JOURNAL OF CLINICAL MICROBIOLOGY, June 2004, p. 2870–2871 Vol. 42, No. 6
0095-1137/04/$08.00+0 DOI: 10.1128/JCM.42.6.2870–2871.2004

Bacteremia Caused by *Gordonia bronchialis* in a Patient with Sequestrated Lung

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Received 5 February 2004/Accepted 12 March 2004

***Gordonia* species have been recognized as pathogens in immunocompromised and immunocompetent patients. We report the first case of bacteremia due to *Gordonia bronchialis* in a diabetic patient with a sequestrated lung. Species identification was confirmed with mycolic acid analysis by high-performance liquid chromatography and sequencing of the 16S rRNA gene.**

A 58-year-old woman with recently discovered diabetes mellitus, long-standing spondylolisthesis, and asthma presented with acute exacerbation of low back pain after an exercise session. Breathlessness, fever, and chills accompanied the pain. The patient had been treated for a pleural effusion and a loculated lung cyst with drainage 15 and 5 years previously, respectively. On physical examination, the patient was febrile with a reduced ability to raise and straighten her right leg and diminished deep tendon reflexes of the right lower limb. The patient's white cell count was elevated, at 15×10^9/liter, with a predominance of polymorphs (86%). Chest X-rays showed pneumonic-type lung consolidation, and consequently the patient was treated with ceftriaxone and clarithromycin for community-acquired pneumonia. Computer-assisted tomography of the thorax suggested a sequestrated lung.

Subsequent magnetic resonance imaging of the lumbosacral spine showed a 5-mm air pocket with enhancement surrounding the lesion from L4 to S1. The antimicrobials with which the patient was treated were changed to cloxacillin for osteomyelitis and ceftazidime for possible infection with *Burkholderia pseudomallei*, which is endemic in the southeast Asia region. On the fifth day, blood cultures taken during admission and incubated in Bactec 9000 (Becton Dickinson, Cockeysville, Md.) were positive for growth. *Haemophilus aphrophilus* was isolated upon subculture on a blood agar plate and identified by using XV disks and the API NH (bioMérieux, Marcy-l'Etoile, France) system. The isolate was found to be susceptible to ceftriaxone by the disk diffusion method. A transthoracic echocardiogram was normal. However, the patient's health did not improve and her neurological status deteriorated, with a loss of ankle reflex. A repeat scan of the lumbar spine demonstrated a subcortical mass at L3 to L4 with a left paravertebral abscess extending inferiorly to the gluteal region. Reincubation of the original blood agar plate for an additional 5 days revealed the presence of a second organism, which formed translucent, nonhemolytic, dry, wrinkled colonies within 24 h; these colonies became opaque, rough, and salmon colored at 72 h. Growth and pigmentation were demonstrated at 35°C with ambient air on Trypticase soy agar with sheep blood, chocolate agar, and brain heart infusion agar. The isolate was a beaded gram-positive bacillus which was weakly acid-fast. The microscopic appearance of the growth on a water agar plate showed symmetra and no aerial hyphae. Tests for lysozyme, casein, tyrosine, and xanthine hydrolysis were negative, while tests for urease and nitrate were positive after 48 h and a test for gelatin liquefaction was positive after a week. The isolate gave a profile number of 1110004 with API Coryne (bioMérieux) and was identified as *Rhodococcus* sp. (98% identification percentage; T index, 0.94). The software also suggested the possibility that the isolate was of the genus *Gordonia*, *Dietzia*, or *Nocardia*.

The isolate was grown on Löwenstein-Jensen medium, whole cells were saponified, and mycolic acids were extracted and derivatized to *p*-bromophenacyl esters and assayed by using high-performance liquid chromatography as previously described (5). The mycolic acid components exhibited elution times of 4.89 to 5.95 min, corresponding to mycolic acid peaks consistent with the genus *Gordonia*. Bacterial DNA was extracted by using a DNAeasy tissue kit (QIAGEN, Hilden, Germany), and 16S rRNA sequencing was performed. A BLAST search of the National Institutes of Health GenBank with 1,408 nt yielded a 99% match to *Gordonia bronchialis* (accession number x79287), with a difference of 4 bp.

An E-test (AB Biodisk, Solna, Sweden) was used to estimate the MICs of drugs with a culture adjusted with a 0.5 McFarland standard inoculum on Mueller-Hinton II agar plates (Bio-Rad, Marnes la Coquette, France). After 48 h of incubation, the MICs were 0.064 μg of ampicillin/ml, 0.094 μg of amoxicillin-

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clavulanate/ml, 0.038 μg of ceftriaxone/ml, and 1.0 μg of vancomycin/ml.

The patient was treated with surgical drainage of the abscesses and a combination of 3.5 months of intravenous vancomycin and 2.5 months of ceftriaxone followed by oral amoxicillin-clavulanate for 6 weeks. Upon laboratory examination, the pus drained from the vertebrae, as well as abscess and debrided tissue, was culture negative for bacteria, mycobacteria, and fungi. The patient subsequently made a full recovery.

Gordonia (previously *Gordona*) species are increasingly recognized as pathogens causing infections in both immunocompromised (6, 8, 11) and immunocompetent (7) humans. Previously considered to be rhodococci, these gram-positive bacilli are aerobic actinomycetes that are weakly acid-fast and may be dismissed as commensals or misdiagnosed as mycobacterial species in clinical laboratories. Currently, there is no single commercially available biochemical testing kit and there are no morphological features to identify the species or distinguish them from *Rhodococcus* spp. (1). Instead, sophisticated tests performed by reference laboratories are required to accurately identify the organism (2, 7, 12). Failure to diagnose infection may lead to inadequate therapy or inappropriate use of antimicrobial agents.

