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(CASE REPORT)

Nosocomial Pneumonia caused by *Corynebacterium amycolatum*: A report of two cases and review of the literature

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Abstract

Nosocomial pneumonia remains a major public health concern, frequently associated with multidrug-resistant bacteria such as *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, or *Staphylococcus aureus*. In contrast, *Corynebacterium amycolatum*, a Gram-positive bacillus usually regarded as a skin commensal, is rarely implicated in pulmonary infections. However, in recent years, this species has emerged as an opportunistic pathogen involved in a wide range of human infections, particularly among hospitalized and immunocompromised patients.

We report here two cases of nosocomial pneumonia in intensive care unit (ICU) patients, both under mechanical ventilation, in whom the microbiological diagnosis was confirmed by bronchoalveolar lavage (BAL). Significant growth of multidrug-resistant *Corynebacterium amycolatum* was obtained, and its pathogenic role was confirmed through clinical and microbiological correlation. These observations highlight the growing importance of this organism—long considered nonpathogenic—and emphasize the need for increased awareness regarding its identification and appropriate therapeutic management.

Keywords: *Corynebacterium amycolatum*; Pneumopathy; Opportunistic infection; Multiresistance; Intensive care unit (ICU)

1. Introduction

Nondiphtherial Corynebacterium species are a group of Gram-positive bacilli long regarded as mere commensals of the skin and mucous membranes, often interpreted as contaminants in clinical specimens (1,2). However, over the past few years, several studies have reported their involvement in invasive infections such as endocarditis, sepsis, meningitis, osteomyelitis, and device-associated infections (3).

Among these species, *Corynebacterium amycolatum* is the most frequently isolated from various biological specimens, including pus, urine, blood cultures, ocular and ear secretions, and sputum (1,4,5). Although its pathogenic role in pneumonia has been suggested in only a few studies, it is increasingly being recognized. In investigations focusing on *Corynebacterium* species recovered from respiratory samples, *C. amycolatum* has consistently emerged as the predominant isolate (1,6).

We report two cases of nosocomial pneumonia due to *Corynebacterium amycolatum* occurring in two patients hospitalized in the intensive care unit during the same period, both exhibiting identical antimicrobial resistance profiles. Through these observations, we aim to emphasize to clinicians the importance of seriously considering the pathogenic

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potential of this organism in nosocomial pneumonia, rather than dismissing it as a mere contaminant, in order to prevent diagnostic and therapeutic delays.

2. Case 1

A 25-year-old man with no prior medical history was admitted after a road traffic accident with severe polytrauma involving cranial, thoracic, and left lower limb injuries. On admission, he was somnolent, febrile, and required intubation and mechanical ventilation in the ICU. Imaging revealed a fronto-parieto-occipital subdural hematoma with multiple fractures. Despite empirical antibiotic therapy, persistent fever led to an infectious workup; including multiple blood cultures, central venous catheter cultures, urine cultures, and a bronchoalveolar lavage (BAL) performed using a bronchoscopic invasive technique to minimize contamination from the upper respiratory tract. Laboratory investigations showed leukocytosis (12,750 cells/mm^3) with neutrophil predominance, a procalcitonin level of 3.53 ng/mL, and a C-reactive protein (CRP) level of 97 mg/L. Other biological parameters were within normal limits.

Blood cultures remained sterile, the cytobacteriological examination of the BAL fluid showed a macroscopically purulent sample. Direct microscopy revealed marked cellularity with more than 25 leukocytes per field (×10 objective) and Gram-positive bacilli, some observed intracellularly (Figure 1).

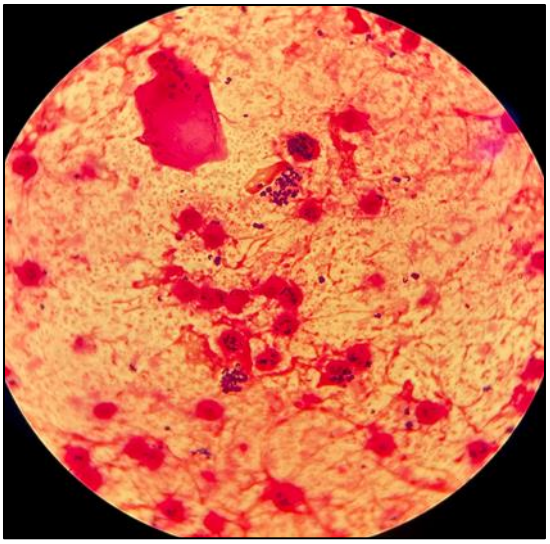

Figure 1 Gram-stained sputum smear showing the presence of Gram-positive bacilli with a palisade arrangement and a V-shaped arrangement intracellularly

