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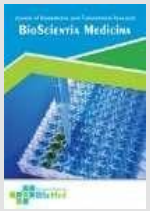

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A Case of Infectious Keratitis Associated with Rigid Gas Permeable Contact Lens Use in a Keratoconus Patient

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A B S T R A C T

Background: Keratoconus is a non-inflammatory corneal ectatic disorder characterized by progressive corneal thinning and ectasia, leading to irregular astigmatism and visual impairment. Rigid gas permeable (RGP) contact lenses are often prescribed to manage keratoconus; however, improper use can lead to complications such as infectious keratitis. **Case presentation:** We present a case of a 25-year-old female with keratoconus who developed infectious keratitis after three months of RGP lens wear. The patient presented with ocular discomfort, pain, photophobia, and redness in the left eye. Clinical examination revealed conjunctival and ciliary injection, a paracentral corneal infiltrate, and decreased visual acuity. Corneal pachymetry confirmed bilateral corneal thinning. The patient was diagnosed with bilateral keratoconus, bilateral compound myopic astigmatism, and left-eye infectious keratitis. Treatment included discontinuation of RGP lens wear, topical antibiotic therapy, and artificial tears. After two weeks of treatment, the corneal infiltrate resolved, and the patient was allowed to resume RGP lens wear with strict adherence to hygiene protocols. **Conclusion:** This case underscores the importance of patient education and meticulous lens hygiene in preventing infectious keratitis and other complications associated with RGP lens wear in keratoconus patients. Regular follow-up examinations are crucial to monitor for signs of complications and ensure optimal lens fit. By adhering to these guidelines, clinicians can help to ensure the safe and effective use of RGP lenses in keratoconus patients.

1. Introduction

Keratoconus is a progressive, non-inflammatory ectatic corneal disease characterized by corneal thinning and steepening, leading to irregular astigmatism and impaired vision. The corneal ectasia in keratoconus can result in significant visual impairment due to irregular astigmatism and myopia, often leading to a reduction in the quality of life. The prevalence of keratoconus varies globally, affecting approximately 1 in 2000 individuals in the general population. It typically manifests during puberty and progresses over the next two decades, with a tendency to stabilize in the third or fourth decade of life. The management of keratoconus has evolved significantly over the years. In the early stages, spectacles or soft contact lenses may provide adequate visual correction. However, as the condition progresses and corneal irregularity increases, rigid gas permeable (RGP) contact lenses become the mainstay of treatment. RGP lenses offer several advantages over spectacles and soft contact lenses, including their ability to mask corneal irregularity, providing a smoother refractive surface and better visual acuity. Moreover, RGP lenses can help to stabilize the cornea and potentially slow the progression of keratoconus. Despite the benefits of RGP lenses, their use is

associated with certain risks and complications. One of the most serious complications is infectious keratitis, a potentially sight-threatening corneal infection. Infectious keratitis can occur due to various factors, including poor lens hygiene, improper lens care, and overnight wear of lenses. The incidence of microbial keratitis associated with RGP lens wear is estimated to be between 0.04% and 0.33% per year.[1-4]

The pathogenesis of infectious keratitis in keratoconus patients wearing RGP lenses is multifactorial. The RGP lens itself can act as a vector for microbial colonization, especially if proper hygiene and disinfection protocols are not followed. The lens can also cause micro-trauma to the corneal epithelium, creating an entry point for pathogens. Additionally, the hypoxic environment created under the lens can further increase the risk of infection. The clinical presentation of infectious keratitis can vary depending on the causative organism and the severity of the infection. Common symptoms include pain, redness, photophobia, tearing, and decreased vision. Clinical signs may include conjunctival injection, ciliary flush, corneal infiltrate, and corneal edema. Prompt diagnosis and treatment are essential to prevent serious complications such as corneal scarring, perforation, and vision loss.[5-7]

The management of infectious keratitis typically involves the discontinuation of contact lens wear and the initiation of intensive topical antibiotic therapy. The choice of antibiotic depends on the suspected causative organism and the clinical severity of the infection. In cases of severe infection or poor response to initial therapy, corneal scraping and culture may be necessary to identify the specific pathogen and guide antibiotic selection. Prevention of infectious keratitis is of paramount importance in keratoconus patients wearing RGP lenses. Patient education plays a crucial role in ensuring proper lens hygiene, care, and handling. Regular follow-up examinations are also essential to monitor for any signs of complications and to ensure optimal lens fit and comfort.[8-10] This case report presents a young female with keratoconus who developed infectious keratitis after three months of RGP lens wear.

