Management of Work-Related Eye Disorders

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Overview
A significant number of eye injuries occur in the workplace, a large number of which can be preventable due to appropriate protective equipment. Prompt response, clear communication, and timely referrals to an ophthalmology specialist, when necessary, can reduce loss of work due to vision impairment and improve the claims outcome.

This article provides a general summary of:
- The statistics regarding work-related eye disorders
- How work place eye injuries commonly occur
- Evaluation and treatment of work-related eye injuries
- Return to work issues to consider after diagnosis and treatment of eye injuries
- How to prevent eye injuries in the workplace
- Important resources for the employer or claims examiner regarding work-related eye injuries
Introduction

Work-related eye injuries and illnesses are common and may occur in a wide number of job categories. While some conditions are minor and transient, others may result in significant loss of vision and work disability. Keys to minimizing potential disability from work-related eye disorders include:

• Primary prevention
• Prompt intervention
• Recognition of red flags suggestive of serious eye disorders requiring specialty evaluation and management

This newsletter will briefly review some considerations.

Epidemiology

It has been estimated that up to 2,000 U.S. workers may sustain a work-related eye injury each day, with up to one-third requiring emergency room treatment.¹ While many eye conditions are transient and do not affect work abilities, in 2008 an estimated 27,450 work-related eye injuries and illnesses resulted in lost work time, with a median number of two days out of work.² The annual cost for work-related eye disorders is approximately $300 million for medical care, indemnity, and lost work productivity.³

Certain populations are at greater risk. For example, men between the ages of 25 and 44 years have the highest rate of work-related eye problems (54% of all injuries). Workers in manufacturing, construction, trade, education, or healthcare experience the majority of work-related eye injuries (72% of all injuries), though eye injuries can occur in all work sectors. The most common type of injury involves the eye being abraded or irritated by foreign matter or particles. Other causes include being struck or injured by:

• Flying objects
• Welder’s flash
• Chemical exposures
• Lacerations
• Contusions
• Thermal exposures
• Infections
• Other etiologies²

Causation

The majority of work-related eye disorders involve foreign bodies or abrasions that have a clear work event and sudden onset of symptoms. Causation determination is easily confirmed for incidences, such as acute trauma and chemical splashes. At times, a worker may experience an abrasion or foreign body with initial mild symptoms that does not prompt evaluation until the patient notes increased complaints the following day when, for example, an embedded foreign body, rust ring, corneal abrasion, or inflammation may be observed. Similarly, welders with flash burns may not seek medical care until the following day due to delayed onset of injury.

¹ https://www.cdc.gov/niosh/topics/eye/
³ https://www.osha.gov/SLTC/eyefaceprotection/
Determination of causation may require more careful analysis in other settings where there may be multiple potential causes, such as:

- Allergic reactions with workplace
- Home exposures
- Pre-existing allergic conditions

Similarly, determination of work-relatedness of cataracts requires:

- Assessment of potential work exposures
- Magnitude and timing of exposures, such as ultraviolet light or radiation
- Non-work causes of cataracts, such as:
  - Genetics
  - Age
  - Smoking
  - Alcohol use
  - Medications
  - Prior trauma
  - Other etiologies

There may be a latency period between the work exposures and onset of symptoms and diagnosis. Careful, comprehensive assessments of occupational, environmental, and medical history with consideration of medical evidence pertaining to causation of specific conditions will help with decision making.

**Evaluation and Treatment**

Management of eye injuries involves:

- An initial assessment for “red flags” suggestive of potentially serious injury or disease that requires urgent evaluation and treatment
- Assessing vision status and confirming the diagnosis
- Providing evidence based medical care
- Monitoring for complications
- Follow-up through recovery
- Assessing work ability
- Exploring opportunities for prevention

Figure 1 denotes the anatomy of the eye to help readers better understand eye structures and “red flags.”

