

An Unusual Etiological Agent of Bilateral Acute Otitis Media: Oligella Ureolytica in an Immunocompetent Adolescent

Dr. Khyati^{1*}, Dr. Vijaykumar Chincholkar², Dr. R V Dake³, Dr. Rujuta⁴ Dr. Deepika¹

¹Junior Resident, Department of Microbiology, Dr..V..M. Government Medical College, Solapur

²Head of Department and Associate Professor, Department of Microbiology, Dr..V..M. Government Medical College, Solapur

³ENT Consultant, Varad ENT and Allergy Testing Hospital, Ambajogai

⁴Senior Resident, Department of Microbiology, Dr V D Govt Medical College, Latur

*Corresponding Author

Dr. Khyati Savarn

Junior Resident, Department of Microbiology, Dr..V..M. Government Medical College, Solapur

E-Mail: savarnkhyati@gmail.com

Contact Number: 7260031201

ABSTRACT

Introduction: *Oligella ureolytica* is an uncommon Gram-negative bacterium that is rarely implicated in human infections and is often dismissed as a contaminant. Its role in otitis media has been rarely reported. This report emphasizes that careful specimen collection and accurate microbiological identification are essential for recognizing uncommon non-fermenting Gram-negative bacilli as true pathogens rather than contaminants.

Case report: A 15-year-old immunocompetent male presented with bilateral ear pain, yellowish white thick non-foul-smelling discharge, mild grade fever, and reduced hearing. Otoscopy revealed bilateral small perforations in the pars tensa with oedematous external auditory canals; audiometry showed bilateral conductive hearing loss with a Type B tympanogram, consistent with acute otitis media. Ear discharge cultures from both ears were identified as *Oligella ureolytica* using an automated VITEK® 2 Compact system. The patient was treated with oral minocycline based on susceptibility results and demonstrated significant clinical improvement on follow-up.

Conclusion: This case suggests *Oligella ureolytica* as a rare yet clinically significant cause of acute otitis media. It highlights the importance of appropriate specimen collection, timely identification and antimicrobial susceptibility testing to differentiate true pathogens from contaminants and facilitate early, effective management.

INTRODUCTION

Oligella ureolytica is a Gram-negative bacterium belonging to the genus *Oligella* within the family *Alcaligenaceae*, whose members are widely distributed in natural environments such as soil, water, and plants [1]. The genus comprises two species—*Oligella ureolytica* and *Oligella urethralis*—named for their small appearance on Gram stain. *O. ureolytica*, formerly designated as CDC group IVe, is considered the more clinically significant species due to its rapid urease activity, whereas *O. urethralis* was previously classified as *Moraxella urethralis* (CDC group M-4) [2,3]. *O. ureolytica* is most frequently isolated from the urinary tract but has only rarely been implicated in infections such as wounds, bacteraemia, septic arthritis and peritonitis [4]. Its involvement in otitis media is exceedingly uncommon, with very few cases reported in the literature [5]. Acute otitis media (AOM) is an infection of the middle ear and represents the second most common paediatric diagnosis in emergency departments

after upper respiratory infections [6]. Acute suppurative otitis media (ASOM), a rapidly progressing inflammatory condition, commonly affects children and presents with ear pain, otorrhea, and fever [7]. The predominant pathogens associated with otitis media include *Streptococcus pneumoniae*, *Moraxella catarrhalis*, and non-typeable *Haemophilus influenzae* [5]. Invasive infections caused by *Oligella* species are rare and are typically observed in individuals with underlying comorbidities or immunocompromised states [2]. If not promptly treated, suppurative middle ear infections may extend to adjacent structures, resulting in serious complications such as tympanic membrane perforation, mastoiditis, labyrinthitis, petrositis, meningitis, brain abscess, hearing loss, and lateral or cavernous sinus thrombosis [6]. Given the rarity of *O. ureolytica* as a causative pathogen in otitis media, we report a case of bilateral acute suppurative otitis media in which this unusual organism was isolated, highlighting its clinical

Take Home Message

The line between contaminant and pathogen is often blurred; therefore, every isolate warrants careful identification before being categorized as a contaminant

significance and the importance of accurate microbiological identification for appropriate

management.