2. Case Presentation

A 25-year-old female presented to the ophthalmology clinic with a primary complaint of discomfort, pain, and photophobia in her left eye, which had persisted for one week. This was accompanied by intermittent episodes of redness and tearing in the same eye over the preceding month. These symptoms are suggestive of an inflammatory or infectious process affecting the ocular surface, prompting further investigation to determine the underlying cause. The patient's ocular history revealed a long-standing history of blurred vision, initially diagnosed at the age of 15. This had been managed with corrective glasses, indicating a refractive error. Three months prior to her presentation, she transitioned to rigid gas permeable (RGP) contact lenses for both eyes. While this initially provided adequate visual correction, she began experiencing increasing discomfort and occasional pain in her left eye over the past month, although she reported no noticeable decrease in visual acuity. This suggests a potential complication related to contact lens wear, warranting careful examination of the ocular surface and lens fit. Visual acuity assessment revealed a significant difference between the two eyes. The right eye demonstrated a visual acuity of 20/150 without correction, improving to 20/20 with RGP lens wear. This indicates a substantial refractive error that is effectively corrected by the RGP lens. However, the left eye presented with a visual acuity of 20/70 without correction, also improving to 20/20 with the RGP lens. This discrepancy in uncorrected visual acuity between the two eyes suggests an underlying pathology in the left eye beyond simple refractive error, contributing to the reduced visual acuity even with optimal refractive correction. External examination of the eyes revealed conjunctival and ciliary injection in the left eye, signifying inflammation of the conjunctiva and deeper ciliary vessels. This finding further supports the presence of an active inflammatory or

infectious process in the left eye, correlating with the patient's reported symptoms of discomfort, pain, and redness. Slit-lamp examination, a crucial tool for detailed ocular assessment, revealed a key finding: a 2 mm paracentral corneal infiltrate located at the 7 o'clock position in the left eye. This infiltrate, a localized area of cellular accumulation within the cornea, is a hallmark of corneal inflammation and often indicative of an infectious process, such as keratitis. The location and size of the infiltrate are important factors in assessing the severity and potential impact on vision. Intraocular pressure (IOP) measurement, essential for evaluating the risk of glaucoma, was within the normal range in both eyes. The right eye had an IOP of 13 mmHg, while the left eye measured 15 mmHg. These values fall within the typical range of IOP and do not suggest any immediate concerns for glaucoma. Corneal pachymetry, a technique for measuring corneal thickness, revealed significant thinning in both eyes. The central corneal thickness was measured at 404 µm in both eyes, indicating a departure from the normal range of corneal thickness. This finding is highly suggestive of keratoconus, a condition characterized by progressive thinning and ectasia of the cornea, leading to irregular astigmatism and potential visual impairment. Although not explicitly mentioned in the provided information, corneal topography is a crucial diagnostic tool in evaluating corneal shape and identifying irregularities. In this case, it is highly probable that corneal topography was performed to assess the corneal curvature and confirm the suspected diagnosis of keratoconus. This non-invasive imaging technique would likely reveal irregular astigmatism, a characteristic feature of keratoconus, further supporting the diagnosis based on corneal thickness measurements. Fluorescein staining, a technique used to visualize corneal defects and assess the integrity of the corneal epithelium, was performed. The initial assessment revealed the previously identified paracentral corneal infiltrate, surrounded by edema, suggesting an active inflammatory process within the cornea. Additionally, the staining pattern indicated a possible epithelial defect, a break in the corneal surface, which could serve as an entry point for pathogens and contribute to the development of infectious keratitis. Based on the comprehensive clinical evaluation, including the patient's symptoms, clinical findings, and ocular examination, the following diagnoses were established; Bilateral keratoconus: The corneal thinning observed on pachymetry, along with the likely irregular astigmatism on corneal topography (though not explicitly stated), strongly supports this diagnosis. Keratoconus is a progressive condition that can lead to significant visual impairment if left unmanaged; Bilateral compound myopic astigmatism: This diagnosis is based on the patient's history of needing corrective lenses since the age of 15 and the improvement in visual acuity with RGP lenses. Compound myopic astigmatism refers to a refractive error where the eye is both nearsighted (myopic) and has an irregularly shaped cornea (astigmatism); Left eye infectious keratitis: The presence of a corneal infiltrate, conjunctival and ciliary injection, and the patient's symptoms of pain, photophobia, and redness strongly suggest infectious keratitis. This serious condition requires prompt and appropriate treatment to prevent potential complications such as corneal scarring and vision loss. While infectious keratitis is the primary diagnosis for the left eye, it is important to consider other possible causes of corneal infiltrates. A sterile infiltrate, an inflammatory response not caused by an infectious agent, is included in the differential diagnosis. However, the constellation of findings in this case, including the patient's symptoms and the presence of conjunctival and ciliary injection, make an infectious etiology more likely (Table 1).

The management of this patient with infectious keratitis secondary to RGP lens wear was prompt and multifaceted, focusing on eliminating the infection, promoting corneal healing, and minimizing the risk of recurrence. Recognizing the potential severity of infectious keratitis, the first step in the treatment plan was the immediate discontinuation of RGP lens wear. This crucial measure aimed to remove the potential

