

## Case Report

# Gonococcal keratoconjunctivitis in an adult

Jae Soo Kim<sup>1\*</sup>, Bo Kyeong Jung<sup>2\*</sup>, Kyong Jin Cho<sup>3</sup>, Ga-Yeon Kim<sup>4\*</sup>

<sup>1</sup>Department of Laboratory Medicine, Dankook University Hospital, Cheonan, Korea; Departments of <sup>2</sup>Laboratory Medicine, <sup>3</sup>Ophthalmology, Dankook University College of Medicine, Cheonan, Korea; <sup>4</sup>Department of Public Health, Dankook University Graduate School, Cheonan, Korea. \*Equal contributors and co-first authors .

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**Abstract:** Cases of eye infection caused by gonococci are rarely reported in adults without genital infection. Delayed diagnosis or misdiagnosis of infectious corneal conjunctivitis by other causative agents leads to acute pain, corneal perforation, vision loss, and severe eye discharge. A 33-year-old male patient visited the emergency department of Dankook University Hospital complaining of pain in both eyes, edema of the eyelids, hyperemia, and blurred vision, which started four days prior. The subject had sexual intercourse with his girlfriend before the appearance of these symptoms. Preliminary examination of eye secretions using Gram staining revealed the presence of intracellular and extracellular Gram-negative diplococci, thus leading to suspicion of gonococcal keratoconjunctivitis. Blood agar medium and Chocolate agar medium were inoculated with the secretion samples and cultured. Bacterial identification was performed using the VITEK 2 microbial identification system. *Neisseria gonorrhoeae* was identified by Gram staining and VITEK 2. Subsequent treatments included a 200 mg/day oral dose of doxycycline, 0.5% moxifloxacin eye drops, and 0.3% tobramycin ointment application six times per day. A urine test during hospitalization revealed occult blood (4+) and WBC (2+), along with moderate presence of bacteria. As genital infection was suspected, the urology department prescribed a single dose of azithromycin (1000 mg). The ocular infection likely occurred through hand autoinoculation by the sexually active adult. According to the existing literature, the disease is usually spread from genital-hand-eye contact in the sexually active population.

**Keywords:** Gonococcal keratoconjunctivitis, *Neisseria gonorrhoeae*

### Introduction

*Neisseria* species are fastidious, Gram-negative cocci that require nutrient supplementation for growth in laboratory culture. The obligate aerobic bacterium is present intracellularly and typically appears in pairs (diplococci) [1]. Of the eleven species of *Neisseria* that colonize humans, only two are pathogenic. *N. gonorrhoeae* is the causative agent of gonorrhoea and *N. meningitidis* is one of the causative agents of bacterial meningitis. *N. gonorrhoeae* is able to evade the host immune system by changing its surface proteins, leading to re-infection [2]. It can cause infections of the genitals, throat, and eyes [3]. Moreover, *N. gonorrhoeae* ocular infections can turn into a vision-threatening condition, especially when corneal scarring and/or perforation occur [4-6]. Ocular infection occurs through hand autoinoculation of the bacteria from infected urine and genital secretions in sexually active adults [7, 8].

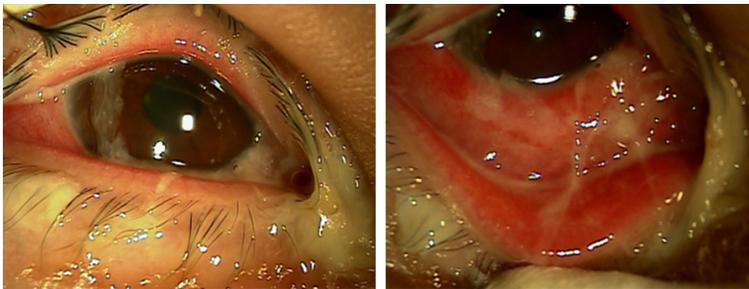
Cases of eye infection caused by gonococci are rarely reported in adults without genital infection. Delayed diagnosis or misdiagnosis of infectious corneal conjunctivitis by other causative agents leads to acute pain, corneal perforation, vision loss, and severe eye discharge [4, 9]. Treatment must be initiated as soon as possible in such cases, even before the results of the culture test are available, due to the aggressive nature of the infection.