Examples of “red flags” for eye injuries could include the following:

**Acute eye trauma (open or closed globe injury):** Direct injury to the eye from a blow or contusion, fractures to surrounding facial or orbital bones, or penetrating objects. Symptoms may include vision loss, bleeding, pain, or double vision. Exam may observe loss of vision, bleeding, or distortion of the pupil or iris (cornea), white part of the eye (sclera), or mucous membranes (conjunctiva).
Thermal or chemical burns: Exposure of the eye to hot material, alkalis or acids, solvents, or other chemicals. Symptoms may include pain, light sensitivity (photophobia), tearing, or vision loss. Exam may note redness, burns to skin or eyes including cornea, conjunctiva, or sclera. Eye damage from some chemicals may be delayed. In particular, hydrofluoric acid exposures if not treated appropriately early may result in delayed necrosis of eye tissues. Allergic reactions to chemical agents or allergens may also manifest acutely or present after several hours.

Radiation injury: Exposure to significant amounts of ultraviolet light including welding flash, lasers, or ionizing radiation may result in delayed onset eye pain (e.g. 4-6 hours), tearing, light sensitivity, or blurred vision. Exam may observe delayed onset redness, tearing, or changes to the cornea or pupil reaction. Ionizing radiation may cause cataracts (Figure 2) after a latency of several years, although there are a number of non-work causes as well.

Treatment of some eye injuries may begin at the workplace for events like acute chemical splashes where prompt eye irrigation is necessary. Patients referred for medical care benefit when the workplace can offer information regarding the location, date, and time of the injury, description of the accident, and other relevant details.

Initial treatment may be provided by an emergency room, occupational medicine, urgent care center, or primary care clinician depending upon the nature and severity of the injury. The initial history commonly includes:

- The injury or exposure details
- Onset and symptoms
- Past eye/vision and medical history
- Specific job issues
- Use of contact lenses and protective eye wear
- Other factors

Initial examination commonly includes:

- Assessment for any disruption, laceration, or penetration of the eyelid, surrounding structures, or globe
- Signs of bleeding or tissue damage
- Pupil size and reaction to light
- Position of the eye and eye movements
- Testing for visual acuity (each eye individually and together, near and far)
- Testing for visual fields

Analgesic drops may be applied to the eye to temporarily decrease discomfort and to permit a better exam and documentation of visual acuity. Fluorescein drops may be applied and the eye examined with a blue light to detect corneal abrasions. The treating clinician will often perform an exam using an ophthalmoscope.

Figure 2. Cataract, National Eye Institute, National Institutes of Health

https://www.flickr.com/photos/nationaleyeinstitute/7544344214/in/album-72157651546570359/
In the absence of “red flags” suggestive of a serious eye problem, patients can generally be treated and followed by primary care providers familiar with common eye injuries and disorders such as:

- Superficial foreign bodies
- Minor corneal abrasions
- Minor chemical exposures or resultant irritation
- Allergic reactions
- Conjunctivitis
- Welder’s flash burns

Eyes generally recover quickly from these injuries or exposures, with progressive improvement within 48 to 72 hours. Visual acuity should be performed at the time of re-evaluation. Patients who experience the following persistent symptoms after 72 hours should be re-evaluated and referred to an ophthalmologist for further assessment:

- Pain
- Irritation
- Light sensitivity
- Redness
- Discharge
- Halos
- Abnormal vision

Specialty evaluation by an ophthalmologist will depend upon the nature of the condition. Further testing could include:

- More in-depth vision testing
- Use of a slit lamp (using increased illumination and magnification to look for inflammation, bleeding, and other problems (Figure 3)) to better visualize eye structures
- Tonometry (to measure eye pressures from glaucoma)
- Additional testing including radiographic imaging to evaluate potential injury to the globe or adjacent bones and soft tissues or look for foreign bodies

Patients with serious injuries, including “red flags,” should be seen in the emergency room to:

- Facilitate prompt evaluation and initial treatment
- Provide access to imaging if indicated (e.g. x-rays, CT scan to evaluate for fractures)
- Permit more timely evaluation by an ophthalmologist when needed

Reviewing medical records from ophthalmologists and optometrists can be challenging due to the use of abbreviations. The American Academy of Ophthalmology has a list of commonly used abbreviations [here](https://www.flickr.com/photos/nationaleyeinstitute/7543731476/in/album-72157646469269359/).
A detailed description of eye injuries and illnesses is beyond the scope of this article. However, the following conditions are some of the more commonly treated work-related eye injuries.

