



Corneal Abrasions

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Ocular emergencies are common in children, representing 6% to 10% of all emergency department visits. Injuries range from mild to severe with corneal abrasions being the most common diagnosis.

The cornea is the anteriormost layer of the eye. It functions to focus external light onto the retina, provide refractive power, and protect the eye's inner structures. It is heavily innervated, so any injury can cause severe pain. Defects that occur in the cornea's most superficial layer, the ocular epithelium, are called corneal abrasions. Corneal ulcers are a more significant defect and extend from the ocular epithelium into the deeper layers of the cornea. This In Brief focuses on corneal abrasions.

Corneal abrasions primarily result from trauma; however, they can also arise spontaneously. Traumatic causes include direct mechanical irritation, foreign body irritation, chemical burns, UV light injury, or contact lens-related injury. In children, minor injury and direct trauma are the most common causes of corneal abrasions, followed by foreign body irritation. Verbal patients will often describe an injury or clear trigger. Playing in leaves, spending time on a sandy beach, or being outside on a windy day before developing a painful red eye raises the index of suspicion for corneal abrasion. Despite concerns for fingernails being a cause of infant corneal abrasions, there is no association between nail length or trimming method and corneal abrasions in infants. Spontaneous corneal abrasions, or recurrent erosions, may result from previous traumatic corneal abrasion or an inherited corneal epithelial defect. They appear similar to other corneal abrasions and should be considered when no clear trigger is identified. Ophthalmologic referral is indicated for recurrent cases. These are less common in the pediatric population.

A child with a corneal abrasion may present with a multitude of ocular symptoms. Acute eye pain, excessive tearing, photophobia, conjunctival injection, and foreign body sensation are common presenting symptoms. In young preverbal children, the presentation can be nonspecific, including general fussiness. Therefore, when other common or more serious causes have been ruled out, the possibility of a corneal abrasion should be considered.

Emergency ophthalmologic conditions that also present with painful, nonpurulent eye include acute-closure glaucoma, hyphema, and hypopyon (blood or pus in the anterior chamber of the eye), and herpes simplex virus keratitis. Any of these require emergency specialist evaluation. Vision loss from corneal abrasions can occur due to scarring, so large lesions involving the visual axis should prompt referral. Prevention of corneal abrasions is key due to the pain and discomfort they cause pediatric patients. Corneal abrasions may be prevented by using protective eyewear for high-risk activities, including contact sports.

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A focused physical examination should be performed when a corneal abrasion is suspected. This includes a full visual inspection of the eye and eyelids (including upper eyelid eversion if possible) to assess for the presence of a foreign body. In addition, assessment of pupil shape, size, and reactivity can be performed with a penlight to evaluate for deeper injury to the globe. Visual acuity testing should be performed in verbal children, with vision loss or new asymmetrical acuity prompting referral. The examiner should evaluate for signs of penetrating trauma, including aqueous humor leakage, hyphema, irregular pupil, or iris defects. The presence of any of these findings raises concern for a vision-threatening injury and necessitates immediate ophthalmology referral. To confirm the diagnosis, corneal examination after application of fluorescein dye should be performed using a cobalt blue filter or Woods lamp. Fluorescein, an ophthalmic indicator dye, is generally available in the form of drops or paper strips. Fluorescein strips can be moistened with saline then gently dabbed against the inferior conjunctiva. A cooperative patient may tolerate drops applied directly to the eye. Once dye is applied, the patient blinks to spread the dye across the ocular surface. If a corneal defect is present, the dye will stain the area of exposed corneal stroma or basement membrane and fluoresce when illuminated with a Wood lamp. Fluorescein dye examination is best performed after visual acuity testing because the dye can temporarily interfere with visual acuity. The shape of the corneal epithelium defect can provide further insight as to the underlying cause, which is important in directing treatment. Linear abrasions are associated with mechanical trauma, whereas defects with dendritic patterns are typical of herpes simplex virus keratitis. Multiple vertical lesions could indicate a retained foreign body under the eyelid. Contact lens-related abrasions often form round lesions.

The mainstay of treatment for corneal abrasions is supportive care. The primary goal should be removing the inciting cause, such as the removal of a retained foreign body, and providing pain control. Gentle saline irrigation or a cotton swab can aid in foreign body removal. A foreign body that cannot be removed requires emergency ophthalmologic referral. If the corneal abrasion occurred in a contact lens wearer, the patient should abstain from wearing contact lenses until the abrasion has fully healed. Ocular colonization with gram-negative bacteria, such as *Pseudomonas aeruginosa*, is often seen in contact lens wearers. As such, closer follow-up is indicated due to the risk of pseudomonal infection. Given that the epithelial layer of the cornea functions, in part, to prevent pathogens

from infecting the cornea, prophylactic antibiotics are often prescribed to prevent bacterial infections, although recent studies suggest this may not be beneficial. For uncomplicated abrasions, erythromycin ophthalmic ointment or polymyxin B/trimethoprim are often used. If the abrasion is related to contact lens use, foreign body, or trauma with a potentially infectious source (ie, fingernails), antipseudomonal antibiotics should be prescribed. Topical antibiotics are generally administered 4 times daily and continued until the patient has been symptom-free for 24 hours. Ointment preparations have been shown to be superior to drops as they provide lubrication. Ointments can cause blurring of vision, so parents can consider applications before sleep to minimize this adverse effect. Pain control is another mainstay of corneal abrasion management. Topical anesthetics are occasionally needed at the time of diagnostic examination but are to be avoided thereafter. Longer courses of topical anesthetics (>1–2 days) can lead to ulceration and delayed healing and as such are generally avoided. Patching the affected eye is no longer advised given the lack of evidence of benefit for either pain control or healing time compared with not patching. Oral pain medication, such as acetaminophen or ibuprofen, in children older than 6 months is generally adequate for pain control.

The prognosis for corneal abrasions is generally good. Most corneal abrasions fully heal within 24 to 72 hours of the initial injury. Follow-up is not routine but should be encouraged if symptoms persist. There are potential complications related to corneal abrasions that warrant monitoring. Infection and progression to bacterial keratitis can occur, particularly in contact lens-related abrasions. Although most corneal abrasions can be diagnosed and managed in the primary care setting, there are some patients who may require urgent ophthalmology referral. These include patients with any signs of penetrating eye trauma or globe rupture, retained corneal foreign body, bacterial keratitis (purulent drainage and widespread inflammation), or traumatic iritis (pupillary defects in the setting of ocular pain and inflammation) at the time of diagnosis. Failure to improve with standard treatment within 24 to 48 hours of initiation should also prompt referral.

COMMENTS: Most children with ocular problems present initially to pediatric providers, so knowledge about the diagnosis and treatment of corneal abrasions and reasons for referral is essential. New research now discourages use of patching the eye, which was commonly done in the past. The pertinent research, as outlined in a 2016 Cochrane

Review, showed no difference in pain control or time to healing with patching. Completing a comprehensive ocular examination can be challenging in children of all ages due to their fear and the pain they are experiencing, yet even more challenging in very young infants. So eliciting the assistance of a trusted parent or family member may help. Perhaps as pediatricians we do not emphasize enough the importance of protective eyewear. In 2004 the American Academy of Pediatrics issued a statement for protective eyewear for children participating in organized sports with spe-

cific mention to reinforce this for children and adolescents who are functionally 1-eyed. Although it is important to minimize the possibility of corneal abrasions during sports-related injuries, it may also be prudent (although this is my suggestion and not evidence based) to consider use of protective eyewear in other circumstances where foreign body irritation can occur, such as walks or playing in dense woods and shrubs or playing in sand on windy days.

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