Chapter

2

Management of Keratitis in Geriatric Population

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INTRODUCTION

Corneal opacities are the fifth leading cause of blindness worldwide, and infectious keratitis is the leading cause of corneal opacity in both developed and developing countries (1). Infectious keratitis is a corneal infection that begins with the invasion and proliferation of various microorganisms (bacteria, viruses, fungi, and parasites) into the cornea, resulting in inflammation and tissue destruction. In the geriatric population, systemic diseases, neoplasms, and immunodeficiency caused by these diseases are more frequent, the risk of trauma is higher, and contact lens use increases. These factors may cause an increase in infectious keratitis and corneal opacities, and thus blindness.

BACTERIAL KERATITIS

Pathogenesis

The corneal tissue is highly immunocompromised. *C. diphtheria*, *N. gonorrhea*, *N. menengitidis*, *H. influenza*, *L. monocytogenes*, and other listeria species are bacteria that can adhere to the intact cornea and initiate inflammatory processes. More common pathogens may invade the cornea as a result of the breakdown of the existing immune defense and damage to the epithelial barrier. Gram-positives are responsible for 29-75.1% of cases, while gram-negatives are responsible for 31-50% (2).

1. Staphylococcal strains: The most common causative agent is *S. aureus*, which is gram-positive and coagulase-positive. To invade the cornea, *staphylococci* use their adhesins to bind to Bowman's layer and stroma, which results from epithelial damage. They are naturally present in the conjunctival flora.

2. *P. aeruginosa:* It is a gram-negative bacillus and is the most common causative agent in contact lens-associated keratitis. Keratitis is severe and rapidly progresses. Left untreated, it causes descemetocele and corneal perforation because it causes liquefaction necrosis.
3. Streptococcal strains: Gram-positive cocci, and their infections are severe. They can progress to hypopyon in the anterior chamber, deep stromal abscesses, and even perforations. *S. pneumoniae* is naturally present in the flora of the upper respiratory tract. Alpha-hemolytic streptococci have been reported to cause infectious crystalline keratopathy.
4. Other causative agents include: *Nocordia* and *Mycobacterium strains*, *Serratia marcens*, *Enterobacteria*, and *Propionabacterium* species.

Risk Factors

1. Contact lens usage: It is the most common cause of infectious keratitis in developed countries (3). The most common predisposing factors are poor handling, prolonged wear, lack of attention to hygiene of the contact lens equipment, and nightwear. Infectious keratitis is observed for all types of contact lenses. However, it is less common in those who wear rigid gas-permeable lenses.
2. Trauma
3. Ocular surface and eyelid diseases: Dry eye syndrome, chronic blepharitis, chronic herpes keratitis, bullous keratopathy, ocular rosacea, atopic keratoconjunctivitis, dacryocystitis, lagophthalmus, exposing keratopathy, entropion, and trichiasis.
4. Post-ocular surgery: Corneal transplantation, corneal cross-linking (CXL), laser refraction, cataract, trabeculectomy, pterygium surgery, etc.
5. Systemic immunosuppression

Clinical Features

Patients present with pain, photophobia, stinging, discomfort, lacrimation, mucopurulent discharge, and blurred or impaired vision.

Biomicroscopic examination may be accompanied by different clinical findings depending on the type of pathogen. In general, an infiltrate area is observed in the cornea due to bacterial proliferation and host immune response. The width and depth of the infiltrate area are important for predicting the prognosis. The infiltrated areas are usually accompanied by epithelial defects. Wrinkles, corneal edema, anterior camera reaction, hypopyon, desmatocele, endothelial inflammatory plaque, lid edema, chemosis, scleritis, and endophthalmitis may be observed in severe corneal infections.

Infectious crystalline keratopathy differs from the others in terms of biomicroscopic findings. It is a self-limiting infectious keratopathy characterized by branching needle-like opacities in the stroma without a corneal epithelial defect or a prominent anterior segment reaction. The causative agents are usually S. iridans, various strains of mycobacteria, and anaerobes. Infected corneal grafts, previous surgery, misuse of topical corticosteroids and anesthetics, and contact lens use are predisposing factors.

Laboratory Examinations

In the diagnosis of keratitis, collecting a corneal scraping sample and culturing it to identify the causative agent is essential for the management of treatment, especially in deep, central corneal infiltrates with a large surface area or corneal infections that do not respond to empirical treatment.

Corneal scraping samples can be taken under the slit light of a slit lamp with topical anesthesia and appropriate material (disposable scalpel, Kimura spatula, wet dacron/calcium alginate swab, broad-tipped hypodermic needle tip) and cultured at the bedside or transported to the laboratory for microbiological examination with special liquid carrier media (Amies transport medium). When taking the sample, a general anesthetic that did not contain a preservative and minimized bacterial proliferation was selected. In general, 0.5% proparacaine hydrochloride is preferred in the clinical setting. Necrotic tissue and loose mucus in the corneal ulcer were removed. Try to scrape the base and borders of the ulcer as much as possible. Cotton swabs are not preferred because they can inhibit bacterial proliferation owing to the fatty acids they contain. In addition, samples can be taken from the conjunctiva, contact lens cases, solution bottles, and lenses themselves, when necessary. **Table 1** shows the media used and agents produced.

Table 1. Media used for corneal scrapings and pathogens isolated (4)

Medium	Isolable pathogens
Blood medium	*P. aeruginosa*, *S. aereus*, *S. epidermidis*, *S. pneumoniae*
Chocolate medium	*H. influenza*, *Neisseria*, *Morexella* and *Bartonella* species
Sabouraud dextrose medium	Mushrooms
Brain-heart infusion	Difficult to grow aerobic and facultative aneorobic bacteria
Löwenstein-Jensen medium	Mycobacterium and Nocardia species
Nutrient-free medium inoculated with *E. coli*	Acanthamoeba
Thayer-Martin medium	Pathogenic *Neisseria* species
Middlebrook medium	Mycobacterium species
Charcoal-free Amies transport medium	Aerobic and facultative aneorobic bacteria, fungi

Corneal scrapings were smeared in a thin layer on a clean glass slide and fixed. The morphological features and staining characteristics of the pathogen could be distinguished. Gram staining is the most commonly used stain for corneal swabs. In addition to helping to differentiate bacteria from fungi, it also helps to differentiate infective bacteria into gram-positive and gram-negative bacteria, allowing for rapid and effective decision-making in directing treatment. The special strains that provided further differentiation and the pathogens detected are described in **Table 2**.