The specimen was cultured on several media, including blood agar, enriched chocolate agar, Chapman medium, and Cetrimide agar. After 24 hours of incubation, both blood and chocolate agar plates yielded monomorphic growth of small, grayish-white, non-hemolytic colonies exceeding 10^5 CFU/mL (Figure 2). Species identification was performed using the BD Phoenix™ M50 automated system, which identified *Corynebacterium amycolatum* with a 99% probability.

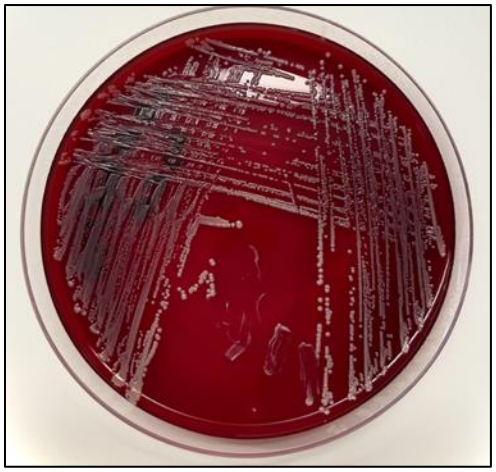

Figure 2 Colonies of *Corynebacterium amycolatum* on blood agar

Antimicrobial susceptibility testing was conducted using the disk diffusion method on Mueller–Hinton agar enriched with defibrinated horse blood and β-NAD (MH-F), according to the 2024 guidelines of the French Society of Microbiology's Antibiogram Committee (CA-SFM) [7]. The results are presented in Table 1.

Culture of the central venous catheter also yielded *Corynebacterium amycolatum* with an identical resistance profile.

Initial treatment with rifampicin, guided by antimicrobial susceptibility testing, was ineffective, with clinical deterioration prompting a repeat bronchoalveolar lavage that again isolated *Corynebacterium amycolatum* with an identical resistance profile. Antibiotic therapy was therefore switched to intravenous vancomycin, leading to favorable clinical and biological evolution, microbiological clearance, and subsequent transfer of the patient to the trauma surgery department.

Table 1 Results of antimicrobial susceptibility testing.

Antibiotic	**Breakpoint**		**Obtained inhibition zone (mm)**	**Result**
	S ≥	R <		
Penicillin G (1μg)	50	12	0	R
Vancomycin (5μg)	17	17	20	S
Tetracycline (30μg)	24	24	14	R
Linezolid (10μg)	25	25	37	S
Rifampicin (5μg)	30	30	33	S
Ciprofloxacin (5μg)	50	25	0	R
Moxifloxacin (5μg)	25	25	6	R
Clindamycin (2μg)	20	20	0	R
Trimethoprim/sulfamethoxazole (1,25- 23,75 μg)	19	16	0	R
S: Susceptible, R: Resistant				

3. Case 2

This was a 67-year-old male patient with a medical history of hypertension and diabetes under treatment. He was admitted to the emergency department of Avicenne Military Hospital in Marrakech for acute respiratory distress that had evolved over the 16 hours preceding his admission.

On admission, clinical examination found a conscious patient, but unstable both hemodynamically and respiratorily and febrile. Pulmonary examination revealed signs of respiratory struggle. The patient was transferred to the intensive care unit (ICU) for further management. Chest imaging showed an emphysematous lung with a small ground-glass opacity in the lower left lobe, suggesting an infectious origin. Laboratory investigations revealed leukocytosis (15,710 cells/mm^3) with neutrophil predominance, procalcitonin level of 4.18 ng/mL, and CRP of 256 mg/L.

Given the clinical, biological, and radiological findings, a bronchoalveolar lavage (BAL) was performed and sent for PCR analysis, which detected co-infection with *Haemophilus influenzae*, *Moraxella catarrhalis*, *Streptococcus pneumoniae*, and *Streptococcus agalactiae*. Cytobacteriological examination of the same specimen confirmed the isolation of *Streptococcus pneumoniae* and *Haemophilus influenzae*, both showing full antibiotic susceptibility. The patient was sedated, intubated, and mechanically ventilated, and was started on dual antibiotic therapy. Due to the severity of his condition, he remained in the ICU for one month.

