

Case PkPWNTFFPyYprsu10754 — Answers

Case Details

Demographics 34-year-old Asian female; housekeeper

Chief complaint eye pain

History of present illness

Secondary complaints/symptoms none

Patient ocular history last eye exam 5 years ago; unremarkable

Family ocular history unremarkable

Patient medical history history of gastrointestinal bleeding

Medications taken by patient Maalox®, multivitamins

Patient allergy history penicillin

Family medical history father: cardiovascular disease

Review of systems

Mental status

Clinical findings

Uncorrected visual acuity

Slit lamp

IOPs: OD:13 mmHg, OS: 12 mmHg @ 3:35 pm by iCare tonometer

Fundus OD

Fundus OS

- Character/signs/symptoms: eye is painful, watery, and sensitive to light
- Location: OD
- Severity: severe
- Nature of onset: acute
- Duration: 5 minutes (patient ran over from a house down the street)
- Frequency: constant
- Exacerbations/remissions: better if she keeps her eyes closed, worse with blinking
- Relationship to activity or function: a bottle of vinegar dropped and the contents splashed into her eye
- Accompanying signs/symptoms: blurred vision
- Constitutional/general health: denies
- Ear/nose/throat: denies
- Cardiovascular: denies
- Pulmonary: denies
- Dermatological: denies
- Gastrointestinal: denies
- Genitourinary: denies
- Musculoskeletal: denies
- Neuropsychiatric: denies
- Endocrine: denies
- Hematologic: denies
- Immunologic: denies
- Orientation: oriented to time, place, and person
- Mood: appropriate
- Affect: appropriate
- OD: VA distance: 20/30
- OS: VA distance: 20/20
- lids/lashes/adnexa: unremarkable OD, OS
- conjunctiva: see image 1 OD, normal OS
- cornea: see image 1 OD, clear OS
- anterior chamber: deep and quiet OD, OS
- iris: normal OD, OS
- lens: clear OD, OS
- vitreous: clear OD, OS
- C/D: 0.25 H/ 0.25 V
- macula: normal
- posterior pole: normal
- periphery: unremarkable
- C/D: 0.25 H/ 0.25 V
- macula: normal
- posterior pole: normal
- periphery: unremarkable



Question 1 / 5

Which of the following BEST describes the solution that caused the corneal chemical burn in this patient?

- A) Acidic solution with a pH > 10
- B) Irritant with a neutral pH
- C) Alkaline solution with a pH < 4
- D) Alkaline solution with a pH > 10
- E) Acidic solution with a pH < 4 — Correct Answer**

Explanation:

This patient reports in her case history that the solution that splashed into her right eye was vinegar (which contains acetic acid). Therefore, the offending agent can be described as an acidic solution in which the pH is typically < 4. Chemical burns are divided into 3 categories: alkali burns, acidic burns, and irritants (further described below): Ocular chemical burns commonly caused by acidic agents (pH < 4): -Sulfuric acid, sulfurous acid, hydrochloric acid, nitric acid, acetic acid, chromic acid, and hydrofluoric acid -Household substances that may contain these chemicals include glass polish (hydrofluoric acid), and vinegar (acetic acid). -Most common acidic burn of the eye is due to an automobile battery explosion resulting in a sulfuric acid burn Ocular chemical burns commonly caused by alkaline agents (pH > 10): -Ammonia, lye, potassium hydroxide, magnesium, and lime -Household substances containing these chemicals include fertilizers, cleaning products (ammonia), drain cleaners (lye), oven cleaners, and plaster or cement (lime) Irritants are solutions that have a neutral pH and typically cause more discomfort to the eye than actual damage. -These include most household detergents and pepper spray

Question 2 / 5

Which of the following is TRUE regarding the pathophysiology of ocular chemical burns?

- A) Alkaline burns are typically confined to superficial tissues
- B) Acidic burns occur more frequently than alkali burns
- C) Acids tend to bind with tissue proteins and coagulate the surface epithelium — Correct Answer**
- D) Acidic burns may continue to penetrate the cornea long after the initial trauma

Explanation:

