

# Chemical Burn of the Eye: Etiology, Clinical Signs and Treatment

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**Annotation:** The mechanisms of chemical damage—particularly the effects of alkalis and acids on ocular tissues—are described on a scientific basis. Special attention is given to the importance of immediate first aid, stages of treatment and rehabilitation, as well as preventive measures against complications. The analysis indicates that early diagnosis and prompt therapeutic intervention play a crucial role in preserving visual function.

**Keywords:** chemical burn, cornea, conjunctiva, alkali, acid, first aid, keratoplasty.

## Introduction

A chemical burn of the eye is a severe injury that occurs as a result of exposure of ocular tissues to acids, alkalis, or other chemical substances. This condition is considered an ophthalmologic emergency requiring immediate medical attention. As a result of the burn, the cornea, conjunctiva, eyelids, and even the sclera may sustain significant damage.

## Etiology

The causes of chemical burns vary. The most common include:

- Alkaline substances: sodium hydroxide (NaOH), ammonia, lime, calcium hydroxide — these cause deeper damage than acids because they penetrate tissues rapidly.
- Acids: sulfuric, hydrochloric, nitric, and acetic acids — they generally cause more superficial injuries.
- Other chemicals: household cleaning agents, battery fluid, disinfectant solutions, etc.

## Pathogenesis

Under the influence of alkalis, saponification occurs in the tissues—lipids are broken down, disrupting cell membranes and deepening tissue damage. Acids, on the other hand, cause coagulative necrosis, forming a protective barrier on the tissue surface that limits deeper penetration of the chemical.

## Clinical Signs

Depending on severity, chemical burns are classified as mild, moderate, or severe. Main symptoms include:

- Decreased visual acuity;
- Severe pain, burning sensation, tearing;
- Swelling of the eyelids and conjunctival hyperemia;
- Corneal opacity, erosion, or necrosis;
- Reduced corneal reflex;
- In severe cases — presence of pus in the anterior chamber (hypopyon), iridocyclitis, or secondary glaucoma.

## Degrees (Dua Classification)

1. Grade I: Epithelial surface damage with mild conjunctival hyperemia.
2. Grade II: Epithelial erosion, corneal haze, damage to superficial stromal layers.

3. Grade III: Corneal opacity with limbal vessel damage.
4. Grade IV: Complete necrosis, cornea appears white or yellowish; poor prognosis.

### First Aid

Proper and immediate first aid is critical in cases of ocular chemical burns:

1. Immediate eye irrigation with running water or saline solution for 15–30 minutes.
2. Remove contact lenses, if present.
3. Check pH level (if possible using litmus paper).
4. After irrigation, apply antibiotic eye drops (Levofloxacin, Tobramycin), corticosteroid drops, artificial tears, and cycloplegics (Atropine).

### Treatment and Rehabilitation

- Local therapy: antibiotic and corticosteroid drops, epithelial regeneration stimulants (Korneregel, Solcoseryl gel).
- Systemic treatment: analgesics, vitamins (A, C, E), calcium preparations.
- In severe cases: limbal stem cell transplantation, keratoplasty, conjunctival or amniotic membrane transplantation.

### Complications

- Corneal opacity (leukoma);
- Secondary infection (keratitis, iridocyclitis);
- Eyelid deformities;
- Secondary glaucoma;
- Permanent vision loss.

### Prevention

- Use of personal protective equipment (goggles, masks) in workplaces.
- Compliance with safety rules when handling chemicals.
- Keeping household cleaning agents out of reach of children.

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