

A case report of corneal abscess caused by *Nocardia farcinica*

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ABSTRACT

Background: Keratitis caused by *Nocardia*, a Gram-positive bacterium prevalent in soil, is an infrequent ocular infection typically following corneal trauma or exposure to soil or vegetation. *Nocardia farcinica*, in particular, is an exceedingly rare causative agent of keratitis, with few documented cases worldwide and none previously reported in Vietnam. **Case Presentation:** We report the first documented case of *N. farcinica* keratitis in Viet Nam, presenting as a corneal abscess in a 70-year-old male farmer following phacoemulsification surgery. Despite prolonged treatment with corticosteroids and atropine eye drops, the patient experienced persistent pain, tearing, and poor vision improvement. A definitive diagnosis was achieved through the culture of corneal swabs on blood agar medium, which yielded dry, wrinkled yellow colonies identified as *Nocardia* spp., with subsequent MALDI-TOF MS (VITEK-MS) confirmation of *N. farcinica*. The patient showed significant improvement following treatment with 0.3% tobramycin. **Conclusion:** This case underscores the importance of considering *N. farcinica* in the differential diagnosis of post-surgical keratitis, particularly in patients unresponsive to standard treatments. It highlights the necessity of a thorough medical history, clinical examination, and the pivotal role of microbiological culture and molecular identification techniques in diagnosing rare infectious agents. This case adds to the global repository of *Nocardia* keratitis cases and suggests a need for awareness and diagnostic readiness for such infections, especially in rural farming communities.

Key words: *Nocardia farcinica*, keratitis, corneal abscess

INTRODUCTION

Nocardia is a rare agent of infectious keratitis, accounting for only about 3% of cases^{1,2}, but it can be misdiagnosed as a fungal or viral infection, thus limiting the treatment and leading to vision damage. *Nocardia* keratitis has been reported only in case reports and a few case series, often occurring after trauma or surgery, including phacoemulsification (PHACO) surgery, and *Nocardia asteroides* is the most common causative pathogen^{2,3}. *Nocardia farcinica* was first described by Edmond Nocard in 1888 as causing lung infections and brain abscesses⁴. In 1997, Eggink *et al.* first reported a case of keratitis caused by *N. farcinica* in a patient who used contact lenses that were improperly cleaned with water from the sink⁵, and to date, there have been few reports of keratitis caused by this bacteria and none in Vietnam. Here, we describe a case of corneal abscess caused by *N. farcinica* after phacoemulsification surgery.

CASE REPORT

A 70-year-old male patient, working as a farmer, with no medical history recorded, was treated at Cho Ray Hospital in November 2023. The patient presented with symptoms of right eye pain, tearing, and vision that did not improve after surgery. About two

months before admission, the patient had PHACO surgery at Phu Yen Hospital. After surgery, the patient immediately returned to farming. About one week later, symptoms of increasing eye pain, tearing, and stinging appeared and vision after surgery did not improve. The patient was treated with corticosteroid drops (Pred Forte) with a diagnosis of uveitis after PHACO surgery at the outpatient department of Eye hospital. After one week of treatment, the patient was given diagnostic tests for hepatitis B and C, syphilis, and HIV and a chest X-ray prior to long-term corticosteroid treatment. Diagnostic tests were negative but chest X-ray results showed damage to the lung apex, so the patient was transferred to a tuberculosis specialist hospital where they were diagnosed with AFB-negative pulmonary tuberculosis and treated with anti-tuberculosis drugs (Turbevid 600 mg/day and ethambutol 600 mg/day). During tuberculosis treatment, the patient continued to use Pred Forte eyedrops. Eye symptoms decreased but the discharge remained and vision did not improve. He was admitted to Cho Ray Hospital and discontinued Pred Forte after admission (total duration of Pred Forte was two months).

Clinical symptoms at admission included the following: visual acuity of the right eye to distinguish be-

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tween light and dark; intense eye pressure; conjunctival hyperemia; corneal edema; central corneal abscess near the main incision, size about 4.0 x 5.0 mm; anterior chamber had fibrin sticking from the back of the cornea to the pupillary area; the anterior chamber pus was 1.5 mm; the posterior structures were difficult to observe. Diagnosis at the time of admission: right eye corneal abscess after PHACO surgery; tuberculosis under treatment. The patient had corneal fluid samples taken for gram staining, fungal screening, and culture before treatment. After taking the specimen, the patient was given oral medications: levofloxacin (500 mg/day), itraconazole (200 mg/day), acetazolamide (500 mg/day), kalium (500 mg/day) and Azarga eyedrops (every 12 hours), Natacin (every 2 hours), Vigamox (every 2 hours), and atropine (every 2 hours). On the fifth day after admission, the patient still had the following symptoms: eye pain at night; right eye corneal edema; ulcer at the edge of the edge at the 9 o'clock position with a feathered edge; ulcer with mucous surface, size 4.0 x 5.0 mm, monitored for corneal perforation; anterior chamber present but irregular, shallow towards the temple; pupil distorted towards the temple; ciliary body reaction 3+.