source of infection and prevent further irritation to the already compromised cornea. To address the patient's refractive needs in the absence of contact lenses, glasses were prescribed for both eyes. The prescription for the right eye was S-5.00, axis C-5.75 (180), correcting the myopic astigmatism in that eye. For the left eye, affected by the infection, the prescription was S-2.75, axis C-5.75 (145), providing adequate visual correction while the cornea healed. The cornerstone of treatment for infectious keratitis is the use of topical antibiotics. In this case, the patient was prescribed moxifloxacin 0.5% eye drops to be administered six times daily in the left eye. Moxifloxacin is a broad-spectrum fluoroquinolone antibiotic with excellent penetration into the cornea and activity against a wide range of bacteria, including those commonly implicated in contact lens-related keratitis. The frequent dosing regimen ensures adequate drug concentration in the cornea to effectively combat the infection. In addition to antibiotics, the patient was prescribed preservative-free artificial tears six times daily in the left eye. Artificial tears serve several purposes in the management of infectious keratitis. They provide lubrication and soothe the ocular surface, reducing discomfort and promoting healing. Preservative-free formulations are preferred in this context to avoid potential toxicity to the corneal epithelium, which is already compromised by the infection. At the initial presentation, the clinical findings in the left eye included conjunctival injection, ciliary injection, and the previously described 2 mm paracentral corneal infiltrate at the 7 o'clock position. These findings confirmed the presence of active inflammation and infection, necessitating the prompt initiation of treatment. At the one-week follow-up visit, the patient continued the prescribed treatment regimen, including topical moxifloxacin 0.5% eye drops and preservative-free artificial tears in the left eye. This continuation of therapy aimed to ensure complete eradication of the infection and prevent recurrence. Encouragingly, the follow-up examination revealed a positive response to treatment. The size of the corneal infiltrate in the left eye had reduced to 1 mm, indicating a significant improvement in the inflammatory process. Additionally, the infiltrate exhibited an "apical bearing" pattern, suggesting that the infection was resolving and the cornea was beginning to heal. After two weeks of consistent treatment, the patient demonstrated further improvement. The corneal infiltrate in the left eye had completely resolved, signifying successful eradication of the infection and corneal healing. This positive outcome allowed for the gradual reintroduction of contact lens wear. The patient was permitted to resume RGP lens wear, but with strict emphasis on hygiene protocols. This included meticulous handwashing before handling the lenses, proper lens cleaning and disinfection techniques, and adherence to the recommended wearing schedule. The importance of maintaining optimal lens hygiene to prevent future infections was reinforced. Considering the patient's underlying keratoconus, the possibility of fitting RGP keratoconus lenses in the future was discussed. These specialized lenses are designed to provide better fit and visual acuity for individuals with keratoconus, potentially offering improved comfort and vision correction compared to standard RGP lenses. Throughout the follow-up period, the patient was consistently advised on the importance of maintaining hand hygiene and RGP lens cleanliness. This ongoing education aimed to empower the patient to actively participate in her eye care and minimize the risk of future complications. The successful management of this case of infectious keratitis highlights the importance of a comprehensive approach that includes prompt diagnosis, appropriate antibiotic therapy, and supportive care with artificial tears. The decision to discontinue RGP lens wear at the initial presentation was crucial in controlling the infection and allowing the cornea to heal. The gradual reintroduction of RGP lens wear with strict hygiene protocols demonstrates a balanced approach that considers both the patient's visual needs and the risk of recurrence. The emphasis on patient education and empowerment is essential in ensuring long-term success and preventing future complications. This

case also underscores the importance of regular follow-up examinations in monitoring the response to treatment and ensuring complete resolution of the infection. The close monitoring allowed for timely adjustments in the treatment plan and facilitated the safe reintroduction of contact lens wear (Table 2).

Table 1. Anamnesis, clinical findings, ocular examination, and diagnosis.

Feature	Description
Anamnesis	
Chief complaint	Left eye discomfort and pain for 1 week, accompanied by photophobia. Intermittent redness and watering of the left eye for 1 month.
History of present illness	Blurred vision since age 15, corrected with glasses. RGP lens wear in both eyes for the past 3 months, with increasing discomfort and occasional pain in the left eye over the last month. No complaints of decreased visual acuity.
Clinical findings	
Visual acuity	OD: 20/150 unaided, 20/20 with RGP correction. OS: 20/70 unaided, 20/20 with RGP correction
External examination	OS: Conjunctival injection, ciliary injection
Slit lamp examination	OS: Paracentral corneal infiltrate (2 mm) at 7 o'clock position
Intraocular pressure	OD: 13 mmHg. OS: 15 mmHg
Corneal pachymetry	Central corneal thickness: 404 µm ODS (Figure 2)
Ocular examination	
Corneal topography (not explicitly mentioned, but likely performed)	Would likely show irregular astigmatism consistent with keratoconus
Fluorescein staining	Initial: Paracentral corneal infiltrate with surrounding edema and possible epithelial defect (inferred) (Figure 1).
Diagnosis	
Primary diagnosis	ODS Keratoconus; ODS Compound myopic astigmatism; OS Infectious keratitis
Differential diagnosis	OS Sterile infiltrate

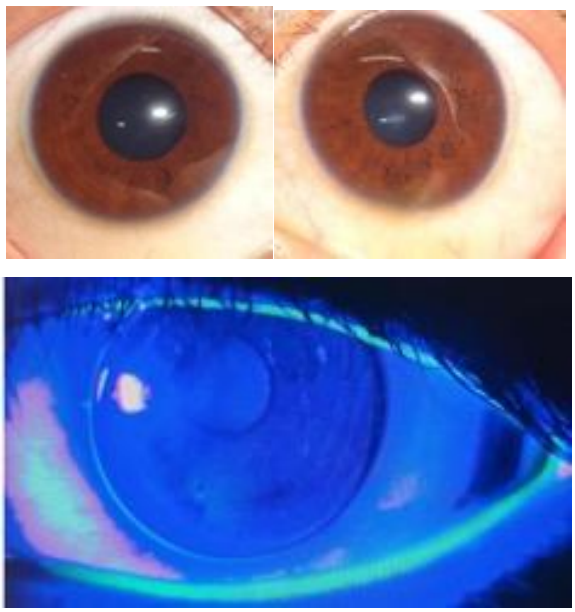

Figure 1. Image of both patients' cornea. There was an infiltrate in the left eye with three point touch using fluorescence.

