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## **Corynebacterium amycolatum peritonitis in a patient undergoing peritoneal dialysis: case report and literature review**

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### **Abstract:**

Peritoneal dialysis is a blood purification technique used in cases of end-stage chronic kidney failure, based on the filtering capabilities of the peritoneum. Infections, often caused by poor asepsis during catheter manipulation, are generally attributed to *Staphylococcus epidermidis* and *Staphylococcus aureus*. *Corynebacterium* usually considered non-pathogenic, is rarely involved in these infections. We present a case of peritonitis due to *Corynebacterium amycolatum* in a patient undergoing peritoneal dialysis. The diagnosis was made based on cytobacteriological examination of the dialysate fluid, which on two occasions showed high levels of white blood cells with a predominance of neutrophilic polymorphonuclear and a monomorphic appearance of colonies on agar medium, whose identification by biochemical tests and antibiotic sensitivity study confirmed the presence of *Corynebacterium amycolatum*. The patient was successfully treated with vancomycin, resulting in symptom resolution and sterilization of the dialysate fluid. Although rare, the involvement of *Corynebacterium* species underscores the importance of confirming its pathogenicity. Further studies are needed to better understand the epidemiology of these infections and guide future treatments. This case also highlights the need for a rigorous approach to confirming the pathogenicity of *Corynebacterium*, despite its traditional classification as a contaminant.

### **Data summary:**

No data was generated during this research, nor is any required for the work to be reproduced.

### **Introduction:**

Peritoneal dialysis is an extrarenal treatment used for end-stage chronic renal failure, leveraging the peritoneum's filtration abilities. Through a catheter, it facilitates exchanges between blood and dialysate [1]. However, mishandling and failure to adhere to aseptic protocols often lead to catheter-related infections, the primary cause of peritonitis in peritoneal dialysis. This negligence permits skin flora bacteria to infiltrate the peritoneal cavity, contributing to the majority of peritonitis cases [2,3]. The most frequently involved pathogens in this type of infection are *Staphylococcus epidermidis* and *Staphylococcus aureus* [3]. The genus *Corynebacterium* is part of the normal skin flora. It has rarely been associated with cases of peritonitis in patients undergoing peritoneal dialysis [4].

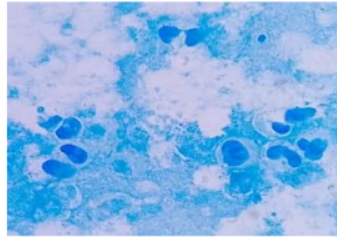
We report the first case in Morocco of peritonitis in peritoneal dialysis caused by *Corynebacterium amycolatum*.

### **Case presentation:**

A 47-year-old patient with end-stage chronic renal failure, who had been started on peritoneal dialysis, was brought to the emergency department of Mohamed V Military Teaching Hospital

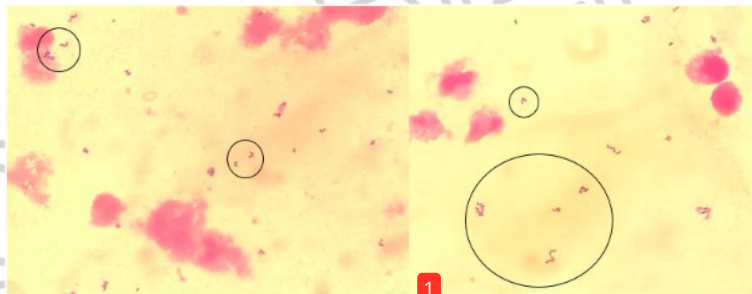
50 complaining of abdominal pain. Despite being afebrile during the clinical examination, the dialysis  
51 fluid appeared cloudy, prompting a sample to be sent to the microbiology laboratory of the  
52 facility for cytobacteriological examination.