**Corneal abrasions** result from the eye being rubbed, scratched, or having a foreign body in the eye. Patients generally report the sensation of a foreign body in the eye, pain, redness, tearing, blurring, or possibly light sensitivity. Abrasions can be confirmed using fluorescein staining (Figure 4). Treatment until the eye heals in two or three days generally includes:

- Ruling out the presence of a foreign body or other injuries
- Use of topical antibiotic drops
- Avoiding contact lens use

After three days from the date of injury, the following situations merit referral to an ophthalmologist:

- Absence of continued improvement
- Persistent sensation of foreign body
- Increased redness or light sensitivity
- Other continued symptoms

**Foreign bodies** in the eye (e.g. dust, dirt, metallic, or other particles (Figure 5)) are common and may be associated with corneal abrasions. Superficial foreign bodies may be removed by irrigation or by gently swabbing with a saline soaked cotton tip swab after using topical anesthetic drops. Embedded foreign bodies may require removal using a needle and slit lamp. At times, patients may have metallic foreign bodies embedded in the cornea and present for evaluation more than a day after injury. In some cases, they may have a surrounding rust ring with residual material that needs to be removed by an ophthalmologist to avoid the development of inflammation, infection, ulceration, or scarring.

**Chemical exposures** can involve a variety of agents. Alkaline agents are generally more damaging than acids, though the degree of injury will depend on a number of factors including the pH strength and form (liquid or powder), as well as the length of contact with the eye. As noted, hydrofluoric acid can cause delayed necrosis. Solvent exposures are also common in industrial accidents. Treatment of chemical exposures requires prompt irrigation of the eye starting at the worksite and continuing until the eye’s pH level is neutralized (approximately pH 7 for acids and alkaline agents) or saline has been used to flush the eye adequately.

With chemical exposures, it is helpful to have the following information available:

- Name of the chemical
- Type of the chemical (e.g. alkali, acid, solvent)
- Type of exposure (e.g. liquid, solid, fume or mist)
- Material Safety Data Sheets (contains information on the chemical including the manufacturer)
- Contact time
- Any emergency medical care provided by first responders such as eye irrigation

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7 https://www.cehjournal.org/article/assessing-and-managing-eye-injuries/
8 http://www.skinsight.com/skin-conditions/adult/corneal-foreign-body?Imiw9cApl
Although many chemical exposures to the eye are minor and resolve, some may result in burns to the eye and surrounding structures, corneal abrasions, necrosis, and loss of vision.

Allergic reactions may develop acutely or after hours or days resulting from a variety of allergenic agents used in industries, such as manufacturing, health care, and food handlers. Treatment of allergic reactions may involve:

- Avoidance of the allergen
- Use of engineering or protective equipment
- Antihistamines either orally or via eye drops
- Short term treatment with steroids either orally or with eye drops

Health care workers may experience a number of biologic exposures to the eye that may require prophylactic treatments (e.g. hepatitis B virus), or necessitate treatment for subsequent infectious conjunctivitis (e.g. bacterial infection treated with antibiotic drops or viral infection treated symptomatically with recommendations to remain out of work transiently while infectious).