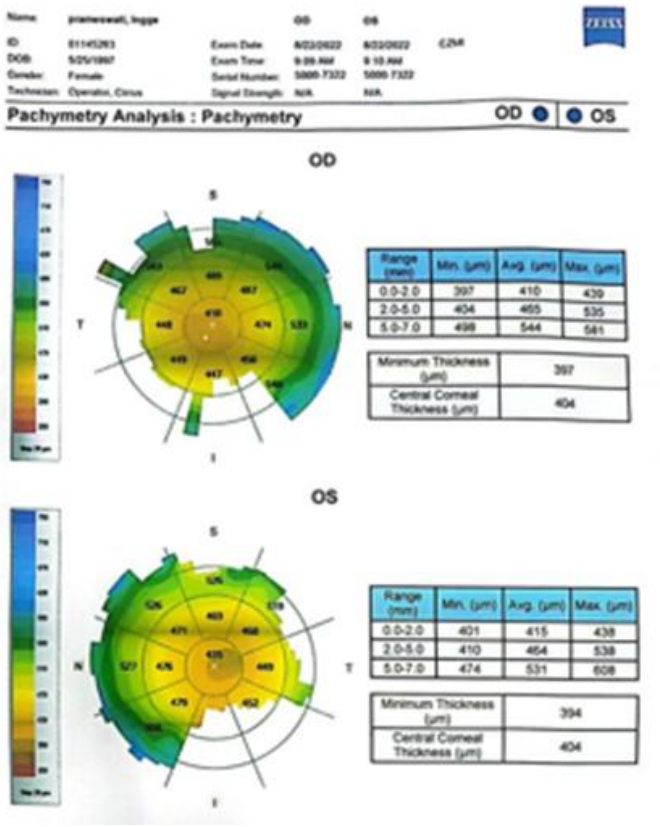

Figure 2. Pachymetry of both patients' cornea. Pachymetry showed both central corneal thinning (ODS: 404 µm).

Table 2. Treatment and follow-up.

Visit	Treatment	Findings
Initial presentation	* Discontinue RGP lens wear. Prescribed glasses: OD S-5.00, axis C-5.75 (180); OS S-2.75, axis C-5.75 (145). Topical moxifloxacin 0.5% eye drops 6 times daily (OS). Preservative-free artificial tears 6 times daily (OS).	* OS: Conjunctival injection, ciliary injection, 2 mm paracentral corneal infiltrate at 7 o'clock position.
1-week follow-up	* Continue topical moxifloxacin 0.5% eye drops (OS). Continue preservative-free artificial tears (OS).	* Reduction in the size of infiltrate on the left eye paracentral cornea to 1 mm with 'apical bearing' pattern (Figure 3).
2-week follow-up	* Resume RGP lens wear with strict hygiene protocols. Consider fitting RGP keratoconus lenses in the future. Advised to maintain hand hygiene and RGP lens cleanliness.	* No infiltrate on the left eye paracentral cornea (Figure 4).

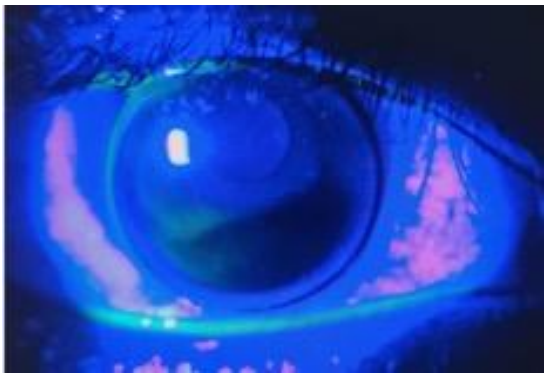

Figure 3. Image of left eye cornea on 1-week follow-up. Shown infiltrate reduced and seen 'apical bearing' by using fluorescence.

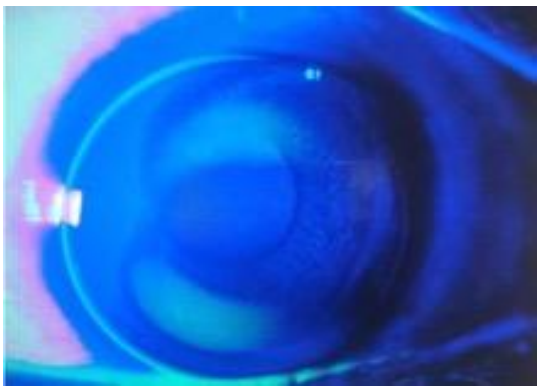

Figure 4. Image of left eye cornea on 2-week follow-up. Showed clear cornea with 'apical bearing' using fluorescence staining.

