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Case Report

# *Mycobacterium Chelonae* Osteoarticular Infection Following Radiotherapy in A Patient with Pigmented Villonodular Synovitis of the Knee: Case Report

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## Abstract

Nontuberculous Mycobacteria (NTM) constitute a diverse group of bacteria in the genus *Mycobacterium*. These bacteria are distinguished from *M. tuberculosis* and *M. leprae* by their inability to cause tuberculosis or leprosy. These bacteria are ubiquitous in the environment, found mainly in soil and aquatic environments.

We present the case of a 74-year-old male patient who, at the onset of his clinical condition in 2020, exhibited a complex osteoarticular course affecting the right knee, characterized by recurrent postoperative infectious complications, multiple orthopedic interventions, a diagnosis of pigmented villonodular synovitis, and the subsequent isolation of *Mycobacterium chelonae*, a rapidly growing non-tuberculous *mycobacterium*.

**Keywords: Nontuberculous Mycobacteria; Infectious; Radiotherapy**

## Introduction

Nontuberculous Mycobacteria (NTM) constitute a diverse group of bacteria in the genus *Mycobacterium*. These bacteria are distinguished from *M. tuberculosis* and *M. leprae* by their inability to cause tuberculosis or leprosy. These bacteria are ubiquitous in the environment, found mainly in soil and aquatic environments [1,2].

Although NTM are generally of low pathogenicity, they have the capacity to cause opportunistic infections, especially in immunocompromised individuals [1,3].

NTM are classified into two main groups based on their growth speed: Slow-growing and fast-growing. Among slow growing species, *Mycobacterium* Avium complex (MAC) is the most prevalent and is a significant cause of Nontuberculous Mycobacterial Lung Disease (NTM-PD). Conversely, the *Mycobacterium* abscessus complex, comprising subspecies such as M. abscessus subsp. abscessus or *Mycobacterium chelonae*, exemplifies a rapidly expanding NTM and is progressively observed in cystic fibrosis patients. NTM infections can present in diverse forms, ranging from lung disease to disseminated infections, particularly in patients with compromised immune systems [3]. The diagnosis and treatment of NTM infections present significant challenges due to the presence of antibiotic resistance and the absence of a definitive correlation between in vitro susceptibility and clinical outcomes [4-6]. The accurate identification of NTM species is imperative for the effective management of these infections, given the diversity of species and their variability in pathogenicity [7].

These species have been particularly linked to the use of mesotherapy, liposuction, and other cosmetic interventions.

Due to their presence in aquatic environments and their resistance to multiple drugs, these organisms are often difficult to manage, and they have a wide variety of clinical manifestations, including subcutaneous nodules, abscesses, and fistulas.

Patients infected with NTM typically present with the following comorbidities: Some type of cancer, Obesity, gastrointestinal diseases, HIV, Cystic Fibrosis (CF), diabetes mellitus, and asthma, respectively [3, 8-10].

The diagnosis of these infections is paramount for determining their prognosis and the appropriate utilization of pharmacology. Consequently, the possession of specific cultures, histopathological studies, and molecular tools that facilitate expeditious identification is of the essence.

These tools are instrumental in the rapid assessment of antibiotic resistance profiles, a crucial step in preventing future comorbidities and the onset of psychological and aesthetic sequelae in our patients.

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Treatment typically necessitates meticulous debridement and the extraction of foreign material.

The following drugs are considered to be of use: The following medications are recommended for administration: imipenem (1 g IV every 6 hours), 500 mg of levofloxacin intravenously or orally once daily, 500 mg of clarithromycin orally twice daily, 1 double strength tablet of Trimethoprim/Sulfamethoxazole (TMP/SMX) orally twice daily, 100 mg to 200 mg of doxycycline orally once daily, 2 g of cefoxitin IV every 6-8 hours, and 10 to 15 mg/kg of amikacin.

## Clinical Case

We present the case of a 74-year-old male patient at the onset of his clinical course in 2020 with a history of stroke in 1991, a smoking history of over 20 years (ceased in 1991), and a significant surgical history, including middle-ear surgery during childhood, appendectomy, right inguinal hernia repair, and vasectomy. The patient experienced a complex osteoarticular course involving the right knee, characterized by recurrent postoperative infectious complications, multiple orthopedic interventions, a diagnosis of pigmented villonodular synovitis, and the subsequent isolation of *Mycobacterium chelonae*, a rapidly growing nontuberculous mycobacterium.

On July 17, 2020, the patient underwent surgery on the right knee due to joint disease that subsequently required multiple procedures. On July 20, 2020, the patient began specialized follow-up with the Infectious Disease department due to a post-surgical infectious complication in the right knee associated with a staphylococcal infection. During this period, a joint infection was documented that required antimicrobial therapy and close clinical monitoring.

The subsequent clinical course was complicated, requiring further surgical interventions, including procedures for cleaning, debridement, and synovectomy. Subsequent surgical history records the placement of a right knee prosthesis (Figure1a and 1b).

**Figure 1**: 1a. Postoperative right knee wound with persistent inflammatory changes and impaired healing. 1b. Postoperative drainage from the affected right knee requiring continued clinical management.