### Case report

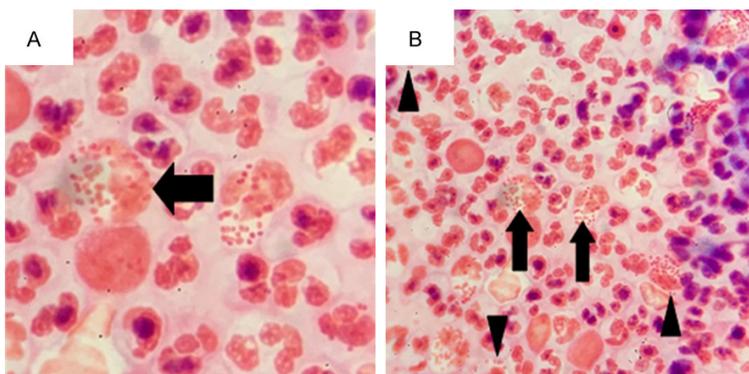
The Institutional Review Board Deliberations of Dankook University approved this study (IRB No. DKU 2020-01-010) and prior informed consent was obtained from the patient for the publication of this case.

A 33-year-old male patient visited the emergency department of Dankook University Hospital in July 2019. He complained of pain in both eyes, edema of the eyelids, hyperemia, severe

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**Figure 1.** At second visit, keratitis with corneal epithelial defect in both eyes and injected conjunctiva with purulent discharge were observed.



**Figure 2.** A. The intracellular diplococci (*Neisseria gonorrhoeae*) with Gram-negative staining. B. The arrows show intracellular diplococci and the arrowheads show extracellular diplococci among neutrophils.

eye discharge, and blurred vision that started four days prior. His blood pressure and pulse rate were 143/96 mmHg and 120 beats/min, respectively. His body temperature was 37.4°C. The eyesight test showed a visual acuity of 0.5 in the right eye, while that of the left eye could not be numerically categorized due to severe visual impairment. The eye pressure was 21 mmHg in the right eye and 23 mmHg in the left eye. The emergency department prescribed 5 mL of fluorometholone ophthalmic solution (0.1%), 0.5 mL of sodium hyaluronate (0.1%), 5 mL of moxifloxacin (0.5%), and ofloxacin eye ointment 3.5 g/tub as antibiotics and anti-inflammatory agents.

Two days later at the ophthalmologic outpatient clinic, the patient displayed excessive yellow-white secretions in both eyes along with blurred vision and eye pain (**Figure 1**). He had sexual intercourse with his girlfriend before the appearance of the symptoms but had no systemic illness, eye trauma, and history of eye surgery. Under the suspicion of gonococcal

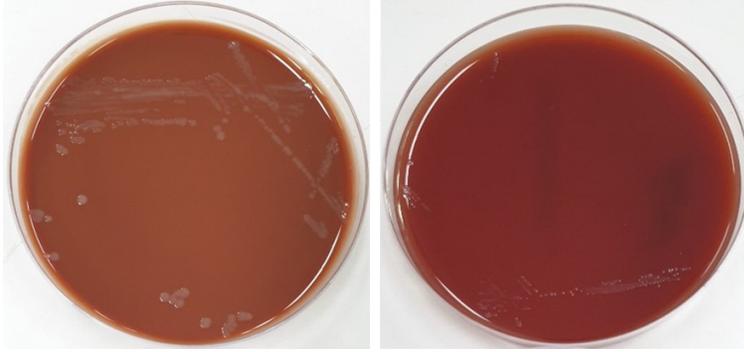
keratoconjunctivitis, a sample of his eye secretion was inoculated onto blood agar and Chocolate agar plates, and also smeared onto a slide. The agar plates and slide were immediately received by the microbiology laboratory for bacterial culture and Gram staining. Subsequent treatment included a 200 mg/day oral dose of doxycycline, usage of 0.5% moxifloxacin eye drops, and 0.3% tobramycin ointment application six times per day.

As soon as the BAP and Chocolate agar were received, the sample inoculation area was spread by disposable loops and then cultured for 24 to 48 h in a 35°C incubator with 5% CO<sub>2</sub>. The slide with the eye secretion smear was subjected to Gram staining. The Gram stain highlighted many neutrophils containing Gram-negative diplococci (**Figure 2**). After 20 h of culture, small colonies were observed in the blood