CASE REPORT

A 15-year-old male presented to the outpatient department with complaints of bilateral ear pain, yellowish white thick non-foul-smelling discharge, decreased hearing, mild-grade fever, and a sensation of ear fullness following a recent upper respiratory tract infection. He also reported a history of swimming in a pond prior to the onset of symptoms. There was no evidence of proptosis or facial oedema. Otoscopic examination revealed small perforations in the anteroinferior quadrant of the pars tensa of both tympanic membranes. The external auditory canals were oedematous and congested, with narrowing of the canal lumen due to inflammatory swelling. Audiometric evaluation demonstrated bilateral conductive hearing loss, and tympanometry showed a Type B tympanogram in both ears. Based on the clinical presentation and audiological findings, a diagnosis of bilateral acute otitis media with tympanic membrane perforation (perforative stage) was established. Ear discharge specimens from both ears were collected. Prior to specimen collection, the external auditory canal was thoroughly cleaned using sterile saline and dried with sterile swabs to remove debris and potential contaminants. The specimen was obtained under aseptic precautions using a sterile swab, ensuring that the sample was collected from the middle ear discharge rather than the external auditory canal. The collected specimen was processed for Gram stain, bacterial, and fungal cultures. Grossly, the specimen was yellowish-white, thick in consistency and non-foul-smelling. Direct microscopy revealed few pus cells along with Gram-negative, non-spore-forming, non-capsulated coccobacilli. Culture on blood agar produced non-haemolytic, grey, moist, circular colonies measuring 1–2 mm in diameter. On MacConkey agar, non-lactose-fermenting colonies measuring 0.5–1 mm were observed. Ear discharge cultures from both ears yielded *Oligella ureolytica*, identified using the

automated VITEK® 2 Compact system (97% probability). Given its recovery from bilateral ear discharge specimens in a patient with clinical evidence of otitis media, the isolate was considered clinically significant and likely associated with the infection rather than contamination. However, antimicrobial susceptibility results could not be interpreted by the VITEK® 2 system because of validated susceptibility testing data and interpretive criteria for *Oligella* spp. are not available in the VITEK® 2 database. It was concluded as nonfastidious, oxidase-positive, catalase-positive, motile, non-fermentative, reduced nitrate to nitrite, and rapidly hydrolyses urea, while citrate utilization and indole tests were negative. Antimicrobial susceptibility testing was performed using Kirby–Bauer disc diffusion method as MIC testing could not be performed due to institutional limitations. Since CLSI does not provide breakpoints for *Oligella* spp., interpretation using *Pseudomonas aeruginosa* breakpoints was performed for therapeutic guidance only. This surrogate approach was adopted to guide antimicrobial therapy in a clinically significant infection. Based on the susceptibility results, appropriate antimicrobial therapy was instituted, and the patient demonstrated a favorable clinical response with resolution of symptoms. The isolate was sensitive to imipenem, meropenem, cefepime, minocycline, piperacillin–tazobactam, and amikacin; intermediate to ceftazidime and ceftriaxone; and resistant to chloramphenicol, tetracycline, doxycycline, fluoroquinolones, cotrimoxazole, and gentamicin. Based on the susceptibility result, the patient was treated with oral minocycline as he preferred outpatient based treatment. He demonstrated significant clinical improvement on subsequent follow-ups on day 7 and day 14.

DISCUSSION

Oligella ureolytica is a rare, non-fermentative Gram-negative coccobacillus considered as a commensal of the urogenital tract but now increasingly recognized as an opportunistic pathogen. A systematic review by Farfour et al. reported that most infections occur in patients with significant comorbidities; however,

infections in immunocompetent individuals have also been documented [2]. The present case involved an immunocompetent adolescent, suggesting that *O. ureolytica* can function as a primary pathogen under favourable conditions. This observation aligns with the findings of Ujwala A. et al. [7], who reported that the

majority of otitis media cases occur in the 0–10-year age group (43.71%), followed by the 11–20-year age group (26.94%), emphasising the increased susceptibility among children and adolescents. Acute otitis media is most commonly caused by *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*, and microbiota studies further confirm that atypical organisms are rarely implicated [5,6]. Nevertheless, Mandal et al. reported the isolation of *Oligella urethralis* from ear discharge in a child with chronic suppurative otitis media, indicating a potential but underrecognized role of this genus in ear infections [1]. Unlike the previously reported chronic presentation, our case demonstrates *O. ureolytica* as a causative agent of acute otitis media, thereby expanding the known clinical spectrum of this organism. Although *O. ureolytica* is predominantly associated with urinary tract infections, severe manifestations such as bacteraemia and fatal infections have been described [3,4]. In contrast to these invasive presentations, the infection in our patient remained localized and responded well to targeted therapy, substantiating the importance of early microbiological diagnosis and intervention. The isolate in the present case was susceptible to imipenem, meropenem, cefepime, minocycline, piperacillin–tazobactam, and amikacin; showed intermediate susceptibility to ceftazidime and ceftriaxone; and was resistant to multiple commonly used antibiotics. A similar susceptibility pattern was reported by Serandour et al., [3] who noted susceptibility to cefepime, imipenem, meropenem, tobramycin, and amikacin, with