On day 28 of hospitalization, persistent fever and respiratory symptoms raised the suspicion of a nosocomial superinfection. A new BAL sample was obtained for cytobacteriological analysis. The specimen appeared macroscopically purulent. Direct microscopic examination showed marked inflammation with more than 25 leukocytes per field (×10 objective) and the presence of intracellular Gram-negative coccobacilli and Gram-positive bacilli.

After 24 hours of incubation, both blood and chocolate agar plates yielded growth of two distinct colony types at a significant threshold (>10^5 CFU/mL). Subculturing on blood agar allowed the isolation of small, whitish-gray, non-hemolytic colonies and mucoid, gray, non-hemolytic colonies. Identification using the BD Phoenix™ M50 system confirmed *Corynebacterium amycolatum* with a 99% probability and *Acinetobacter baumannii* resistant to imipenem but sensitive only to colistin.

Antimicrobial susceptibility testing of *C. amycolatum* was performed using the disk diffusion method, in accordance with the 2024 guidelines of the French Society of Microbiology's Antibiogram Committee (CA-SFM) (7), revealed a resistance profile similar to that observed in the first patient.

A second BAL performed two days later again yielded *Corynebacterium amycolatum* and *Acinetobacter baumannii* with identical resistance profiles. The patient was subsequently treated with vancomycin and colistin according to susceptibility results.

During the first days of this adjusted treatment, clinical and biological improvement was observed. However, ten days later, the patient's condition deteriorated again. A repeat BAL revealed a *Pseudomonas aeruginosa* infection, requiring further therapeutic adjustment and resulting in prolonged hospitalization.

4. Discussion

Corynebacteria are Gram-positive bacilli with a characteristic club-shaped appearance and swollen ends, typically arranged in palisades or in formations resembling "Chinese letters." They are catalase-positive, non-motile, non-spore-forming bacteria with an aerobic or facultatively anaerobic metabolism. The *Corynebacterium* genus comprises two major groups: *Corynebacterium diphtheriae*, the etiologic agent of diphtheria, and the non-diphtherial corynebacteria (ND-C), also referred to as "coryneform" bacteria (2,8). The latter represent a heterogeneous group of species widely distributed within the human microbiota, particularly on the skin and respiratory and genital mucosa. For a long time, these bacteria were regarded as harmless commensals lacking clinical significance, and their isolation from clinical specimens was often interpreted as mere colonization or contamination rather than true infection (9).

The pathogenic potential of coryneform bacteria has long been underestimated. However, recent evidence highlights their emerging role as opportunistic and nosocomial pathogens responsible for a wide range of human infections (10). This pathogenicity is thought to be associated with several virulence factors, including the presence of pili, microcapsules, cell wall components, enzymes, and toxins, which enable these microorganisms to adhere to epithelial surfaces, multiply in vivo, and evade host defense mechanisms (11).

In addition to *Corynebacterium diphtheriae*, the causative agent of diphtheria, several non-diphtheritic species (*C. striatum*, *C. jeikeium*, *C. amycolatum*, *C. urealyticum*, *C. pseudodiphtheriticum*, among others) have been identified in a variety of infectious contexts. These bacteria have been implicated in skin and soft tissue infections, urinary tract infections, ocular infections, infections related to orthopedic implants, bacteremia, endocarditis, pneumonia, and infections associated with medical devices such as catheters, prosthetic joints, and cardiac valves (3).

The clinical relevance of *Corynebacterium amycolatum* has long been overlooked, mainly due to difficulties in accurate identification and its frequent confusion with *C. xerosis* and *C. striatum*, which share highly similar biochemical characteristics (12). In a study by Esteban *et al.*, 82% of isolates initially classified as *C. xerosis* were reidentified as *C. amycolatum* using advanced diagnostic techniques (13). This species, which is widely present in the normal human microbiota, has increasingly been implicated in a variety of infections, particularly those occurring after surgical procedures or invasive medical interventions involving implanted or indwelling medical devices (14). Moreover, *C. amycolatum* has been reported as a causative agent of septicemia, endocarditis, meningitis, septic arthritis, and urinary tract infections (1,3).

