival pH can be used to determine the stopping point as described below.

The normal pH of tears is 6.5 to 7.6, but when measured in the cul-de-sac, normal pH is closer to 8. Therefore, 7.5 to 8 is a reasonable stopping point. In order to measure the pH of the eye and not the irrigating solution, irrigate with 2L of solution per affected eye, wait 5 to 10 minutes, then measure pH. If not in the 7.5 to 8 range, repeat the cycle.

However, for serious exposures (strong acids or any alkali burns), two hours of additional irrigation after the conjunctival pH reaches 7.5 to 8 is recommended to ensure neutralization of the anterior chamber.

Page 13-- Slide Title: *Questions for Patients*

BEGIN IRRIGATION FIRST, ASK QUESTIONS LATER

The severity of the injury depends upon:
Length of contact time, pH (molarity), concentration, viscosity, volume, and physical form of the contaminant (liquid, particulate, etc.), heat created by reaction, and associated toxic substances.

DO NOT DELAY the initiation of irrigation to remove contact lenses. Contacts were once thought to trap chemicals underneath or to absorb vapors in the air. Studies have shown that neither of these occur, at least with the chemicals studied. Contact lenses, either hard or soft, may actually form a barrier that prevents or lessens chemical burns, and soft contacts do not increase exposure of the cornea to vapors (*Journal of the Contact Lens Association of Ophthalmologists*, January, 1992, and summarized in *Scientific American*, April, 1998)

Page 14-- Slide Title: *Contraindications*

No Speaker Notes are included on this slide

Page 15-- Slide Title: lactated Ringer's vs. Normal Saline

MorTan, Inc. recommends the use of lactated Ringer's solution for irrigating due to pH:
- -tears pH: approximately 7.1
- -normal saline pH: 4.5-7.0
- -lactated Ringer's pH: 6.0-7.5

The buffering capacity of the lactate ion found in lactated Ringer's solution returns the pH to normal more quickly when used with either acidic or basic contaminants*

Normal Saline may cause discomfort and/or morphological changes*

Lactated Ringer’s solution is very similar to Hartmann’s Solution

*from independent studies

Page 16-- Slide Title: *Suggestions for the "Difficult Patient"*

Assure patient that insertion of The Morgan Lens will quickly alleviate pain.

Use common sense: telling a patient "this is going to hurt" almost guarantees that it will (especially with children). Instead saying "this will feel really cold" (unless you've warmed the solution) or reminding them that the lens will not be touching their eye may be better.

If using Normal Saline, remember that its low pH may make it difficult for some patients to tolerate (especially for long term). Switching to lactated Ringer's (Hartmann's solution) may help as their pain may be coming from the irrigating solution and not the irrigation procedure.

It may help to have a parent hold a small child during the irrigation process.

Page 17-- Slide Title: *Benefits of the Morgan Lens*

Benefits of using The Morgan Lens:

-100% or irrigating solution is delivered to cornea, cul-de-sac and conjunctiva
-Frees medical staff
-Patient can be moved while irrigating progresses
-Patient can rest comfortably
-Highly cost effective

Page 18-- Slide Title: *Summary*

Summary:

-Burns are the most urgent of ocular injuries
-Irrigation MUST be started as quickly as possible
-All surfaces of eye must be flushed thoroughly
-Irrigation should continue until pH is within normal range
-Alkali burns may require hours of irrigation
-Severe infections may require hours or even days of irrigation

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Page 19-- Slide Title: *Contact Information*

Speaker notes were compiled using numerous sources including:
Burns, Chemical, authored by Robert Cox, MD.
(http://202.71.136.146:8080/healthcarehouse/diseases/emerg_em/topic73.htm)
and
Burns, Ocular by Wende R. Reenstra-Buras, MD
(http://www.emedicine.com/EMERG/topic736.htm)
and
Principles and Practices of Emergency Medicine (Third Edition, Schwartz, et.al.)