3. Discussion

Keratoconus is a progressive, non-inflammatory corneal ectatic disorder characterized by corneal thinning and steepening, leading to irregular astigmatism and impaired vision. The irregular corneal shape in keratoconus poses significant challenges for vision correction. While spectacles and soft contact lenses may provide adequate vision in the early stages, rigid gas permeable (RGP) lenses often become the preferred option as the condition progresses. RGP lenses offer several advantages for keratoconus patients. Their rigid structure masks the corneal irregularity, creating a smoother refractive surface and improving visual acuity. Additionally, RGP lenses may help to stabilize the cornea and potentially slow the progression of keratoconus. However, RGP lens wear carries an inherent risk of complications, with infectious keratitis being one of the most serious. The risk of microbial keratitis associated with RGP lens wear is estimated to be between 0.04% and 0.33% per year. The pathogenesis of infectious keratitis in keratoconus patients wearing RGP lenses is multifactorial. The RGP lens itself can act as a vector for microbial colonization, especially if proper hygiene and disinfection protocols are not followed. The lens can also cause micro-trauma to the corneal epithelium, creating an entry point for pathogens. Additionally, the hypoxic environment created under the lens can further increase the risk of infection. The clinical presentation of infectious keratitis can vary depending on the causative organism and the severity of the infection. Common symptoms include pain, redness, photophobia, tearing, and decreased vision. Clinical signs may include conjunctival injection, ciliary flush, corneal infiltrate, and corneal edema. Prompt diagnosis and treatment are essential to

prevent serious complications such as corneal scarring, perforation, and vision loss. The management of infectious keratitis typically involves the discontinuation of contact lens wear and the initiation of intensive topical antibiotic therapy. The choice of antibiotic depends on the suspected causative organism and the clinical severity of the infection. In cases of severe infection or poor response to initial therapy, corneal scraping and culture may be necessary to identify the specific pathogen and guide antibiotic selection. Prevention of infectious keratitis is of paramount importance in keratoconus patients wearing RGP lenses. Patient education plays a crucial role in ensuring proper lens hygiene, care, and handling. Regular follow-up examinations are also essential to monitor for any signs of complications and to ensure optimal lens fit and comfort.[11,12]

Infectious keratitis is a potentially sight-threatening corneal infection caused by various microorganisms, including bacteria, fungi, and protozoa. The RGP lens itself can serve as a substrate for microbial colonization, especially if proper lens hygiene and disinfection practices are not followed. Microorganisms can adhere to the lens surface and form biofilms, increasing the risk of infection. The lens material, lens case, and the patient's tear film can all harbor microorganisms that may cause keratitis. Common bacterial pathogens include *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Streptococcus pneumoniae*. Fungal keratitis, although less common, can occur with poor lens hygiene or in individuals with compromised immune systems. The microorganisms responsible for contact lens-related infectious keratitis are typically found in the environment and can contaminate lens cases, solutions, and the lenses themselves. These microorganisms can adhere to the lens surface, particularly in the presence of deposits or biofilms, and multiply, increasing the risk of infection. The ability of different microorganisms to adhere to RGP lenses varies depending on the lens material, the type of microorganism, and the presence of other factors, such as tear film components and lens care solutions. Biofilms are complex communities of microorganisms that can form on various surfaces, including contact lenses. These biofilms provide a protective environment for microorganisms, making them more resistant to disinfection and host immune responses. The formation of biofilms on RGP lenses can significantly increase the risk of infectious keratitis, as the microorganisms within the biofilm are more difficult to eradicate. The RGP lens can cause micro-trauma to the corneal epithelium, creating entry points for pathogens. This micro-trauma may result from lens movement, improper fit, or foreign particles trapped beneath the lens. Even minor abrasions or scratches on the corneal surface can disrupt the epithelial barrier and provide an opportunity for microorganisms to invade the cornea. The corneal epithelium, the outermost layer of the cornea, serves as a protective barrier against infection. However, RGP lenses, due to their rigid nature and movement on the ocular surface, can cause micro-trauma to the epithelium. This micro-trauma can occur even with properly fitted lenses and meticulous lens care. The micro-abrasions or scratches created by the lens can disrupt the epithelial barrier, allowing microorganisms to penetrate the cornea and initiate an infection. The risk of epithelial micro-trauma is higher in individuals with keratoconus due to the altered corneal shape and thinning. The irregular corneal surface in keratoconus can make it more challenging to achieve a stable and comfortable lens fit, increasing the likelihood of lens movement and subsequent micro-trauma. The RGP lens can create a hypoxic environment on the corneal surface, reducing oxygen availability to the corneal epithelium. This hypoxia can compromise the integrity of the epithelium and increase its susceptibility to infection. The cornea typically receives oxygen from the tear film and the atmosphere. RGP lenses, while providing excellent visual correction, can impede oxygen flow to the cornea, especially during extended wear or overnight wear. The corneal epithelium requires a constant supply of oxygen to maintain its metabolic functions and structural integrity. Oxygen deprivation can lead to epithelial cell damage, reduced cell