53 The specimen was cultured across various media including blood agar, enriched chocolate agar,  
54 blood agar supplemented with nalidixic acid and colistin, and Schaedler agar. Incubation of the  
55 first two mediums occurred at 37°C under aerobic conditions with CO<sub>2</sub>, whereas the latter two  
56 were subjected to anaerobic incubation. Cytological examination was performed using Kova  
57 Slide® counting cells, revealing white blood cell and red blood cell counts of 670/mm<sup>3</sup> and  
58 32/mm<sup>3</sup> respectively. The leukocyte formula showed a predominance of neutrophilic  
59 polymorphonuclear cells at 98%, while lymphocytes were at 2% (Figure 1).



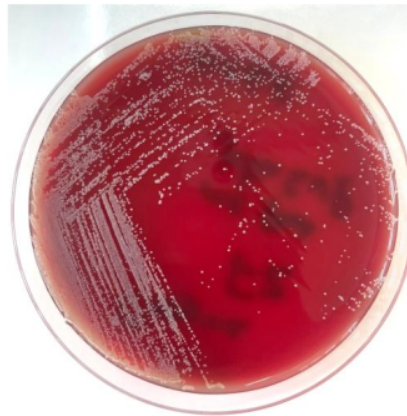
60  
61 **Figure 1:** Neutrophilic polymorphonuclear cells on a smear stained with methylene blue

62 Microscopic examination after Gram staining revealed the presence of Gram-positive bacilli  
63 (Figure 2).



64  
65 **Figure 2:** Gram-positive bacilli on a Gram-stained smear

66 Following a 24-hour incubation period for aerobic culture, and 48-hour for the anaerobic one, a  
67 monomorphic aspect of colonies of Gram-positive coryneform bacilli was observed across all agar  
68 media utilized (Figure 3).



69  
70 **Figure 3:** Colonies of *Corynebacterium amycolatum* on blood agar

71 Species identification was based on biochemical characteristics using an API® Coryne gallery (bio-  
 72 Mérieux SA, Marcy l'Étoile/France), yielding *Corynebacterium amycolatum* with a probability of  
 73 99%. Antimicrobial susceptibility testing was performed using the disk diffusion technique  
 74 following the recommendations of the Antibiotic Susceptibility Committee of the French Society  
 75 of Microbiology (CA-SFM) and the European Committee on Antimicrobial Susceptibility Testing  
 76 (EUCAST) [5]. Antibigrams were conducted using 0.5 McFarland suspensions on blood agar, and  
 77 incubated at 37°C under aerobic conditions. The obtained results are represented in Table 1.

Penicillin G	Ciprofloxacin	Linezolid	Rifampicin	Tetracycline	Trimethoprim/Sulfamethoxazole	Vancomycin
R	R	S	S	S	R	S

78 **Table 1:** Results of antimicrobial susceptibility testing

79 Moreover, the sample was further enriched in an aerobic blood culture bottle (BD BACTEC™ Plus  
 80 medium), yielding positive results consistent with the initial culture. Non-specific biological  
 81 markers indicated a C-reactive protein level of 17.4 mg/l (normal range < 5 mg/l), with all other  
 82 assessments within normal limits. To exclude alternative infectious causes, cultures on  
 83 Lowenstein Jensen medium and smears stained with Ziehl-Neelsen stain to detect acid-fast bacilli  
 84 were conducted. Furthermore, PCR GeneXpert® (Xpert MTB/RIF) was employed to investigate the  
 85 presence of the *Mycobacterium tuberculosis* complex, all yielding negative results. Mycological  
 86 examination also returned negative findings.

87 To confirm the pathogenicity of *Corynebacterium amycolatum* in this case, a second sample was  
 88 sent to the laboratory 4 days later. It was handled using the same steps as the first sample.  
 89 Cytological examination showed white blood cell and red blood cell counts of 1550/mm<sup>3</sup> and  
 90 55/mm<sup>3</sup> respectively. The leukocyte formula indicated a predominance of neutrophilic  
 91 polymorphonuclear cells at 99%, with lymphocytes at 1%. The results of Gram staining, culture,  
 92 antibiogram, as well as enrichment on aerobic blood culture bottle, were identical to the first  
 93 sample.