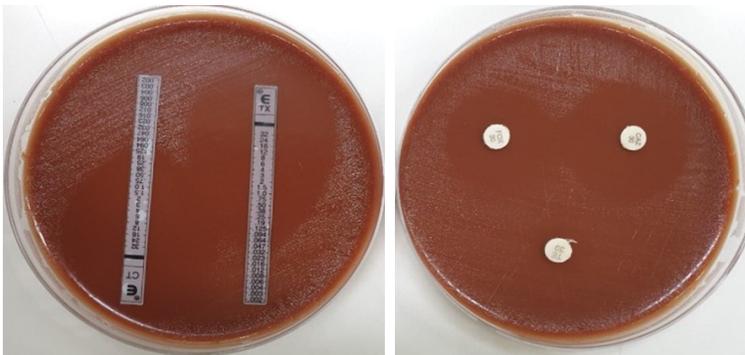
agar medium and slightly larger translucent gray colonies were observed in the Chocolate agar medium (**Figure 3**). These colonies grew larger after 48 h of culture, and were also found to be positive for catalase- and oxidase-activity. *N. gonorrhoeae* was identified as the infectious agent from the eye secretions using VITEK 2 (Biomerieux Clinical Diagnostic, France). Antimicrobial test results revealed susceptibility to cefotaxime (0.125 mg/mL) and ceftriaxone (0.094 mg/mL) by E-test (bioMérieux, Marcy l'Etoile, France) and resistance to ciprofloxacin and tetracycline by the disc diffusion method (**Figure 4**).

The patient was hospitalized four days after the visit. During hospitalization, urinalysis revealed occult blood (4+) and WBC (2+), along with moderate presence of bacteria. Since genital infection was suspected, the urology department prescribed a single dose of azithromycin (1000 mg). He was discharged on the 11<sup>th</sup> day of hospitalization in a better condition. No symptoms of urinary tract infection were ob-

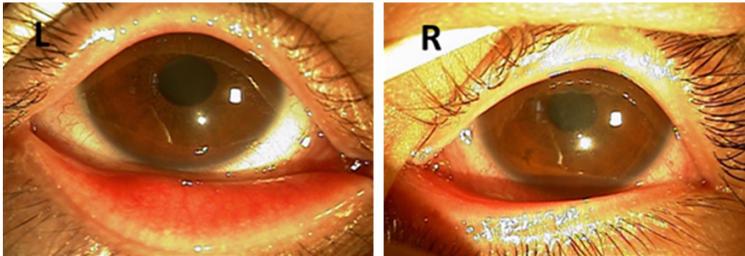
## Gonococcal keratoconjunctivitis



**Figure 3.** The growth of *N. gonorrhoeae* colonies on BAP and Chocolate agar was shown.



**Figure 4.** Antimicrobial susceptibility test results using E-test (left) and disc diffusion method (right) were shown.



**Figure 5.** After 10 weeks antibiotics use, there was slight injection in both eyes, cornea was clear on right eye, however, corneal opacity was observed in the left eye.

served. At discharge, his right visual acuity was 0.5 and his left visual acuity was approximately finger count 50 cm. From the 15<sup>th</sup> day onward, steroid fluorometholone (0.1%) eye drops four times per day were added to the treatment regimen. From the 24<sup>th</sup> day onward, oral doxycycline was discontinued, and levofloxacin (0.5%) and fluorometholone (0.1%) were applied to the eyes four times per day.

Ten weeks after discharge, uncorrected vision was 0.6 for the right eye and 0.3 for the left eye.

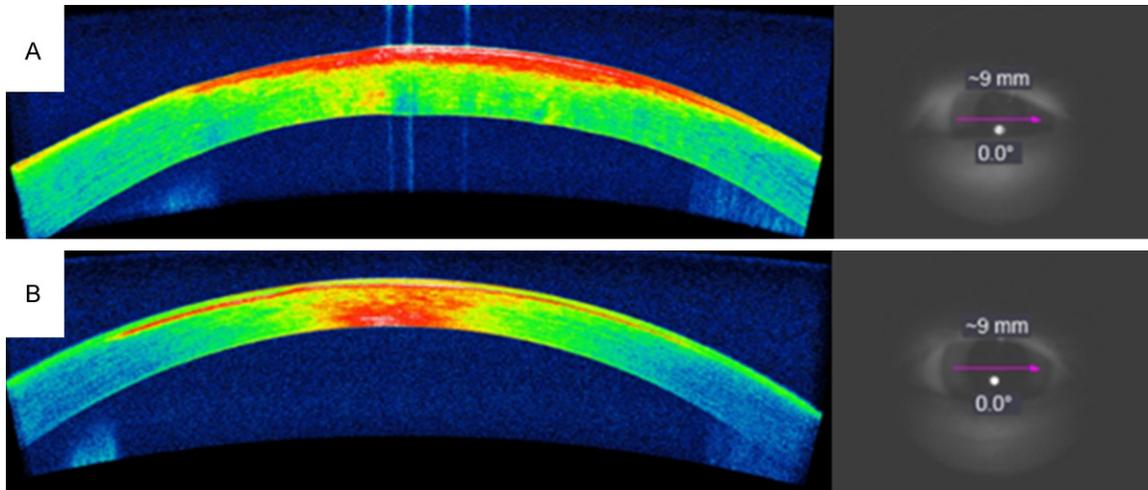
The corrected vision was 1.0 in the right eye and 0.7 in the left eye. The ocular pressure was 13 mmHg in the right eye and 8 mmHg in the left eye. Corneal opacity remained in the left eye (**Figure 5**), but the inflammation was no longer detectable (**Figure 6**).

