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## Case Report

### *Mycobacterium chelonae* Wrist Infection in an Immunocompetent Patient

病例報告：在一個免疫力正常患者出現的龜分枝桿菌手腕感染

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#### ABSTRACT

We report a 48-year-old Chinese immunocompetent female who presented with right wrist pain and swelling for 9 months because of *Mycobacterium chelonae* infection of her right wrist. *M. chelonae* infection has been increasingly reported. Immunocompromised patients are at increased risk of developing such an infection, however, this occasionally occurs in immunocompetent patients. *M. chelonae* infection more commonly causes cutaneous or soft tissue infection; however, in our case, we found that the infection was so severe that the infective tenosynovial tissue from the volar side of the wrist had eroded through both the volar and dorsal cortex of the distal radius. To our knowledge, wrist tenosynovitis with osteomyelitis of the distal radius caused by *M. chelonae* is rarely reported, especially in an immunocompetent nontraumatic individual. We successfully treated this patient by repeated surgical debridement using different approaches, appropriate antibiotics, as well as application of antibiotic-loaded cement to fill the bone defect.

#### 中文摘要

我們報告一位48歲免疫力正常的中國籍女性患者，因為龜分枝桿菌感染而導致右手手腕腫痛達九個月之久。有關龜分枝桿菌感染的報告在增加。免疫功能不足的患者會有較高的機會感染，但它也可感染免疫力正常的患者。龜分枝桿菌感染常見導致皮膚及軟組織的感染，但在這案例中，我們發現感染嚴重引致橈骨遠端掌側的感染組織侵蝕穿過橈骨遠端背側的骨皮質。就我們所見，龜分枝桿菌感染而導致手腕關節炎和橈骨遠端側侵蝕的案例很少被報告過，特別是在一個免疫力正常、無創傷病歷的患者中。我們成功用不同途徑的清創手術、適當的抗生素、以及以抗生素混合骨水泥填補骨缺陷的方法治療好患者。

## Introduction

*Mycobacterium chelonae* is classified as a nontuberculosis mycobacterium. It is an ubiquitous environmental organism, and can be found in water, soil, and domestic animals.<sup>1</sup> *M. chelonae* is a fast-growing mycobacterium, belonging to Group IV according to the Runyon classification of nontuberculosis mycobacteria. A growing number of rapid-growing mycobacteria have emerged as causes in both immunocompetent and immunocompromised human hosts, which may cause infections in various sites.<sup>2</sup> Soft tissue infection and osteomyelitis are examples of manifestation of *M. chelonae* infection. Various forms of presentations include mass,

granuloma, abscess, and synovitis involving the peritendon space. Although *M. chelonae* is regarded as a fast growing mycobacterium, as an infection it can also present with a long onset. The clinical features of *M. chelonae* can be indistinguishable from tuberculosis infection; therefore, early diagnosis using culture and identification of the bacilli is essential. Treatments are usually based on surgical treatments and chemotherapy, but are sometimes difficult due to the recurrent nature and resistance to treatment. This case serves to highlight the importance of combination of repeated surgical treatments and chemotherapy, including systemic and topical chemotherapy, to manage such infection.

## Case report

A 48-year-old woman presented with right wrist swelling and pain for 9 months. She enjoyed good past health and there was no

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previous injury to her right wrist before the swelling. The patient could not recall any history of puncture wound. There was no history of previous surgery or invasive procedure. She had no recent history of medication intake or traditional Chinese medicine use. The swelling and pain progressed in 2 months and the patient consulted a private orthopaedic surgeon. Magnetic resonance imaging (MRI) of her right wrist was performed, showing tenosynovitis of the right wrist. Open biopsy of the right wrist was performed. Following the initial positive smear result of acid fast bacilli, she was referred to the chest clinic and was started on antituberculosis medication, including isoniazid, rifampicin, pyrazinamide, and ethambutol.

The patient was referred to us 1 week after biopsy. On physical examination, there was swelling and erythema mainly over the volar side of the wrist, as well as mild swelling over the dorsal side. The wound condition over the volar side was normal. There was no neurological deficit. Radiograph of the right wrist showed osteopenic change over the distal radius but no pathological fracture (Figure 1). Blood parameters including white cell count and C-reactive protein were normal. There was mild elevation of erythrocyte sedimentation rate. The biopsy result revealed *M. chelonae* infection, which was sensitive to amikacin.

However, the infection was not controlled well with antituberculosis medication. Because of progression of pain and swelling, operative debridement was performed 4 weeks after the open biopsy (Figure 2). The operative approach used was Henry's approach via the old scar. Intraoperative findings included infective granulation tissue deep to the pronator quadratus muscle, eroding the radius from the volar side deep to the dorsal cortex in the Lister tubercle. After debriding the volar side, the dorsal side was debrided through the bone defect eroded by the synovitis. The operative field was then irrigated with amikacin solution.