Gram stain results did not find bacteria or fungi. However, on the fifth day, dry, yellow wrinkled, colonies appeared on the blood agar, denting the agar. On the colony's Gram stain, bacteria appeared thin, filamentous, branching, and irregular, which suggested *Nocardia*. The MALDI-TOF MS (matrix-assisted laser desorption ionization-time of flight mass spectrometry) method using the VITEK-MS system (bioMérieux SA, Marcy-l'Étoile, France) identified the bacteria as *Nocardia farcinica*.

After obtaining the bacterial culture results, the patient was stopped with levofloxacin antibiotics, supplemented with intravenous antibiotics (imipenem 500 mg every 6 hours), oral antibiotics trimethoprim/sulfamethoxazole (960 mg every 12 hours) and Azarga eyedrops (every 12 hours), Natacin (every 2 hours), Vigamox (every 2 hours), and atropine (every 2 hours). A second corneal smear sample was taken for staining, bacterial culture, and molecular biology testing for tuberculosis bacteria. The results of the culture and tuberculosis test were negative. On the 10th day after admission, the patient's right eye had reduced pain, and examination results showed reduced anterior chamber fibrin, reduced anterior chamber pus streaks, corneal edema, thinning of the abscess, and average eye pressure.

DISCUSSION

Nocardia farcinica belongs to the genus *Nocardia*, which are filamentous, aerobic, weakly acid-resistant Gram-positive bacilli that commonly live in environments such as soil, water, mud, dust, and decomposing plants. The genus *Nocardia* has about 87 species, of which the most common is *N. asteroides*. Other less common species such as *N. farcinica*, *N. brasiliensis*, *N. cyriacigeorgica*, and *N. exalbida* often cause lung infections in immunocompromised patients and can spread to other organs via the bloodstream, but can also cause infection in immunocompetent patients whose wounds are exposed to environments containing bacteria⁶. Although ocular infections caused by *Nocardia* are rare¹, they are an important cause of corneal infections⁷. Research on cases of *Nocardia* infections in China (2009–2021) shows that the rate of eye infections caused by this bacteria is only 2% (9/441 patients) and the majority of patients are over 45 years old⁸. In Italy, studies from 2000 to 2022 showed that *Nocardia*-related eye infections accounted for 1% of cases, mainly due to *N. asteroides*⁹. Very few cases have been reported of ocular infections due to *N. farcinica*.

Nocardia farcinica was first described by Edmond Nocard in 1888⁴, and subsequent reports showed that the bacterium often causes lung infections and brain abscesses and can cause disseminated Nocardiosis (Nocardiosis), especially in immunodeficient patients¹⁰. In 1997, Eggink *et al.* first reported a keratitis case caused by *N. farcinica* in a patient using improperly cleaned contact lenses⁵. A study conducted on 138 patients with eye infections caused by *Nocardia* from 1999 to 2010 by DeCroos *et al.* (2011) also showed that the majority of eye infections caused by *Nocardia* were keratitis (111/138 patients); the remainder were conjunctivitis and endophthalmitis. This was also the largest report of ocular *Nocardia* infection but only 6/111 patients had *N. farcinica* isolates, and most cases of keratitis were caused by *N. asteroides* (51/111 cases)³.

The most common risk of *Nocardia* keratitis is traumatic corneal damage; other recognized risks include surgery (LASIK, PHACO, *etc.*), prolonged use of topical corticosteroids, and wearing contact lenses¹¹, and can occur in patients with normal immune systems. DeCroos *et al.* (2011) also showed that all patients with *Nocardia* keratitis had no previous history of disease that may cause immune system deficiency³. The majority of patients with *Nocardia* keratitis have a history of ocular exposure to soil, plants, or agriculture-related occupations³. Approximately half of patients



Figure 1: Right eye of patient (5th day admission).

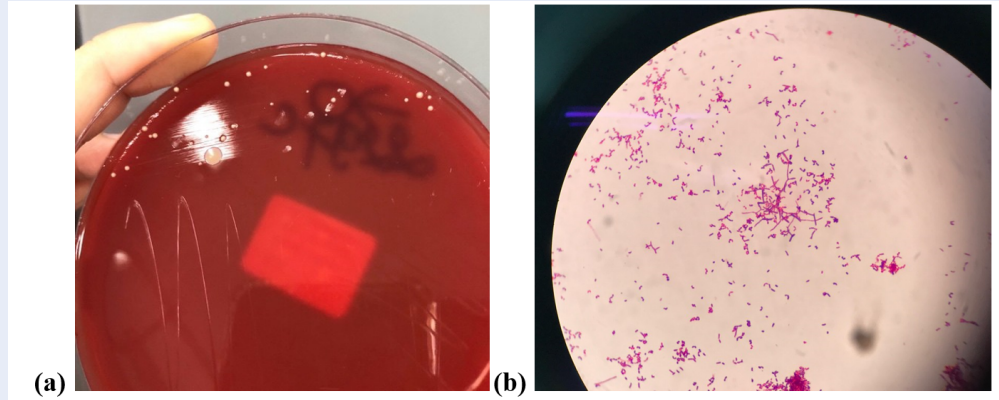


Figure 2: Bacterial culture and gram stain results of the corneal fluid samples. (a) Colonies on blood agar (48 hours) were dry, yellow, and wrinkled, (b) Gram stain of colonies.