However, the role of *Corynebacterium amycolatum* as a pathogenic agent responsible for pneumonia has long been underestimated. Several recent studies have addressed this issue to assess the likelihood of its pathogenic potential in patients with pulmonary infections. S. Clariot *et al.* conducted a cohort study involving 31 patients admitted to intensive care units, all of whom were mechanically ventilated, in whom *Corynebacterium* spp. was isolated (6). Similarly, T. Nhan *et al.* carried out a study including 27 hospitalized patients from different departments, in whom *Corynebacterium* spp. was isolated from respiratory samples such as bronchial secretions, bronchoalveolar lavage (BAL), or protected distal specimens (15).

In both studies, the involvement of *Corynebacterium* spp.—mainly *Corynebacterium amycolatum*—as a true pathogen was confirmed in more than half of the cases, after exclusion of simple colonization or the involvement of other microorganisms. The authors highlighted several predisposing factors for *Corynebacterium*-related pneumonia, including impairment of airway protective mechanisms, bronchial obstruction, structural lung damage, prolonged antibiotic exposure, extensive use of indwelling intravenous devices, primary or acquired immunosuppression, and prolonged stays in intensive care units (6,15).

In our study, the first patient was a young polytraumatized man admitted to the intensive care unit (ICU), placed under mechanical ventilation, and fitted with a central venous catheter during his stay. The second patient was an elderly individual with multiple chronic comorbidities, hospitalized in the ICU for a severe clinical condition, also under mechanical ventilation, and who remained hospitalized for nearly one month. Both patients were admitted during the same period, in adjacent ICU rooms, and were monitored by the same nursing staff. Notably, the first patient developed the infection first, followed by the second patient, who presented *Corynebacterium amycolatum* pneumonia four days later.

From a microbiological standpoint, direct examination of bronchoalveolar lavage (BAL) fluid in both patients showed abundant cellularity with a predominance of polymorphonuclear neutrophils, along with the presence of intracellular Gram-positive bacilli. Cultures performed at a significant threshold ($>10^4$ CFU/mL) (16) yielded *Corynebacterium amycolatum* in at least two consecutive samples from each patient, both displaying identical resistance phenotypes. Clinically and biologically, both patients showed a favorable outcome after initiation of targeted antibiotic therapy based on susceptibility testing results.

Regarding antibiotic resistance, several studies isolating *Corynebacterium amycolatum* from various clinical specimens have highlighted the multidrug-resistant nature of this species to multiple antibiotic classes. In the study conducted by R. Meher et al., which aimed to assess the pathogenic potential of corynebacteria at surgical sites, all isolates were found to be multidrug-resistant, with 51.8% showing susceptibility only to gatifloxacin and vancomycin (17). Similarly, S. Yahia et al. reported in a study of 75 *Corynebacterium* spp.-positive clinical samples—of which *C. amycolatum* was the predominant species (20 cases, representing 27% of isolates)—high resistance rates to penicillin and ceftriaxone (75%), erythromycin (80%), and clindamycin (85%) (4). Furthermore, M. Sengupta's study, conducted among 12 patients in whom *C. amycolatum* was isolated from ear swabs, revealed resistance to ceftriaxone in 66.7% of cases and to imipenem in 33.3%, while all isolates remained fully susceptible to vancomycin (5).

These findings are consistent with our observations, where the *Corynebacterium amycolatum* strains isolated from both patients retained susceptibility only to vancomycin, linezolid, and rifampicin.

The clinical course in both patients was favorable following the initiation of appropriate targeted therapy. In contrast, S. Clariot et al. reported in their study that fewer than half of the patients with *Corynebacterium* spp. pneumonia survived (6), although this outcome was most likely related to the fragile condition and multiple pre-existing comorbidities of the studied population rather than the infection itself.

5. Conclusion

The presentation of these two cases highlights the emergence of bacteria long regarded as non-pathogenic, such as *Corynebacterium amycolatum*, and their ability to cause true nosocomial pneumonia. Person-to-person transmission, either directly or through healthcare personnel, remains a possibility that should not be overlooked. It is therefore essential to document additional cases of *C. amycolatum* infection to better understand its epidemiology, clinical characteristics, and resistance profile, with the aim of optimizing therapeutic strategies.

Compliance with ethical standards

Acknowledgments:

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval:

Ethical approval was obtained according to institutional guidelines.

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