### Discussion

Gonococcal keratoconjunctivitis can be observed in neonates whose eyes are infected during passage of the fetus through the birth canal (ophthalmia neonatorum). However, here we report gonococcal keratoconjunctivitis observed in an adult due to infection of the mucosal surfaces of the eyes after transmittance through sexual practices, that is, auto-inoculation. Uncomplicated infection by *N. gonorrhoeae* manifests most commonly as urethritis and most untreated urethritis cases resolve spontaneously after several weeks [10]. On the other hand, gonococcal keratoconjunctivitis is a potentially fatal infection because gonorrhea causes severe ulcerative keratitis and can rapidly progress to corneal perforation [9]. *N. gonorrhoeae* invades intact corneal and conjunctival epithelium through pili adherence to the corneal epithelium. The attached bacterium is engulfed by the epithelial protrusions and after 8 to 24 h the superficially infected cells

are likely to desquamate and infect deeper layers of cells [11]. Therefore, accurate diagnosis and antibiotic treatment are needed as soon as possible. However, the low incidence of this disease can delay correct clinical diagnosis due to false diagnostic approaches, such as infectious corneal conjunctivitis, by other common causes of the pathogen [4]. In addition, rare cases of eye infections by *N. gonorrhoeae* in adults without genital infections have been reported [12]. In fact, this case was incorrectly diagnosed as epidemic keratoconjunctivitis when it first came

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**Figure 6.** Anterior segment OCT (optical coherence tomography). A. At the second visit, the cornea is swollen and severely infiltrated in left eye. B. 10 weeks after the start of treatment, corneal swelling decreased and infiltration decreased. But subepithelial opacity remains in the left eye.

to the emergency department and then suspected as gonococcal keratoconjunctivitis two days later.

The simplest and quickest way to verify the diagnosis of gonorrhoea in a routine setting is through direct microscopy with Gram stained samples that display intracellular Gram-negative diplococci within the neutrophils. The sensitivity of microscopy depends on the anatomical sites and is the highest in urethral slides of men (up to 89%) [10]. The growth of this bacterium requires CO<sub>2</sub> and the optimal growth temperature is 35-37°C. Therefore, the sample must be received by the microbiology laboratory immediately after collection [13]. Eye secretions were inoculated directly into the blood agar and Chocolate agar plates by an ophthalmologist and immediately sent to the microbiology laboratory. In the lab, the inoculation sites were widely spread using disposable loops to incubate in an incubator with 5% CO<sub>2</sub>.

In this patient, smears of the exudate revealed numerous intracellular and extracellular Gram-negative diplococci, which were highly suggestive of *N. gonorrhoeae*. On the next day, *N. gonorrhoeae* grown in the blood agar medium and Chocolate agar medium was observed. Gram-negative rods, such as *Acinetobacter* species, can sometimes be indistinguishable from *N. gonorrhoeae* by Gram staining, but we definitively identified *N. gonorrhoeae* by using VITEK 2 microbial identification system. VITEK 2, an innovative automated system, is frequently us-

ed for rapid microbial identification and antimicrobial susceptibility testing. Subsequent treatment included a 200 mg/day oral dose of doxycycline, usage of 0.5% moxifloxacin eye drops, and 0.3% tobramycin ointment application six times per day. Fluorometholone (0.1%) four times per day was added after 15 days. No inflammation was observed after 10 weeks from the start of the treatment.

In this case study, we report the correct diagnosis of keratoconjunctivitis in an adult caused by *N. gonorrhoeae*. He visited the emergency department with blurred vision and excessive yellow-white discharge from both eyes. The ocular infection likely occurred through hand autoinoculation by the sexually active adult patient. *N. gonorrhoeae* was identified as the infectious agent using Gram staining and VITEK 2.

### Disclosure of conflict of interest

None.

**Address correspondence to:** Ga-Yeon Kim, Department of Public Health, Dankook University Graduate School, 119, Dandae-Ro, Dongnan-Gu, Cheonan-Si, Chungnam 31116, South Korea. Tel: +82 41 550 1493; Fax: +82 41 550 1490; E-mail: sysnhj77@gmail.com

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