Over the following months, the patient's clinical course was characterized by recurrent episodes of joint inflammation and infection, necessitating antimicrobial treatments and further surgical interventions. According to records from August 2023, following the initial surgery in July 2020, the patient required five additional surgical procedures due to infectious complications and a diagnosis of pigmented villonodular synovitis. During this period, an infection caused by Extended-Spectrum Beta-Lactamase (ESBL)-producing Escherichia coli was also identified in the joint fluid; the patient received targeted treatment with ertapenem (1 g intravenously or intramuscularly every 24 hours for 14 days). On May 19, 2021, during a follow-up assessment by the Infectious Disease service, no clinical evidence of active infection was found; consequently, continuing antibiotic treatment was not deemed necessary at that time.

Concomitant with the infectious complications, the patient presented with pigmented villonodular synovitis of the right knee a condition currently termed diffuse-type tenosynovial giant cell tumor, pending histopathological confirmation of this variant. This disease is characterized by locally aggressive synovial proliferation with a tendency toward recurrence, persistent joint inflammation, and progressive deterioration of osteoarticular structures. Given the complexity of the local disease and the patient's history of multiple surgical procedures, he underwent radiotherapy targeting the affected joint. A course of 15 radiotherapy sessions was documented, concluding on May 28, 2021. Subsequently, the patient continued to exhibit local inflammatory changes in the right knee a joint that had previously undergone surgery and radiotherapy.

During post-radiotherapy follow-up, the local clinical progression prompted an expansion of the diagnostic workup to include microorganisms other than conventional bacterial agents. On September 10, 2021, targeted microbiological testing was requested, including Ziehl-Neelsen staining, fungal culture, and specific culture for non-tuberculous mycobacteria. This request represents the first available documentary evidence of a clinical suspicion of mycobacterial infection, occurring approximately three and a half months after the completion of radiotherapy. Subsequently, on September 23, 2021, a culture of right knee synovial fluid identified *Staphylococcus aureus via* MALDI-TOF mass spectrometry. Antimicrobial susceptibility testing showed sensitivity to oxacillin, clindamycin, levofloxacin, daptomycin, doxycycline, rifampicin, linezolid, vancomycin, and trimethoprim/sulfamethoxazole, among other antimicrobials evaluated. On September 24, 2021, another microbiological report regarding the right knee was issued, describing numerous Gram-positive cocci, polymorphonuclear leukocytes, and fibrin debris. Ziehl-Neelsen staining was negative for acid-fast bacilli. However, the mycobacterial culture incubated at 35°C showed growth of *Mycobacterium sp*., initially classified as a rapidly growing *mycobacterium*. Given the significance of the isolate and the need to precisely identify the species involved, identification was performed using molecular techniques (Figure 2).

On September 30, 2021, results were issued from a study identifying atypical mycobacteria *via* Restriction Fragment Length Polymorphism (RFLP) analysis targeting the hsp65 gene region. The study identified *Mycobacterium chelona*. This result established the identity of the *mycobacterium* previously isolated in culture. M. chelonae belongs to the group of rapidly growing nontuberculous mycobacteria and has been associated with infections of the skin, soft tissues, bones, and joints, particularly in patients with a history of invasive procedures, surgeries, or local structural abnormalities.

The finding was clinically significant because it occurred in a knee with a history of recurrent bacterial infection, multiple surgical procedures, and prior exposure to local radiotherapy. Identification took place approximately four months after the completion of radiotherapy. The coexistence of conventional bacterial and mycobacterial isolates posed a diagnostic challenge, given the

**Figure 2**: Synovial fluid specimen obtained during microbiological evaluation for nontuberculous mycobacterial infection.

difficulty of distinguishing between persistent infection, infectious episodes caused by different microorganisms, and inflammation associated with proliferative synovial disease.

Following the identification of M. chelonae, the patient remained under specialist follow-up and received an antibiotic regimen specifically tailored to the isolated *mycobacterium*, consisting of: 1) Levofloxacin 500 mg orally every 24 hours for 4 to 6 months, depending on the response. 2) Clarithromycin 500 mg orally every 12 hours for 4 months; however, this was switched to azithromycin, yielding good results. Ultimately, after two years of treatment, a favorable clinical response and negative follow-up cultures were observed (Figure 3).

## Discussion

**Figure 3**: Post-treatment clinical appearance of the right knee following prolonged antimicrobial therapy.

Infections caused by atypical mycobacteria following surgical procedures are on the rise. This trend is not limited to the fields of plastic surgery or cosmetic dermatology; we are increasingly observing these organisms colonizing surgical instruments used in non-aesthetic procedures as well. This is due to several factors: limited knowledge regarding these microorganisms and their behaviour issues with aseptic techniques; prolonged exposure to inappropriate treatment regimens that merely trigger resistance genes in the bacteria; and inadequate sterilization of surgical equipment or improper aseptic handling of prostheses.

Mycobacteria are ubiquitous and found in almost all environments; therefore, it is crucial that all healthcare personnel be actively involved in understanding, diagnosing, and preventing these conditions.

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