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Rare Case of Implant-Associated Infection Caused by *Gordonia bronchialis*

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ABSTRACT

Background and Aim: *Gordonia (G.) bronchialis* is a saprophytic bacterium, but the incidence rate of infections caused by it is increasing. We report a rare case of arthritis caused by *this bacterium* in a patient with hip involvement.

Case Presentation: A 66-year-old female patient with complaints of pain in the right hip joint and right groin area sought medical help 10 months after the endoprosthetics surgery. Physical examination did not reveal local inflammatory processes, but blood tests revealed increased inflammation markers. To verify the diagnosis, a hip puncture was performed with subsequent bacteriological examination, including MALDI-TOF mass spectrometry method, which resulted in *G bronchialis* detection.

Conclusion: The patient underwent surgical treatment – a two-stage revision endoprosthetics of the right hip joint. In the postoperative period, the patient received parenteral antibiotic therapy with vancomycin and ciprofloxacin. Upon discharge, oral ciprofloxacin was prescribed for six weeks. A control hip joint aspiration revealed no microbial growth in the synovial fluid. The periprosthetic joint infection was controlled, and the patient was approved for the second-stage operation.

Keywords: Arthritis, *Gordonia bronchialis*, Hip Joint, Synovial Fluid

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1. Introduction

The genus Gordonia includes 39 species, but only 9 of them are considered opportunistic **(1)**. The most common and clinically significant pathogen is *Gordonia (G.) bronchialis*, which causes infection in immunocompromised individuals and less often in immunocompetent individuals **(2)**. In most cases, *G. bronchialis* is isolated from postoperative wounds, especially after sternotomy with cardiac surgery and implantation of prosthetic materials **(3-5)**. There are also reports of isolation of this bacterium from sputum, wound tissue, blood, peritoneal fluid, bone, pus, pleural fluid and vitreous body **(6-13)**. A literature review of PubMed, SCOPUS, and Google Scholar from 2004 to 2024 identified 35 articles describing clinical cases related to *G. bronchialis* infection. A review of those articles revealed no cases of arthritis. However, one instance of tibial osteomyelitis was described

following arthroscopic knee surgery, with no reported infection of the joint itself **(7)**. We report a rare case of arthritis caused by *G. bronchialis* in a patient with hip involvement.

2. Case Presentation

A 66-year-old woman was observed for a long time due to osteoarthritis of the right hip joint. Conservative therapy made it possible to relieve pain and maintain a sufficient level of physical activity. However, since February 2024, the intensity of the pain syndrome has increased rapidly and significantly, the patient began to notice a significant limitation in the range of motion in the right hip joint and a limitation in the ability to support the right lower limb. The quality of life has significantly decreased. In July 2024, surgical treatment was performed: total endoprosthetics of the right hip joint with an endoprosthesis of a cementless type of fixation. The postoperative period was without complications, and wound healed by primary closure. The patient was discharged in a satisfactory condition 10 days after the surgical treatment. At follow-up examinations 3 and 6 months after the surgery, the patient did not present any active complaints and demonstrated good clinical and functional results.

It is also known from the anamnesis in 2014 that immune thrombocytopenic purpura (ITP) was verified in the patient for the first time. The patient underwent repeated inpatient treatment in the Hematology Department, where conservative therapy with glucocorticosteroids (prednisolone) and hemostatic therapy (etamsylate) was provided, but significant clinical improvement was not achieved. Due to persistent severe thrombocytopenic hemorrhagic syndrome in 2017, the patient underwent radical surgical splenectomy treatment, which made it possible to achieve stable positive dynamics until 2019. Since 2019, prednisolone intake (30 mg/day) was resumed, which continues till now.

Nine months after the surgery, the patient began to notice persistent pain in the right hip joint and right groin area. No additional examination was performed, and the patient sought medical help a month after the onset of symptoms. X-ray examination revealed signs of instability and migration of the acetabular component of the total endoprosthesis of the right hip joint (Figure 1). Physical examination of the proximal part of the right thigh and the area of the postoperative scar did not reveal any edema, hyperemia, or local hyperthermia. There was no change in skin color, no wound defects or fistulas. However, a detailed examination of laboratory blood parameters over time revealed a moderate but stable increase of markers of the systemic inflammatory response. Over the past two months, there has been a persistent increase in the levels of C-reactive protein to 28.6 mg/L (the norm is up to 5 mg/L.); erythrocyte sedimentation rate up to 42 mm/hr (the norm is up to 30 mm/hr), fibrinogen level up to 6.2 g/L (the norm is 2-4 g/L), with normal leukocyte counts $5.6*10^9$/L (the norm is $4.0\text{-}9.0*10^9$/L).