Although *G. bronchialis* infection has been reported in sternal wounds following coronary artery bypass grafting (10), this species has not been known to cause septicemic infection. Our patient suffered from bacteremia with possible spread to previously inflamed lumbosacral vertebrae. The primary source was suspected to be the sequestrated lung, as there had been a history of previous loculated lung disease and possible recurrent infections. We were unable to isolate any organism from the paravertebral abscess, as the patient had already been on antibiotic therapy; however, with the response to vancomycin, the isolated *G. bronchialis* was considered to be the significant pathogen. The diagnosis was particularly challenging because of a mixed microbial infection. Growth of the isolate in the laboratory was most likely suppressed by the presence of the rapidly growing *H. aphrophilus*.

The slow growth rate of the isolate may have caused the laboratory to miss the organism because the laboratory follows standard procedures and time constraints for growth. The small number of infections with *Gordonia* species reported for humans may also be accounted for by the difficulty in identifying the organism in routine microbiology laboratories. Biochemical identification of the aerobic actinomycetes is time-consuming, labor-intensive, and not always conclusive. Methods such as 16Sr RNA gene sequencing (9) and high-performance liquid chromatography analysis (3, 4, 10) provide more definitive identification of the *Gordonia* species. However, these highly complex methods rely on access to specialized equipment and facilities as well as competent laboratory personnel.

We thank Grace Wang and Ong Lan Huay, Singapore General Hospital, for their technical assistance.

REFERENCES

1. **Brown, J. M., M. M. McNeil, and E. P. Desmond.** 2003. *Nocardia*, *Rhodococcus*, *Gordonia*, *Actinomadura*, *Streptomyces*, and other aerobic actinomycetes, p. 370–398. *In* P. R. Murray, E. J. Baron, J. H. Jorgensen, M. A. Pfaller, and R. H. Yolken (ed.), Manual of clinical microbiology. ASM Press, Washington, D.C.
2. **Buchman, A. L., M. M. McNeil, J. M. Brown, B. A. Lasker, and M. E. Ament.** 1992. Central venous catheter sepsis caused by unusual *Gordona* (*Rhodococcus*) species: identification with a digoxigenin-labeled rDNA probe. Clin. Infect. Dis. **15:**694–697.
3. **Butler, W. R., D. G. Ahearn, and J. O. Kilburn.** 1986. High-performance liquid chromatography of mycolic acids as a tool in the identification of *Corynebacterium*, *Nocardia*, *Rhodococcus*, and *Mycobacterium* species. J. Clin. Microbiol. **23:**182–185.
4. **Butler, W. R., J. O. Kilburn, and G. P. Kubica.** 1987. High-performance liquid chromatography analysis of mycolic acids as an aid in laboratory identification of *Rhodococcus* and *Nocardia* species. J. Clin. Microbiol. **25:** 2126–2131.
5. **Butler, W. R., K. C. Jost, Jr., and J. O. Kilburn.** 1991. Identification of mycobacteria by high-performance liquid chromatography. J. Clin. Microbiol. **29:**2468–2472.
6. **Drancourt, M., M. M. McNeil, J. M. Brown, B. A. Lasker, M. Maurin, M. Choux, and D. Raoult.** 1994. Brain abscess due to *Gordona terrae* in an immunocompromised child: case report and review of infections caused by *G. terrae*. Clin. Infect. Dis. **19:**258–262.
7. **Drancourt, M., J. Pelletier, A. A. Cherif, and D. Raoult.** 1997. *Gordonae terrae* central nervous system infection in an immunocompetent patient. J. Clin. Microbiol. **35:**379–382.
8. **Lesens, O., Y. Hansmann, P. Riegel, R. Heller, M. Benaissa-Djellouli, M. Martinot, H. Petit, and D. Christmann.** 2000. Bacteremia and endocarditis caused by a *Gordonia* species in a patient with a central venous catheter. Emerg. Infect. Dis. **6:**382–385.
9. **Pham, A. S., I. Dé, K. V. Rolston, J. J. Tarrand, and X. Y. Han.** 2003. Catheter-related bacteremia caused by the nocardioform actinomycete *Gordonia terrae.* Clin. Infect. Dis. **36:**524–527.
10. **Richet, H. M., P. C. Craven, J. M. Brown, B. A. Lasker, C. D Cox, M. M. McNeil, A. D. Tice, W. R. Jarvis, and O. C. Tablan.** 1991. A cluster of *Rhodococcus* (*Gordona*) *bronchialis* sternal-wound infections after coronary-artery bypass surgery. N. Engl. J. Med. **324:**104–109.
11. **Riegel, P., R. Ruimy, D. de Briel, F. Eichler, J.-P. Bergerat, R. Christen, and H. Monteil.** 1996. Bacteremia due to *Gordona sputi* in an immunocompromised patient. J. Clin. Microbiol. **34:**2045–2047.
12. **Steingrube, V. A., R. W. Wilson, B. A. Brown, K. C. Jost, Jr., Z. Blacklock, J. L. Gibson, and R. J. Wallace, Jr.** 1997. Rapid identification of clinically significant species and taxa of aerobic actinomycetes, including *Actinomadura*, *Gordona*, *Nocardia*, *Rhodococcus*, *Streptomyces*, and *Tsukamurella* isolates, by DNA amplification and restriction endonuclease analysis. J. Clin. Microbiol. **35:**817–822.