Tissue culture showed growth of *M. chelonae*, which was sensitive to amikacin and clarithromycin. After the operation she was given combined chemotherapy including intravenous amikacin and Tienam, and oral clarithromycin. Antituberculosis medication was



**Figure 2.** Intraoperative photograph showing bony erosion over the patient's distal radius by *Mycobacterium chelonae* infection.

stopped. Postoperatively the wrist pain improved and the wound healed 2 weeks after operation. The wrist was protected with a short arm brace.

However, we noticed that the wrist swelling recurred again 1 month later. This time the swelling was mainly over the dorsal side of the right wrist. Surgical debridement and synovectomy was performed via both dorsal and volar approach. There was 3 cm × 3 cm inflamed tissue over the dorsal side, involving the volar side through a 1 cm × 1 cm-distal radius bone defect. Thorough debridement of the bone defect and synovectomy in both the



**Figure 1.** Plain radiograph of the patient's distal radius on initial presentation, showing osteolytic changes and cortical thinning over the distal radius.



**Figure 3.** Plain radiograph of the patient's distal radius after multiple debridement and cement augmentation (7 months after initial presentation). The bony defect was successfully filled with cement.

dorsal and volar side were performed. The bone defect was filled with gentamycin-loaded cement.

Blood parameters were monitored regularly. White cell count and C-reactive protein were normal. Erythrocyte sedimentation rate was elevated at around 2–3-fold of the normal value.

Three months after the last operation, a granulomatous lesion was noted over the previous surgical wound. Further surgical debridement was performed. Intraoperative findings showed a granuloma fungating out over the previous surgical wound extended from an abscess, which formed over the previous distal radius bone defect. Another granuloma was noted over the volar radiocarpal joint involving the first extensor compartment. All granulomata were excised and the abscess over distal radius was drained and curetted. Again, the bone defect was filled with gentamycin-loaded cement spacer.

Approximately 6 weeks after the latest operation, a small granulomatous lesion was noted over the subcutaneous plane extending to the middle of the surgical wound. Exploration of the wound showed that there was no bony involvement. The granuloma was excised. The old cement spacer was removed and the wound was thoroughly irrigated. A new gentamycin-loaded cement spacer was inserted to the distal radius defect.

MRI of the right wrist was performed to monitor progress. It showed significant resolution of the intramedullary abscess and soft tissue enhancement over the volar aspect of distal radius, however, there was increasing soft tissue enhancement over extensor aspect as well as radial aspect of the wrist.

Therefore, we decided to explore the dorsal aspect of the wrist. The dorsal approach was applied. Intraoperative findings showed tenosynovitis involving the first to third extensor compartment at the wrist level. There was no bony involvement. There was a small granulomatous nodule over the radial wrist just ulnar to the superficial branch of the radial nerve. Thorough synovectomy and excision of granuloma were performed.

MRI was repeated 2 months later. It showed that there was resolution of soft tissue enhancement over both the volar and dorsal aspect of the distal radius. The blood parameters including inflammatory markers became normalized after multiple surgical debridement. There was no growth in the culture of the bone and soft tissue taken from the last two operations. Clinically the soft tissue swelling and tenosynovitis improved with the infection under control.

The patient was regularly followed up at 3 months, 5 months, 7 months, and 1 year after the latest operation. The wrist pain subsided; there was no more wrist swelling. The active range of motion of right wrist was full. The grip power was comparable to the left side. Serial X-rays showed consolidated bone without signs of infection (Figure 3). The patient returned to her normal life without limitation.

**Discussion**

This case report indicates the importance of adequate surgical debridement and antibiotic as therapy for localized disease in bone and soft tissue caused by mycobacteria of rapid growth in