resistance to ceftazidime and ceftriaxone. These findings highlight the importance of susceptibility-guided therapy. In our case, minocycline was selected for treatment after reviewing the antimicrobial susceptibility testing (AST) report, which indicated susceptibility to several antimicrobial agents. Clinicians advised the use of minocycline as it provides an effective oral therapeutic option with good tissue penetration. Minocycline is a second-generation, semi-synthetic tetracycline with broad-spectrum activity against both Gram-positive and Gram-negative bacteria. As the patient was clinically stable and managed on an outpatient (OPD) basis, an oral antibiotic was preferred. Following initiation of therapy, the patient showed a good clinical response to minocycline. Despite belonging to the same antimicrobial class, tetracycline, doxycycline, and minocycline may exhibit different susceptibility patterns. Resistance to tetracycline and doxycycline with retained susceptibility to minocycline may result from efflux-mediated resistance mechanisms, such as tet(K) or tet(L), which have limited activity against minocycline due to its structural properties.[8] Overall, the present case parallels existing literature regarding the emerging pathogenicity and variable antimicrobial profile of *O. ureolytica* while differing in its presentation as bilateral acute otitis media in an adolescent with no known disease. Reporting such rare presentations enhances current understanding of the organism's clinical behaviour and signifies the need to consider uncommon pathogens when routine etiological agents are not identified.

CONCLUSION

This case suggests that *Oligella ureolytica* is an uncommon but clinically relevant etiological agent of acute otitis media in a patient with no known comorbidities. It reinforces the importance of appropriate specimen collection, thorough microbiological workup, and accurate identification using both conventional and automated methods to prevent misinterpretation of rare organisms as contaminants. Antimicrobial susceptibility testing played a crucial role in guiding appropriate antimicrobial therapy. Increased recognition of such unusual non-fermenting Gram-negative bacilli is essential for timely diagnosis, appropriate management, and a better understanding of their emerging role in ear

infections. In the absence of isolation and antimicrobial susceptibility testing of *Oligella ureolytica*, treatment would have relied on empirical broad-spectrum antibiotics, which might have been suboptimal and subsequently could have resulted in delayed clinical response or persistence of infection. Inadequate treatment of acute suppurative otitis media could have also led to serious complications such as mastoiditis, labyrinthitis, facial nerve palsy, meningitis, brain abscess, and lateral sinus thrombosis. Therefore, identification of the isolate and susceptibility-guided therapy played an important role for appropriate antimicrobial selection and favourable clinical outcome.

LIMITATIONS

A limitation of this report is that species identification was based on phenotypic characteristics and automated system identification without confirmation by molecular

methods or MALDI-TOF. Although the isolate was considered clinically significant based on the microbiological findings and the patient's clinical presentation, definitive species confirmation would have

strengthened the diagnosis. Furthermore, CLSI does not provide species-specific antimicrobial susceptibility testing breakpoints for *Oligella* spp., and MIC testing was not available at our institution. Consequently, susceptibility results were interpreted using surrogate criteria and should be interpreted with caution until

validated breakpoints for *Oligella* spp. become available. Additionally, a follow-up culture was not performed after treatment due to the patient's unwillingness, precluding microbiological confirmation of eradication of the organism. Also, being a single case report, the findings cannot be generalized.

REFERENCES

1. Mandal PK, Cleanthous A, Rigas V, Kleinecke M, Lawrence K, Leach AJ, Smith-Vaughan H, Morris PS, Beissbarth J, Marsh RL. Complete genome sequence of *Oligella urethralis* MSHR-50412PR, isolated from an ear discharge swab of a child with chronic suppurative otitis media. *Microbiology Resource Announcements*. 2024 Feb 15;13(2):e01071-23.
2. Farfour E, Vasse M, Vallée A. *Oligella* spp.: A systematic review on an uncommon urinary pathogen. *European Journal of Clinical Microbiology & Infectious Diseases*. 2024 Jun;43(6):1037-50.
3. Serandour P, Plouzeau C, Michaud A, Broutin L, Cremniter J, Burucoa C, Pichon M. The First Lethal infection by *Oligella ureolytica*: a Case Report and Review of the literature. *Antibiotics*. 2023 Sep 21;12(9):1470.
4. Demir T, Celenk N. Bloodstream infection with *Oligella ureolytica* in a newborn infant: a case report and review of the literature. *The Journal of Infection in Developing Countries*. 2014 Jun 11;8(06):793-5.
5. Taylor SL, Papanicolas LE, Richards A, Ababor F, Kang WX, Choo JM, Woods C, Wesselingh SL, Ooi EH, MacFarlane P, Rogers GB. Ear microbiota and middle ear disease: a longitudinal pilot study of Aboriginal children in a remote south Australian setting. *BMC microbiology*. 2022 Jan 13;22(1):
6. Danishyar A, Ashurst JV. Acute otitis media.
7. Lokhande UA, Akulwar SL. Study of profile of otitis media: A study from Maharashtra, India. *Int. J. Curr. Microbiol. App. Sci*. 2016;5(12):349-54.
8. Karamanolis NN, Kounatidis D, Vallianou NG, Dimitriou K, Tsaroucha E, Tsioulos G, Anastasiou IA, Mavrothalassitis E, Karampela I, Dalamaga M. Unraveling the anti-cancer mechanisms of antibiotics: current insights, controversies, and future perspectives. *Antibiotics*. 2024 Dec 25;14(1):9.