turnover, and impaired barrier function, making the cornea more susceptible to infection. RGP lenses, due to their low oxygen permeability compared to soft contact lenses, can create a hypoxic environment on the cornea, particularly during extended wear or overnight wear. The risk of hypoxia-induced corneal damage is higher in individuals with keratoconus due to the already compromised corneal structure and reduced oxygen supply. The thinning and ectasia of the cornea in keratoconus can further impede oxygen diffusion, making the cornea more vulnerable to the effects of hypoxia. Inadequate lens cleaning and disinfection practices are major risk factors for infectious keratitis. Failure to properly clean and disinfect lenses allows microorganisms to proliferate on the lens surface, increasing the risk of infection. Proper lens hygiene includes regular cleaning with a lens solution recommended by an eye care professional, rubbing and rinsing the lenses to remove debris and deposits, and storing the lenses in a clean case with fresh solution. Contact lenses, including RGP lenses, can become contaminated with microorganisms from the environment, hands, or eyelids. If these microorganisms are not effectively removed through proper cleaning and disinfection, they can multiply on the lens surface and increase the risk of infection. Poor lens hygiene practices, such as infrequent cleaning, improper rubbing and rinsing techniques, or reusing lens solution, can contribute to microbial buildup on the lenses and increase the risk of keratitis. Wash hands thoroughly with soap and water before handling contact lenses. Clean lenses daily using a lens solution recommended by your eye care professional. Rub and rinse the lenses gently to remove debris and deposits, even if using a "no-rub" solution. Store lenses in a clean case with fresh solution. Replace lens cases regularly, typically every three months. Do not "top off" old solution in the lens case, always use fresh solution. Sleeping with RGP lenses significantly increases the risk of infectious keratitis. Overnight wear creates a prolonged hypoxic environment on the cornea and reduces the opportunity for the cornea to recover from the mechanical stress of lens wear. The cornea is particularly vulnerable to infection during sleep because the eyelids are closed, reducing oxygen flow and tear exchange. The cornea receives oxygen primarily from the tear film and the atmosphere. During sleep, the eyelids are closed, limiting oxygen access to the cornea. RGP lenses, due to their lower oxygen permeability compared to soft contact lenses, can further reduce oxygen flow to the cornea, especially during extended wear or overnight wear. This reduced oxygen supply can compromise the integrity of the corneal epithelium, making it more susceptible to infection. Avoid sleeping with RGP lenses unless specifically instructed by your eye care professional. If overnight wear is necessary, discuss alternative lens options or strategies to minimize the risk of infection with your eye care professional. Smoking has been identified as a risk factor for infectious keratitis in contact lens wearers. Smoking compromises the ocular immune system and reduces tear film stability, increasing the risk of infection. The toxins in cigarette smoke can damage the ocular surface and impair the eye's natural defense mechanisms. Smoking has numerous negative effects on ocular health. The toxins in cigarette smoke can damage the cells of the ocular surface, including the corneal epithelium, making it more susceptible to infection. Smoking also reduces tear film stability, leading to dry eye symptoms and further compromising the integrity of the ocular surface. Additionally, smoking can impair the eye's natural immune defenses, making it more difficult to fight off infection. Quit smoking to improve overall health, including ocular health. If you are unable to quit smoking, discuss strategies to minimize the risk of keratitis with your eye care professional. A previous episode of infectious keratitis increases the risk of recurrence. This is likely due to persistent changes in the cornea or tear film that make the eye more susceptible to infection. Patients with a history of keratitis should be particularly vigilant about lens hygiene and follow-up care. A previous episode of keratitis can cause subtle but persistent changes in

the cornea or tear film, making the eye more vulnerable to future infections. These changes may include alterations in the corneal epithelium, reduced tear film stability, or changes in the ocular surface microbiome. If you have a history of keratitis, be extra vigilant about lens hygiene and follow-up care. Inform your eye care professional about your history of keratitis so they can provide appropriate monitoring and guidance. Individuals with weakened immune systems, such as those with diabetes, HIV/AIDS, or undergoing chemotherapy, are at increased risk of infectious keratitis. Their immune systems may not be able to effectively fight off invading microorganisms. The immune system plays a crucial role in defending the body against infection. Individuals with compromised immune systems are more susceptible to various infections, including keratitis. Their immune systems may not be able to mount an effective response to invading microorganisms, allowing the infection to establish and progress more easily. If you have a compromised immune system, discuss your risk of keratitis with your eye care professional. Take extra precautions with lens hygiene and follow-up care. Consider alternative vision correction options if necessary. Exposure to contaminated water or soil can increase the risk of keratitis, particularly from Acanthamoeba, a free-living protozoan that can cause a severe form of keratitis. Acanthamoeba is a free-living protozoan commonly found in water and soil. It can contaminate contact lenses, lens cases, and solutions, especially if tap water is used for lens care. Acanthamoeba keratitis is a severe form of keratitis that can be difficult to treat and may lead to vision loss. Avoid swimming, showering, or using hot tubs while wearing contact lenses. Use sterile saline solution for lens care, not tap water. If you have exposure to contaminated water or soil, remove your lenses and consult your eye care professional. Using outdated or contaminated contact lens solutions can also increase the risk of keratitis. It is essential to follow the manufacturer's recommendations for solution use and replacement. Contact lens care solutions are designed to clean, disinfect, and store contact lenses. However, these solutions can become contaminated with microorganisms over time or if not handled properly. Using outdated or contaminated solutions can increase the risk of keratitis. Always check the expiration date on contact lens solutions before use. Do not use solutions that have changed color or appear cloudy. Replace solutions regularly, even if they have not been used. Follow the manufacturer's recommendations for solution use and replacement. Understanding the pathogenesis and risk factors for infectious keratitis is crucial for both eye care professionals and contact lens wearers. By educating patients about proper lens hygiene, care, and handling, and by addressing modifiable risk factors, the incidence of this potentially sight-threatening condition can be significantly reduced.[13-15]