**Trauma to the eye** may result in a range of injuries including:

- Blunt injury, which can result in:
  - Bleeding into the anterior chamber of the eye (hyphema with a blood collection noted in front of the cornea on inspection)
  - Bleeding behind the cornea (vitreous bleed)
  - Bleeding on the retina
- Other injuries, which can result in:
  - Retinal tears
  - Rupture of the globe
  - Fractures (with possible entrapment of the eye muscles limiting movement)

Patients may present with vision loss or double vision, visible blood, or change in pupil size. Fractures are evaluated with x-rays, CT scans, and occasionally MRI (as long as there are no penetrating metallic particles in the eye). Penetrating injuries may result from a high velocity particle from a tool, such as a chisel or saw, and may cause a variety of injuries depending upon size, location, and forces. These injuries require radiographic imaging and ophthalmologic evaluation.

**Return to Work Issues**

Many patients with minor eye injuries or disorders can return to work promptly at regular or transient modified duty. Decisions regarding return to work require consideration including:

- The nature and severity of injury or illness
- Treatment needs
- Visual acuity
- Workplace exposures
- Job demands

Lack of adequate visual acuity (near, far vision, visual fields, etc.) may limit some types of work. Public safety workers (e.g. police, fire, commercial motor vehicle drivers, and other safety sensitive positions covered by the U.S. Department of Transportation) need to meet regulatory vision requirements to return to unrestricted work.
Prevention

It is estimated that prevention efforts could potentially reduce work-related eye injuries by 90 percent. Prevention opportunities should be explored in all cases. This involves review of:

- The injury
- Job demands
- Use of safety equipment
- Workplace safety education

For example, engineering controls that include machine or splash guards can reduce the chance of being struck by a projectile or cutting fluids while machining. When possible, use of chemicals with lower risk of irritation, injury, or allergy is preferable. Education in safe work practices, selection, use, and maintenance of protective equipment may also help reduce injuries and exposures. Use of protective equipment suitable to the type of work can be used in addition to engineering controls or when engineering controls are not feasible. Options include protective eye glasses or goggles, face shields, or splash guards. OSHA has a useful Eye and Face Protection eTool web page to help employers understand compliance requirements, perform a hazard assessment of the workplace, and select appropriate eye and face protective equipment. Workers should realize that contact lenses do not offer eye protection and should be removed after chemical exposures or when injury occurs.

Other useful OSHA educational materials include information on eye injuries due to welding and ways to prevent welding injuries. Availability of eye irrigation stations permits prompt treatment of chemical exposures to the eye, and proper maintenance can avoid microbial contamination. Obtaining advice from qualified health and safety professionals, optometrists, or ophthalmologists can assist employers with decision making regarding the best options for individual workers and workplace settings.

Conclusion

Prevention of eye injuries at work and home can reduce serious injury and impairment due to vision loss. For workers who experience chemical exposures, prompt workplace irrigation and communication with the treating health care provider including Material Safety Data Sheet information for chemical exposures can enhance treatment. For workers with traumatic injuries, prompt referral for ophthalmologic evaluation can improve outcomes. Adherence with treatment recommendations, monitoring for complications, and vision status are other key factors. There are a number of available resources with useful information regarding eye safety. Select resources are listed below:

- CDC, NIOSH: [Eye Safety](https://www.cdc.gov/niosh/topics/eyesafety/)
- U.S. Dept. of Labor, Occupational Safety and Health Administration: [Eye and Face Protection](https://www.osha.gov/Publications/OSHA3818.pdf)
- American Academy of Ophthalmology:
  - [Eye Injuries at Work](https://www.aao.org/patient-information/eye-injury-workplace)
  - [Recognizing and Treating Eye Injuries](https://www.aao.org/patient-information/recognizing-treating-eye-injuries)
  - [First Aid for Eye Scratches](https://www.aao.org/patient-information/first-aid-eye-scratches)
  - [Protective Eyewear](https://www.aao.org/patient-information/protective-eyewear)
  - [Learning the Lingo: Ophthalmic Abbreviations](https://www.aao.org/patient-information/learning-the-lingo-ophthalmic-abbreviations)

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