In order to verify the diagnosis and determine further tactics of surgical treatment, the patient underwent double puncture of the right hip joint under ultrasound navigation with subsequent bacteriological examination of the synovial fluid. Clinical material was collected in 2 vial containing media for the isolation of aerobic and anaerobic microorganisms with antibiotic adsorbents, which were subsequently cultured at 37°C in an automatic hemocultivator Yunon® Labstar 50 (SCENKER Biological Technology Co., Ltd., China). After 48 hr, the synovial fluid was determined as infected, therefore, the material was seeded on nutrient media including 5% blood agar with defibrinated sheep blood (HiMedia, India), Urinary Tract Infections Chromogenic Agar (ConLab, Spain), and Anaerobic Agar (HiMedia, India). Inoculation was grown under anaerobic conditions, which were created using the BACTRON 300 anaerobic station (SHELDON, USA). After 3 days, round, convex colonies with a diameter of 1-3 mm and rough edges were found on blood agar. The surface of the colonies was uneven, shiny, cream-colored, and soft (Figure 2). Gram staining revealed Gram-positive short coryneform rods without branches. Also, the grown crops were identified using MALDI-TOF mass spectrometer (BRUKER, Germany) with a score of more than two. Antibiotic susceptibility testing was performed according to Clinical & Laboratory Standards Institute (CLSI) M62 guidelines («Performance Standards for Susceptibility Testing of Mycobacteria, Nocardia spp., and Other Aerobic Actinomycetes») **(14)**. The resulting minimum inhibitory concentrations were: vancomycin 0.38 mg/L (Susceptible), ciprofloxacin 0.032 mg/L (Susceptible), amikacin 0.125 mg/L (Susceptible) and ceftriaxone 0.125 mg/L (Susceptible).

Given the presence of verified microflora in the synovial fluid, the patient was diagnosed with "Chronic periprosthetic infection of the right hip joint. Septic instability of the components of the right hip joint endoprosthesis with migration of the acetabular component. Contracture of the right hip joint, condition after total endoprosthetics of the right hip joint (2024)." The patient was indicated for surgical treatment - a two-stage revision arthroplasty of the right hip joint. The first stage included the removal of the endoprosthesis components, debridement,

installation of an articulating spacer impregnated with antibiotics.

The first stage of the revision total hip arthroplasty was performed in June 2025. Following removal of the prosthesis components, debridement, and repeated irrigation with antiseptic solutions, an acetabular component of an articulating spacer was fashioned. This component consisted of bone cement (Synicem 1.40 g) impregnated with vancomycin powder (4 gr per dose of bone cement). After polymerization of the bone cement, the acetabular component was placed into the prepared acetabulum. It was secured there using bone cement (Synicem 1.40 g), which was also impregnated with vancomycin powder (4 gr per dose of bone cement). After repeated irrigation and curettage of the bone marrow canal of the femur, a femoral stem (size 3) was placed within the cement mantle. The cement consisted of bone cement (Synicem 1.40 g) impregnated with vancomycin powder (4 gr per dose of bone cement). After sequential trialing, a 28+8 femoral head was implanted. Reduction of the dislocation was then performed, followed by layered wound closure.

Postoperative management included systemic parenteral antibiotic therapy consisting of vancomycin 1.0 gr intravenously infused twice daily and ciprofloxacin 100.0 mg intravenously infused twice daily. Additional symptomatic treatment was provided, including nonsteroidal anti-inflammatory drugs and analgesics, as well as prophylaxis for venous thromboembolic events. The wound healed without complication. The patient was discharged on the 15th postoperative day. The outpatient regimen included continued oral antibiotic therapy for 6 weeks with ciprofloxacin 500 mg, one tablet twice per day. At the first clinical follow-up examination performed one month after surgery, no signs of recurring infection were evident. General blood tests showed sustained positive trends: CRP – 6.7 mg/L, ESR – 17 mm/hr, fibrinogen – 4.8 gr/L, leukocytes – 9.8 * 10^9/L.