Infectious keratitis is an inflammatory condition of the cornea triggered by an infectious agent, such as bacteria, fungi, viruses, or parasites. The clinical presentation of infectious keratitis can vary depending on the causative organism, the severity of the infection, and the patient's overall health. However, some common symptoms and clinical signs are associated with this condition. Pain is often a prominent symptom of infectious keratitis, ranging from mild discomfort to severe, throbbing pain. The pain is typically localized to the affected eye and may worsen with blinking or eye movements. The cornea is richly innervated with sensory nerves, making it highly sensitive to pain. When the cornea is infected, the inflammatory response triggers the release of chemical mediators that stimulate these nerves, leading to pain. The severity of pain can vary depending on the depth and extent of the corneal involvement, as well as the individual's pain tolerance. Redness of the conjunctiva and surrounding tissues is a common sign of ocular inflammation and infection. The redness may be diffuse or localized to the area of the cornea affected by the infection. Redness occurs due to the dilation of blood vessels in the conjunctiva and sclera in response to inflammation. The inflammatory response is triggered by the presence of

the infectious agent and the body's attempt to fight the infection. Photophobia, or sensitivity to light, is a frequent symptom of infectious keratitis. The inflamed cornea becomes more sensitive to light, causing discomfort or pain in bright environments. Photophobia is thought to be caused by the stimulation of sensory nerves in the cornea by light. The inflammation and edema in the cornea can disrupt the normal transmission of light, leading to increased sensitivity and discomfort. Excessive tearing or watering of the eye is a common response to ocular irritation and inflammation. The tearing may be accompanied by a sticky or mucopurulent discharge from the eye. Tearing is a reflex response to ocular irritation. The inflammation in the cornea triggers the lacrimal glands to produce more tears in an attempt to wash away the irritant and lubricate the eye. The discharge may be clear, watery, or mucopurulent, depending on the severity and type of infection. Infectious keratitis can cause decreased vision due to corneal edema, infiltration, or scarring. The severity of vision loss depends on the location and extent of the corneal involvement. The cornea is the clear front part of the eye that allows light to pass through to the retina. When the cornea is infected, the inflammation and edema can disrupt the normal passage of light, leading to blurred or distorted vision. If the infection is severe or left untreated, it can cause corneal scarring, which can permanently impair vision. Redness of the conjunctiva, the membrane lining the inner surface of the eyelids and covering the sclera (white part of the eye). The conjunctival injection may be diffuse or localized to the area surrounding the corneal infection. Conjunctival injection is a non-specific sign of ocular inflammation and can be caused by various conditions, including infections, allergies, and irritations. In infectious keratitis, the conjunctival injection is often more pronounced in the area surrounding the corneal infection. Engorgement of the deeper ciliary blood vessels surrounding the cornea, often indicating a more severe inflammatory process. The ciliary flush appears as a ring of redness around the cornea and is often associated with pain and photophobia. Ciliary flush is a sign of inflammation in the ciliary body, the structure that produces the aqueous humor (the fluid that fills the front part of the eye). The ciliary flush is often seen in more severe cases of keratitis, particularly those involving the deeper layers of the cornea. A localized area of cellular accumulation within the cornea, often appearing as a white or opaque lesion. The corneal infiltrate represents the accumulation of inflammatory cells and debris in the cornea in response to the infection. The corneal infiltrate is a hallmark of infectious keratitis. It represents the body's attempt to fight the infection by sending white blood cells and other inflammatory cells to the site of infection. The appearance of the infiltrate can vary depending on the causative organism and the stage of the infection. Swelling of the cornea due to fluid accumulation, causing the cornea to appear hazy or cloudy. The corneal edema is caused by the disruption of the corneal endothelium, the inner layer of the cornea responsible for maintaining corneal clarity. The corneal endothelium is a layer of cells that pumps fluid out of the cornea, keeping it clear. When the endothelium is damaged by infection or inflammation, fluid can accumulate in the cornea, causing it to swell and become cloudy. A break in the corneal epithelium, often associated with stromal inflammation and tissue loss. The corneal ulcer may appear as a shallow or deep depression in the cornea and may be surrounded by a zone of infiltration or edema. A corneal ulcer is a more severe form of corneal involvement in infectious keratitis. It represents a break in the epithelial barrier, allowing the infection to penetrate deeper into the cornea. Corneal ulcers can lead to significant vision loss if not treated promptly. Accumulation of white blood cells in the anterior chamber (the space between the cornea and the iris), indicating a severe inflammatory response. The hypopyon appears as a white or yellowish layer in the anterior chamber and is often associated with severe pain and decreased vision. Hypopyon is a sign of severe intraocular inflammation and is often seen in cases of bacterial or fungal keratitis. The presence of hypopyon indicates that the infection has spread to