are considered to have *Nocardia* keratitis upon examination if there are characteristic corneal symptoms such as patchy anterior stromal infiltrates with yellow-white pin-head-sized raised calcareous lesions arranged in a wreath pattern⁷. Infiltration is often located in the mid-periphery of the cornea near the site of damage or abrasion¹¹. Clinically, *Nocardia* keratitis can be confused with fungi or atypical mycobacteria. In this patient, eye symptoms appeared around one week after lens replacement surgery. Immediately after surgery, the patient returned to farming work and these symptoms may be similar to the irritation after lens replacement, so the patient was treated with corticosteroid eyedrops for two months. There is a risk that prolonged *Nocardia* keratitis may lead to corneal abscesses or not be recorded in patients with previous immunodeficiency diseases.

Based on phenotypic characteristics such as bacterial morphology, a positive Gram stain can indicate *Nocardia* or some aerobic actinomycetes with similar morphology. DeCroos et al.(2011) showed that Gram staining can detect about 63% of cases of *Nocardia* keratitis early³. In this patient, the presence

of bacteria was not recorded in the Gram stain smear-directed sample, which may be due to the patient having an onset three months before hospitalization and using antibiotics, anti-inflammatories, and corticosteroid eyedrops. However, *Nocardia* species have different epidemiological characteristics, toxins, and antibiotic sensitivities, so accurate species identification is important in choosing the appropriate treatment. To accurately identify *Nocardia* species, it is necessary to culture specimens and use appropriate identification methods. Currently, most clinical microbiology laboratories use biochemical tests to identify microorganisms, but *Nocardia* grows slowly and identification often takes a long time and can be inaccurate, because there are many newly isolated *Nocardia* species, and the biochemical characteristics of the species in the reports are not consistent¹⁰. The identification by protein mass spectrometry technology (MALDI-TOF MS) can give quick and accurate results for many *Nocardia* species that often cause disease¹⁰; however, not many microbiology laboratories in Viet Nam use this system. In our study, we used

the VITEK-MS system of Biomerieux (Marcy-l'Étoile, France) to identify the isolated agent as *N. farcinica*. In addition, molecular biology methods or gene sequencing can be used to identify cases that cannot be identified by the MALDI-TOF method, but the technique is complex and expensive, so it is difficult to apply in clinical microbiology laboratories. Regarding antibiogram testing, due to the slow growth of bacteria, the microdilution method in liquid medium is the gold standard for determining the antibiotic sensitivity level of *Nocardia*. However, this technique is complex and rarely used in clinical laboratories, so most clinical microbiology laboratories only report identification results, and clinicians can choose antibiotics according to the normal susceptibility spectrum of bacteria and according to treatment guidelines. According to the standards of the Clinical and Laboratory Standards Institute (CLSI), *N. farcinica* is often sensitive to amikacin, amoxicillin-clavulanic acid, ciprofloxacin, linezolid, and sulfonamides and resistant to ceftriaxone, clarithromycin, and tobramycin. Reports of keratitis indicate that *Nocardia* usually responds well to aminoglycosides and sulfonamides⁷, of which ophthalmic amikacin is considered the first choice of treatment, followed by tobramycin and gentamicin¹². Sensitivity rates to amikacin, gentamicin, and gatifloxacin of *Nocardia* in 111 cases of keratitis were also relatively high (97%, 85%, and 75% respectively)³.

CONCLUSION

We report the first case of keratitis after PHACO surgery due to *N. farcinica*. Because the frequency of the disease is rare and symptoms that occur immediately after surgery can overlap with postoperative irritation, clinicians need to pay attention to the patient's risk factors, such as contact with soil or dust immediately after surgery, characteristic clinical signs, and the response to common treatment methods to guide diagnosis, and patient samples should be tested to find the pathogen. However, because *Nocardia* exists commonly in nature, there needs to be a discussion between the laboratory and the clinician to determine the meaning of *Nocardia* isolated in samples.

ABBREVIATIONS

AFB: Acid Fast Bacilli, HIV: Human Immunodeficiency Virus

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AUTHOR'S CONTRIBUTIONS

Conceptualization and Investigation: MLP, TVNA; Writing-Original Draft: MLP, VDTT, PTT; Writing-Review & Editing: all authors. All authors read and approved the final manuscript.

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AVAILABILITY OF DATA AND MATERIALS

Data and materials used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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