94 Following these results, the patient received vancomycin for three weeks. Post-treatment, he  
 95 reported no further abdominal pain, and the dialysis fluid cleared. A subsequent  
 96 cytobacteriological examination after three weeks revealed a decrease in the white blood cell  
 97 count (160/mm<sup>3</sup>) and a sterile culture. The same results were observed after 6 months.

98  
 99 **Discussion:**

100 Peritoneal dialysis accounts for 11% of dialysis techniques used and 9% of renal replacement  
 101 therapies worldwide [6]. Peritonitis, characterized by the infection of peritoneal fluid and  
 102 inflammation of the peritoneum, has a mortality rate of 18% among all infectious causes and is  
 103 the leading reason for switching to hemodialysis. Dialysate contamination occurs mainly through  
 104 the endoluminal route and less frequently from an intra-abdominal infection site or an infection  
 105 at the catheter's exit site [7]. The most common pathogens are coagulase-negative staphylococci,  
 106 especially *Staphylococcus epidermidis*, which frequently colonize the skin and hands, as well as  
 107 *Staphylococcus aureus*. Less commonly, when peritonitis arises from an intra-abdominal source,  
 108 *Enterobacteriales*, *Streptococcus sp.*, and anaerobic bacteria are involved [3].

109 The genus *Corynebacterium* includes numerous species of Gram-positive bacilli that are part of  
 110 the skin and mucosal flora, alongside *Staphylococcus sp.* and *Microcococcus sp.* [3,4]. These bacteria  
 111 are generally viewed as having low pathogenicity [3]. Although their isolation in clinical samples  
 112 has always been regarded as contamination, *Corynebacterium* has been increasingly recognized  
 113 as a pathogen responsible for peritonitis. Consequently, the management of *Corynebacterium*  
 114 peritonitis has been included in the guidelines established by the International Society for  
 115 Peritoneal Dialysis (ISPD) since 2010 [8]. The involvement of the *Corynebacterium* genus in

116 peritonitis during peritoneal dialysis does not exceed 5% [3]. A study conducted in Australia and  
117 New Zealand among patients undergoing peritoneal dialysis reported a *Corynebacterium*  
118 peritonitis rate of 1.5% [2], while in the study by Barraclough et al., the rate was 2.3% [4].  
119 To date, five cases of peritonitis on peritoneal dialysis due to *Corynebacterium amycolatum* have  
120 been reported, including 3 adults [9-11] and two children [12]. All were cases of recurrent  
121 peritonitis, but this was not the case in our instance.

122 Regarding therapeutic management, the choice of antibiotic remains a subject of ongoing  
123 discussion. One study indicated that the use of ceftazidime was associated with favorable outcomes  
124 [4], while another revealed a recurrence rate of 48% with the same antibiotic, preferring  
125 vancomycin for better results [13]. However, a study conducted by Htay et al. found that patients  
126 treated with ceftazidime had outcomes similar to those treated with vancomycin [2]. The treatment  
127 duration recommended by the ISPD is 3 weeks [8].

### 128 **Conclusion:**

129 The involvement of *Corynebacterium* species in peritonitis occurring during peritoneal dialysis,  
130 although rare, requires special attention. The traditional classification of *Corynebacterium* as a  
131 contaminant underscores the importance of thorough confirmation of its pathogenicity in these  
132 cases. Additional studies are essential to deepen our understanding of the bacterial epidemiology  
133 of these infections and to guide future therapeutic decisions.

134 **13**

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139 F.Z.A. and I.A. contributed to the initial drafting of the manuscript, while E.B., Y.B.L., F.B., A.M., and  
140 M.C. revised it. M.E. provided final approval for the version intended for publication.

### 141 **Conflicts of interest:**

142 The authors state that they have no conflicts of interest.

### 143 **Consent to publish:**

144 The patient has given written informed consent for this report's publication, following the journal's  
145 patient policy.

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