Case Report

Mycobacterium chelonae Wrist Infection in an Immunocompetent Patient

M. chelonae infection and osteomyelitis are examples of manifestation of Mycobacterium chelonae, a fast-growing mycobacterium belonging to Group IV according to the Runyon classification of nontuberculosis mycobacteria. A growing number of rapidly-growing mycobacteria have emerged as causes in both immunocompetent and immunocompromised human hosts, which may cause infections in various sites. 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 debridement using different approaches, appropriate antibiotics, as well as application of antibiotic-loaded cement to fill the bone defect. We report a 48-year-old Chinese immunocompetent female who presented with right wrist pain and swelling for 9 months because of 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.

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. 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. 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
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 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
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 extending from an abscess, which formed over the previous distal radius bone defect. Another granuloma was noted over the volar radiocarpal joint involving the 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 5). 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

| Clinical condition | Culture result | Imaging             | Surgical treatment                                      | Chemotherapy                  | Blood parameters                  |
|-------------------|----------------|---------------------|--------------------------------------------------------|------------------------------|-----------------------------------|
| Initial presentation | Left wrist pain and swelling | 20 colonies of *Mycobacterium chelonae* | 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 *M. chelonae* | — | 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 | — | — | 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 | — | — | 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 | — | — | 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 | — | 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 | — | 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, and contaminated footbath. Infections resulting from contact or inoculation during or after an invasive procedure such as insulin injection or tattooing have also been reported. Cases affecting paediatric patients, adult patients, and the elderly have been reported. Soft tissue infection caused by *M. chelonae* infection did not respond to antibiotic treatment.

A case of recurrence of *M. chelonae* infection after surgical treatment has been reported in post-LASIK keratitis; 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. 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.

**Funding/support**

The authors declare that no financial or grant support was received for the work described in this article.

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