At 3 months postoperatively, the patient was deemed appropriate for a control hip joint aspiration, with subsequent evaluation of the synovial fluid. The results of the microbiological analysis demonstrated the absence of microbial growth. Given the successful resolution of the periprosthetic joint infection, the patient was then scheduled for the second-stage operation: revision of total hip arthroplasty of the right hip.cins **(13)**.

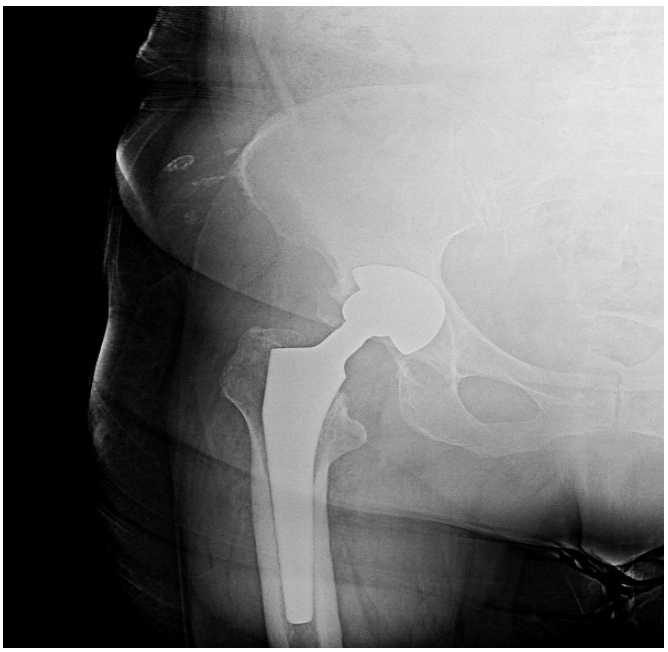


Figure 1. X-ray of an infected hip joint **(Prepared by Authors, 2025)**.

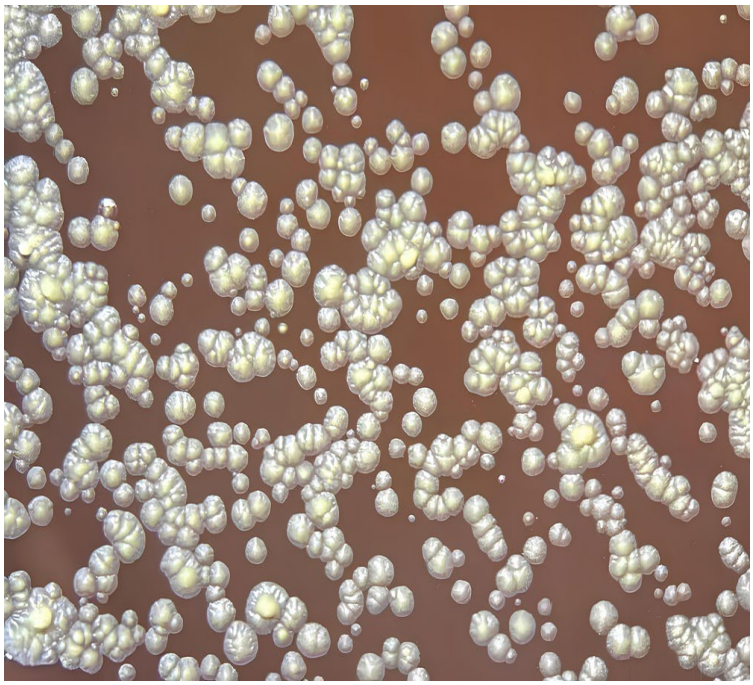


Figure 2. Photograph of colonies of *Gordonia bronchialis* on blood agar **(Prepared by Authors, 2025)**.