**Table 1**  
Summary of clinical progress, investigation results, and treatment in our patient

	Clinical condition	Culture result	Imaging	Surgical treatment	Chemotherapy	Blood parameters
Initial presentation	Left wrist pain and swelling	20 colonies of <i>Mycobacterium chelonae</i>	MRI: wrist tenosynovitis X-ray: osteopenia of distal radius	Open biopsy	Anti-TB medication	WCC normal CRP normal ESR elevated 2 fold
1 mo	Progression of pain and swelling	1 colony of <i>M. chelonae</i>	—	Surgical debridement (volar approach)	IV amikacin 850 mg daily IV Tienam 500 mg every 6 hours Oral clarithromycin 500 mg twice a day Anti-TB medication stopped	WCC normal CRP normal ESR elevated 2 fold
2 mo	Increased swelling at dorsal aspect of wrist	No growth	—	Surgical debridement, synovectomy (volar and dorsal approach) Antibiotics-loaded cement	IV amikacin 850 mg daily Oral clarithromycin 500 mg twice a day	WCC normal CRP normal ESR elevated 3 fold
5 mo	Fungating granuloma with distal radius abscess	No growth	—	Excision of granuloma Drainage of abscess Antibiotics-loaded cement	IV amikacin 850 mg daily IV Tienam 500 mg every 8 hours Oral clarithromycin 500 mg twice a day	WCC normal CRP normal ESR elevated 2 fold
6.5 mo	Superficial granuloma No bony involvement	No growth	X-ray: bony defect filled up with cement	Excision of granuloma Change of antibiotics-loaded cement	IV amikacin 750 mg daily IV Tienam 500 mg every 8 hours Oral clarithromycin 500 mg twice a day	WCC normal CRP normal ESR slightly elevated
10 mo	Tenosynovitis over dorsal aspect of wrist	No growth	MRI: resolution of intramedullary abscess, increased soft tissue enhancement of dorsal wrist	Synovectomy Excision of granuloma	IV amikacin 750 mg daily IV Tienam 500 mg every 8 hours Oral clarithromycin 500 mg twice a day	WCC normal CRP normal ESR normal
13 mo	Wrist swelling improved	No growth	MRI: resolution of soft tissue enhancement in both volar and dorsal wrist	—	Systemic antibiotics stopped	WCC normal CRP normal ESR normal

CRP = C-reactive protein; ESR = erythrocyte sedimentation rate; IV = intravenous; MRI = magnetic resonance imaging; TB = tuberculosis; WCC = white cell count.

immunocompetent individuals. To our knowledge, wrist tenosynovitis eroding the distal radius caused by *M. chelonae* in an immunocompetent nontraumatic individual has not been reported previously.

*M. chelonae* is a rapid-growth mycobacteria, it has been reported to be isolated from environmental sources such as tap water, medical instrument bronchoscope,<sup>3</sup> and contaminated footbath.<sup>2,4</sup> *M. chelonae* infections resulting from contact or inoculation during or after an invasive procedure such as insulin injection<sup>5</sup> or tattooing<sup>6</sup> have also been reported. Cases affecting paediatric patients, adult patients, and the elderly have been reported.<sup>7,8</sup> Soft tissue infection caused by *M. chelonae* is more common but cases of osteomyelitis were also reported.<sup>9</sup>

A case of recurrence of *M. chelonae* infection after surgical treatment has been reported in post-LASIK keratitis<sup>10</sup>; the cause of recurrence was misidentification of the offending organism and the infection did not respond to antibiotic treatment.

Although the origin of the organism may be household, the infection is not that common. Lack of clinical suspicion and absence of classical clinical features make diagnosis difficult. In our case, differential diagnoses also included pyogenic and tuberculosis infection, neoplasm, and inflammatory arthritis. Thus, early biopsy helped us to guide the management.

In our case, the patient initially presented with right wrist synovitis mainly over the volar side whereas the dorsal side was only mildly involved. Surgical debridement from the volar side was performed. However, recurrence over the dorsal side occurred, requiring further debridement through combined volar and dorsal approaches. Therefore, radical debridement would be essential to prevent recurrence in *M. chelonae* infection. In addition, combined approaches may be necessary for adequate removal of infective tissue, especially in extensive infection involving multiple compartments. After debridement, we filled the bone defect with gentamicin-loaded cement. Topical chemotherapy with application of antibiotics-loaded cement guaranteed that there is higher local concentration of aminoglycoside inside the potential spaces of infection.

Other than repeated radical surgical debridements, appropriate antibiotic use is also important. *M. chelonae* is naturally resistant to standard first-line antituberculous chemotherapy. *In vitro*, *M. chelonae* is susceptible to amikacin, imipenem, and clarithromycin.<sup>11</sup> In our treatment plan, we closely collaborated with the respiratory physician and microbiologist. Intravenous amikacin and Tienam, and oral clarithromycin were given for eradication of

infection. There is no established guideline for the duration of chemotherapy use. According to the patient's clinical condition, the total period of Tienam use was 12 months while amikacin and clarithromycin use was 13 months (Table 1).

In conclusion, treatment of *M. chelonae* in the musculoskeletal system relies on early adequate debridement and chemotherapy including systemic and topical means. We propose combined approaches during surgical debridement in cases where a single approach cannot completely remove infective tissue.

### Conflicts of interest

All authors have no conflicts of interest to declare.

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