Features and pathophysiology of ocular chemical burns: -Alkali burns are twice as common as acid burns because alkaline chemicals are more widely used at home and work -Alkalis tend to penetrate deeper than acids and may even continue to penetrate the cornea long after the initial trauma has occurred -Alkali solutions can destroy the cellular structure of not only the corneal epithelium, but also the stroma and endothelium -Acids bind and coagulate surface proteins, which bars further penetration -Acidic burns are typically confined to the superficial tissues Damage by severe chemical injuries typically occurs in the following order: -Epithelial necrosis of the conjunctiva and cornea with disruption and occlusion of the limbal vasculature -Limbal stem cell loss may result in conjunctivalization and vascularization of the corneal surface, or persistent corneal epithelial defects that can lead to corneal ulceration or perforation -Other long-term effects may include cicatricial entropion, symblepharon, and ocular surface wetting disruption -Deeper penetration of chemicals can cause breakdown and precipitation of glycosaminoglycans, leading to stromal corneal opacification -Iris and lens damage may result from anterior chamber penetration of chemical agents -Damage to the ciliary epithelial cells impairs ascorbate secretion, which is required for collagen production and corneal repair -Hypotony and phthisis bulbi may occur in severe cases

Question 3 / 5

Which of the following best describes the FIRST action that should be taken when a patient with an ocular chemical burn presents to your office?

- A) Copious irrigation with saline solution — Correct Answer**
- B) Copious irrigation with a weak basic solution to neutralize the acidic chemical
- C) Copious irrigation with a weak acidic solution to neutralize the alkaline chemical
- D) Detailed case history
- E) Careful examination of the corneas with slit-lamp biomicroscope

Explanation:

A chemical burn is considered an ocular emergency and is the only eye injury that requires immediate treatment without first taking a case history or performing a careful examination. Irrigation of the eye should begin as soon as the patient walks through the door. Office treatment of patients with chemical burns should adhere to the following procedures: -Immediate, copious irrigation is crucial in order to minimize the contact time of the eye and the chemical, and to normalize the pH in the conjunctival fornices as soon as possible -Normal saline solution should be used to constantly irrigate the eye for at least 15-30 minutes, or until the pH is neutralized -Testing the eye with litmus paper is the best way to establish pH (wait a few minutes after stopping irrigation) -Do not try to neutralize the pH faster by using other types of solutions; this can cause further damage due to unwanted reactions that can release harmful substrates -If the initial contact with the patient is via telephone, advise the patient to flush the eye with solution (or water) for 20-30 minutes before coming to your office - Double-eversion of the eyelids should be performed, along with swabbing of the fornices with a cotton-tipped applicator, so that any retained particulate matter that may be trapped can be removed (more common in cases with lime or cement) - Debridement of necrotic corneal epithelium should be performed using a cotton-swab to allow for proper re-epithelialization of the cornea

Question 4 / 5

Which of the following topical medications is NOT indicated in the treatment of patients suffering from a corneal chemical burn?

- A) Scopolamine
- B) Pilocarpine — Correct Answer**
- C) Prednisolone acetate
- D) Ketorolac
- E) Moxifloxacin

Explanation:

Treatment of patients with corneal chemical burns typically includes a combination of topical steroids, cycloplegics, antibiotics, and possibly non-steroidal anti-inflammatory (NSAID) drops. Never give a patient a prescription for a topical anesthetic drop! Cycloplegic: -A strong agent such as 0.25% scopolamine is indicated -Avoid phenylephrine because of its vasoconstrictive properties Antibiotic: -A broad spectrum antibiotic is indicated to prevent possible infection in cases of corneal epithelial disruption Steroid: -Indicated in order to reduce inflammation and neutrophil infiltration -However, steroids also impair stromal healing by decreasing collagen synthesis and fibroblast migration -May be used initially, but should be substituted with an NSAID after 7-10 days -NSAIDs do not affect keratocyte function Other possible treatments in more severe cases include: -Ascorbic acid: improves wound healing by promoting synthesis of mature collagen by corneal fibroblasts -Citric acid: inhibits neutrophil activity and reduces the intensity of an inflammatory response -Tetracyclines: effective collagenase and neutrophil activity inhibitor

Question 5 / 5

Which of the following oral pain management medications should be used with caution in this patient?

- A) Advil®
- B) Aleve®
- C) Tylenol®
- D) Aspirin® — Correct Answer**
- E) Motrin®

Explanation:

The use of Aspirin® has been shown to increase the risk of gastrointestinal (GI) bleeding, especially in patients who already have a history of GI issues. Therefore, caution should be taken in treating these patients, and a discussion with the patient's primary care physician should occur if the patient is considering the use of this medication. Some enteric-coated formulations have been advertised as being "gentle to the stomach," however studies have not proven that enteric coating reduces the risk of GI bleeding.