



THE OCULAR IMMUNOLOGY  
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## **Corneal Inflammation or Keratitis**

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### **What is keratitis?**

Keratitis is inflammation of the cornea, the clear window of the front of the eye. The cornea is an incredibly unique tissue in the body, in that it is perfectly transparent, and allows light to pass through to help us see. It is incredibly fragile and depends greatly on the mechanisms in place which protect it from the harsh outside environment. When the cornea becomes injured, or when forces external to the cornea drive inflammation around it, scarring can occur, which is often permanent – this is the number one cause of blindness in the world.

### **What are the symptoms of keratitis?**

Decreased vision, often described as blurry or hazy, is a frequent complaint of patients with keratitis. When inflammation affects the front surface of the cornea, it is usually associated with tremendous sharp pain and light sensitivity, sometimes along with conjunctival redness and tearing. Inflammation of deeper levels of the cornea may present with blurring with or without other symptoms and may equally threaten with permanent vision loss.

### **What causes keratitis?**

Keratitis may occur as a result of a wide variety of conditions, but by far the most common is infection. Interestingly, the most common microbe causing corneal infections is herpes simplex virus. This usually comes as a great surprise to most people who associate herpes simplex virus either with a sexually transmitted problem or with the very common fever blisters and cold sores which people often experience. Indeed, herpes can infect the cornea, and it usually does so in exactly the same way that it infects an individual's lip or

mouth when they are having an episode of fever blister or cold sore. Such an individual has not contracted the herpes recently but rather is experiencing a recurrence or reactivation of herpes from its dormant state. The original infection or contact with the virus usually occurred many years before, perhaps usually in childhood. For some unlucky individuals, when the virus “wakes up” from its dormant state in the trigeminal ganglion (perhaps because of a stress to immune system such as fever or sunburn, trauma, or stress) rather than “marching” down the nerve twigs that supply the mouth and lips, instead it takes a “wrong turn” and marches down the nerve twigs which supply the eye, resulting in an episode of herpes infection of the cornea. Such infections have major blinding potential because of the aforementioned inflammation (keratitis) and resulting high probability of scarring of the cornea. The major initial symptom of herpes keratitis is light sensitivity, followed by pain, redness and tearing. Any of these signs and symptoms should stimulate a patient to seek an ophthalmologist’s care immediately, since the earlier herpes infection of the cornea is diagnosed and treated, the less likely significant permanent damage will occur.

Another underlying cause of keratitis is autoimmune disease. Autoimmune diseases, particular those with components involving vasculitis (inflammation of blood vessels) can cause inflammation especially in the periphery of cornea, known as peripheral keratitis. Additionally, problems such as dry eye and abnormal eyelid function, which lead to poor corneal health, can lead to keratitis by making the corneal more susceptible to infection or other types of inflammation. Contact lens abuse and poor lens hygiene are also common causes of corneal inflammation via secondary infection.

### **How does herpes virus cause keratitis?**

Herpes is mostly known as the virus which causes painful sores in and around the mouth, as well as a sexually transmitted disease. It is actually quite common, with most people in a given population being exposed to it at some point in their life. It usually lies dormant in nerves (sensory roots), and can become “activated” during moments of illness, stress, or just bad luck. It travels through these nerves that can also connect to and affect several parts of the eye, including the cornea, and can cause devastating inflammation and scarring.

### **What other medical conditions are associated with keratitis?**

Aside from herpes, bacterial and fungal infections can cause severe keratitis requiring aggressive medical treatment and sometimes surgery. Contact lenses and diseases which affect the eyelids, such as thyroid disease or rosacea, can lead to a compromised corneal surface, and secondary infection. Severe systemic allergies involving the eyes can also

involve inflammation of the cornea. Autoimmune diseases, especially rheumatoid arthritis and types of systemic vasculitis, can be a risk factor for developing keratitis and dangerous thinning of the cornea which may also require surgery.

### **How is keratitis diagnosed?**

Keratitis is diagnosed by an ophthalmologist using slit-lamp biomicroscopy. A thorough history and review of systems are important in evaluating any inflammatory condition, including corneal inflammation. The cause of keratitis, however, may need further work up, which may require blood work, culture of ocular fluid or tissue, or even biopsy.

### **What are the complications of keratitis?**

Scarring is the most frequent complication, and this may result in severe decrease in vision if the scar is located centrally in the visual axis. Infectious keratitis that is not promptly treated can progress through the entire thickness of the cornea, or begin to involve neighboring sclera, possibly leading to spread of infection inside the eyeball or perforation, or both, and possible loss of the eye. Thinning of the peripheral edges of the cornea may lead to irregular astigmatism, and if severe, can also lead to perforation, which can also lead to infection, and possible loss of the eye.

### **What is the treatment for keratitis?**

Aggressive eradication of infection is the most important step in treating infectious keratitis, which may involve around-the-clock use of fortified antibiotic eye drops. Cycloplegic (dilating) drops can be used for relief from pain and light sensitivity. Hospitalization is sometimes needed for those patients who are not able to properly administer drops themselves, or when systemic antibiotics are used. Viral keratitis is best treated with use of topical and/or systemic antiviral medication. Topical corticosteroids can be employed once surface disease is resolved. Fungal keratitis is treated in a similar fashion with topical and systemic antifungal medications; however, corticosteroids should never be used to help resolve inflammation or scarring in these cases.

Noninfectious keratitis is best treated with topical corticosteroid, with close observation when there is significant thinning to make sure the wound does not worsen. Use of steroids in ulcerative (thinning) keratitis is controversial for this reason; however, the underlying cause for thinning – inflammation – must be kept in mind and treated. Topical antibiotics are given when superficial corneal damage exists as prophylaxis against infection. Severe keratitis, especially that driven by known autoimmune disease, may require oral or intravenous corticosteroids or immunomodulatory therapy.

Surgical therapy may be useful in acute keratitis. Peripheral ulcerative keratitis may benefit from simple resection of conjunctiva around the active inflammation. Corneal glue applied to severely thinned or perforated areas, along with a contact lens bandage, can help wounds regain structural integrity. Removal of superficial corneal layers may rid the burden of severe infection or scarring. However, corneal transplant may be necessary for aggressive ulcers nonresponsive to therapy or for central scarring left behind by treated keratitis. Some research is being done to see if a surgical method involving riboflavin and ultraviolet light may be helpful in treating corneal infections.