the anterior chamber and requires aggressive treatment to prevent further complications. The diagnosis of infectious keratitis is based on a combination of patient history, clinical presentation, and ocular examination findings. A detailed history, including contact lens wear habits, recent ocular trauma, and systemic illnesses, is essential in guiding the diagnosis. Clinical examination typically involves visual acuity assessment, external examination of the eye, and slit-lamp biomicroscopy to evaluate the cornea and anterior segment. In cases where the diagnosis is uncertain or the infection is severe, corneal scraping and culture may be performed to identify the causative organism and guide antibiotic selection. Corneal scraping involves gently collecting a sample of the corneal tissue from the area of the infiltrate or ulcer. The sample is then sent to a laboratory for culture and identification of the microorganism. This information helps in selecting the most appropriate antibiotic therapy for the specific pathogen.[16-18]

The management of infectious keratitis requires prompt and aggressive treatment to eliminate the infection, promote corneal healing, and preserve vision. The immediate discontinuation of contact lens wear is essential to remove the potential source of infection and allow the cornea to heal. Contact lenses, especially if not properly cleaned and disinfected, can harbor microorganisms and contribute to the persistence of the infection. Removing the contact lenses eliminates the source of contamination and allows the cornea to receive adequate oxygenation, promoting healing. Topical antibiotics are the mainstay of treatment for infectious keratitis. The choice of antibiotic depends on the suspected causative organism and the severity of the infection. Broad-spectrum antibiotics, such as fluoroquinolones, are often used initially, while more targeted therapy may be initiated once the causative organism is identified through culture. The frequency and duration of antibiotic administration depend on the severity of the infection and the clinical response. Frequent instillation of antibiotic drops, typically every hour or two initially, is crucial to maintain adequate drug concentration in the cornea and effectively combat the infection. As the infection improves, the frequency of administration can be gradually reduced. Supportive care measures may include topical corticosteroids to reduce inflammation, cycloplegic agents to relieve pain and prevent complications, and artificial tears to lubricate the ocular surface and promote healing. Topical corticosteroids can help reduce inflammation and prevent corneal scarring, but they should be used cautiously and under the close supervision of an eye care professional, as they can also suppress the immune response and potentially worsen the infection. Cycloplegic agents, such as atropine or cyclopentolate, can help relieve pain by temporarily paralyzing the ciliary muscle, which controls lens accommodation. They can also help prevent complications such as posterior synechiae (adhesion of the iris to the lens) and reduce the risk of corneal perforation in severe cases. Artificial tears provide lubrication and soothe the ocular surface, promoting healing and reducing discomfort. Preservative-free artificial tears are preferred in this context to avoid potential toxicity to the corneal epithelium, which is already compromised by the infection. Close monitoring of the patient's response to treatment is crucial. Regular follow-up examinations allow for assessment of the infection's resolution, identification of any complications, and adjustment of the treatment plan as needed. Follow-up examinations typically involve visual acuity assessment, slit-lamp biomicroscopy to evaluate the cornea and anterior segment, and assessment of any signs or symptoms of complications. The frequency of follow-up visits depends on the severity of the infection and the clinical response. Initially, more frequent visits may be necessary, with the interval between visits gradually increasing as the infection resolves. In cases of severe corneal ulceration or persistent epithelial defects, debridement (removal of loose or necrotic tissue) may be performed to promote healing and reduce the microbial load. Amniotic membrane transplantation may be considered in cases of severe

or non-healing corneal ulcers. The amniotic membrane has anti-inflammatory and pro-healing properties and can help promote corneal epithelialization and reduce scarring. In rare cases, surgical intervention may be necessary to manage complications such as corneal perforation or impending perforation. Surgical procedures may include corneal patch grafting, tectonic keratoplasty, or penetrating keratoplasty. The successful management of infectious keratitis requires a multi-faceted approach that addresses the infection, promotes corneal healing, and prevents complications. Prompt diagnosis, appropriate antibiotic therapy, supportive care, and close monitoring are essential for achieving the best possible outcome and preserving vision.[19,20]

4. Conclusion

This case report highlights the potential for infectious keratitis in keratoconus patients using RGP lenses, emphasizing the importance of early diagnosis and treatment to prevent severe complications such as corneal scarring and vision loss. The successful management of this case underscores the effectiveness of a comprehensive approach that includes prompt discontinuation of lens wear, intensive topical antibiotic therapy, and supportive care with artificial tears. The case also demonstrates the critical role of patient education and adherence to strict hygiene protocols in preventing recurrence and ensuring the safe and effective use of RGP lenses in keratoconus patients. Regular follow-up examinations are essential to monitor for signs of complications, ensure optimal lens fit, and reinforce patient education. Further research is needed to investigate the risk factors for infectious keratitis in keratoconus patients using RGP lenses and to develop strategies for prevention and management. This could include studies evaluating the efficacy of different lens materials, disinfection methods, and patient education programs. By disseminating knowledge and increasing awareness of this potential complication, eye care professionals can help keratoconus patients using RGP lenses maintain optimal eye health and quality of life. The findings from this case report contribute to the growing body of evidence supporting the importance of vigilance and proactive measures in managing keratoconus patients using RGP lenses.

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