3. Discussion

Although bacteria of the genus *Gordonia* are mainly represented by saprophytic flora and found in soil and water, according to research data the number of infection cases caused by this genus is increasing. Infection typically occurs through inhalation of air or dust containing *G. bronchialis*, but predisposing factors are immunosuppressive states, especially against the background of surgical interventions, the presence of intravenous catheters or implanted devices. In this patient, prolonged prednisolone treatment for ITP, leading to an immunosuppressed state, served as the predisposing factor. Implant colonization occurs through the formation of biofilms, which reduce the permeability of microorganisms, protecting them from the action of antibacterial agents, and ultimately leading to antibiotic resistance **(15, 16)**. The composition of the cell wall includes mycolic acids, which impart hydrophobicity to the cell surface and protect against environmental influences. This aspect also applies to hydrophilic antibiotics, such as beta-lactams, to which natural resistance has developed.

The disease mostly occurs without clinical signs of infection, which complicates diagnosis and worsens the course of the disease **(13)**. There are also problems in isolating and identifying bacteria of the genus *Gordonia*, including *G. bronchialis*. At least 3 days of cultivation are required to detect colony growth on a dense nutrient medium. However, in laboratories where the incubation time is less than 72 hr, the risk of false negative results increases due to non-compliance with the time interval. Due to the similarity with representatives of the genus Mycobacterium and Nocardia, determination of the genus using microscopic and biochemical methods is difficult **(16)**. The most reliable and sensitive methods for identifying *G. bronchialis* are MALDI-TOF mass spectrometry, PCR, and 16S rRNA sequencing, which may not be available in some laboratories.

To date, there are no standard guidelines for the interpretation of results and treatment of infections caused by bacteria of the genus Gordonia, which leads to empirical selection of therapy. Published literature indicates that a combination of vancomycin and ciprofloxacin was the primary initial therapy. Monotherapy with either vancomycin or ciprofloxacin was less common. Both approaches showed good efficacy against *G. bronchialis* **(13)**. Imipenem and amikacin demonstrated high susceptibility in laboratory tests and were often used in combination therapy with vancomycin. Positive clinical outcomes were also observed with aminoglycosides, carbapenems, and third-generation cephalosporins. Some strains showed resistance to linezolid, clarithromycin, tigecycline, and co-trimoxazole. Our observed antibiotic susceptibility profile and positive treatment responses were consistent with other studies. This suggests a typical bacterial strain and a favorable disease outcome.

According to available literature, a systematic review by Zivkovic Zaric et al **(13)** reported 28 cases of *G. bronchialis* isolation. Of these, the bacterium was isolated from sputum and wound tissue in 7 cases,

from blood in 6 cases, from peritoneal fluid, bone, and pus in 3 cases each, from cardiac pacemakers in 2 cases, and from pleural fluid and vitreous humor in 1 case each. However, there were no reported instances of *G. bronchialis* isolation from the joint space.

4. Conclusion

Our described case of *Gordonia bronchialis* isolation from synovial fluid represents a complex clinical example of periprosthetic joint infection caused by a rare pathogen. Currently, there is insufficient data regarding the clinical course of *G. bronchialis* infections, antimicrobial susceptibility, and optimal treatment regimens. This highlights the need for further investigation of this microorganism.

5. Declarations

5.1 Acknowledgment

The authors would like to thank the participants for their support and participation in the study.

5.2 Ethical Considerations

All ethical standards are met in this study. All data were obtained from the routine clinical process.

5.3 Authors' Contributions

M.Yu. Sefedinova and D.M. Kudashev – patient management and treatment appointment, D.M. Kudashev and A.A. Knyazev – surgical treatment, A.V. Kozlov, L.R. Shafigullina, A.A. Abramova, V.A. Ulivanova – microbiological research, A.V. Lyamin and A.V. Kozlov – research concept and design, writing an article – L.R. Shafigullina, reviewing and editing – A.V. Lyamin A.V., Kozlov and M.Yu. Sefedinova. All authors have read and agreed to the published version of the manuscript.

5.4 Conflict of Interests

The authors declare no conflict of interest.

5.5 Financial Support and Sponsorship

The author(s) received no financial support for the research or publication of this article.

5.6 Using Artificial Intelligence Tools (AI Tools)

All authors declare that there is no use of AI Tools in this study, including the writing of this manuscript.

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