Prosthetic knee joint infection due to *Mycobacterium abscessus*

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**ABSTRACT**
Infected total knee arthroplasty (TKA) due to *Mycobacterium abscessus* is very rare with only three such cases described in literature. Only one case was managed successfully, however, with a prolonged course of anti tubercular therapy. In this case report, we present an elderly lady with infected TKA after 2 years of the primary procedure. Although initially it grew different bacteriae, *M. abscessus* was isolated during the second debridement. She was successfully treated with total of 5 months of second line anti tubercular drugs with revision prosthesis performed during chemotherapy. Two years followup revealed satisfactory outcome with no relapse.

**Key words:** Antibiotics, debridement, mycobacteria other than tuberculosis, *Mycobacterium abscessus*, total knee arthroplasty

**MeSH terms:** Antibiotic resistance, arthroplasty, replacement knee, abscess, debridement

**INTRODUCTION**
Mycobacteria other than tuberculosis (MOTT) have been infrequently implicated as a cause of prosthetic joint infection (PJI). In this case report, we present a case of *Mycobacterium abscessus* infection following total knee arthroplasty (TKA) in an elderly female patient. We aim to describe the unusual presentation of the disease and our management strategy.

**CASE REPORT**
A 71-year-old hypertensive lady presented to us with an abscess over her right knee after 2 years of asymptomatic period following an uneventful bilateral TKA. Clinical examination revealed tender swollen knee joint with pus drainage from the surgical scar which grew *Staphylococcus aureus* on bacterial culture. However, polymerase chain reaction (PCR) and culture for acid-fast *Bacilli* were negative. Laboratory investigations demonstrated raised erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) (89 mm/h and 55 mg/L, respectively), with synovial fluid leukocytosis. Radiograph suggested evidence of loosening of the implant [Figure 1]. She underwent resection arthroplasty where loose implants were extracted and substituted with gentamicin impregnated cement spacer [Figure 2]. Surprisingly, intraoperative specimens failed to grow an organism. Postoperatively, she was given antibiotics (cefoperazone-sulbactam and linezolid) as per earlier antibiotic susceptibility test. However, ESR and CRP stayed high (92 mm/h and 7.36 mg/L, respectively). In contrast, total leukocyte count remained normal at all times.

She redeveloped the abscess over right knee after 3 months. *Mycobacterium* was isolated this time from synovial fluid aspirate on BACTEC MGIT 960 system containing Middlebrook 7H9 broth base with OADC (oleic acid, bovine albumin, catalase, dextrose, and polyoxyethylene stearate) enrichment and PANTA (polymyxin B, amphotericin B, nalidixic acid, trimethoprim, and azlocillin) antibiotic mixture. Further test over culture isolate using SD TB Ag MPT 64 rapid...
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Persistence of symptoms and raised ESR and CRP (66 mm/h and 4.02 mg/L, respectively) after 6 weeks of anti tubercular treatment (ATT) led to re-debridement with change of cement spacer when necrotizing granulomas consistent with tuberculosis were observed on histopathological examination [Figure 4]. Following surgery, she was maintained on same anti tubercular drugs; however, imipenem was discontinued after 3 weeks. After 2 months, the ESR and CRP improved (32 mm/h and 0.8 mg/L, respectively) and revision TKA was performed with long stemmed tibial and femoral components [Figure 5]. Intraoperative tissue cultures were sterile. ATT was stopped after 6 weeks of negative culture report. She was reviewed at regular intervals for 2 years and no clinical relapse was noted. At her last followup, she had stable knee with 0–90° flexion [Figure 6]. Informed consent was obtained from the patient for reporting her case including clinical photographs.

**DISCUSSION**

*M. abscessus* belongs to rapid growing *Mycobacterium* (RGM) subgroup of atypical *Mycobacterium* which are ubiquitous in environment and take less than a week to grow on standard blood agar plate. Literature describes total of 25 cases of PJI, including 16 cases of knee-PJI, by RGM species including *Mycobacterium chelonae*, *Mycobacterium smegmatis*, *Mycobacterium fortuitum*, *M. abscessus*.
Mycobacterium wolinskyi, and M. abscessus,\textsuperscript{1,9} of which only four were associated with M. abscessus\textsuperscript{1,4,8,9} [Table 1]. Diagnosis is frequently delayed due to similar clinical and laboratory presentation to a bacterial abscess and lack of its growth in routine culture adding to morbidity.\textsuperscript{7} Furthermore, co- or super-infections are known to occur with this bacterium.\textsuperscript{5} In our case, too, the diagnosis was delayed due to initial growth of different bacteria and simultaneous lack of mycobacterial growth in first synovial aspirate as well as in tissues taken during exploration. However, we believe that multiple specimens with high degree of suspicion could have led to early diagnosis.

Many authors recommend removal of implants,\textsuperscript{3,8,9,17,18} especially in case of M. abscessus which is considered as one of the most resistant organisms to chemotherapeutic agents.\textsuperscript{1,18} Nevertheless, there is no common consensus on removal of well fixed prosthesis as there are few reports documenting complete eradication of infection with ATT only with retention of well fixed implants.\textsuperscript{1,2} Our experience with re debridement indicates the resistant nature of this microbial and supports the fact that it is extremely difficult to get rid of it with antibiotic alone. Furthermore, there is no definite guideline for time interval between explantation and reimplantation. Studies suggest at least 6-month interval before revision surgery so as to achieve complete eradication of infection.\textsuperscript{1} Whereas we followed the pattern of inflammatory markers (ESR and CRP) and subsequently performed reimplantation after 2 months of second debridement. This suggests that the timing of revision surgery should be individualized based on clinical evaluation and inflammatory markers pattern.

The duration of antibiotics for long term suppression of infection, once the tissue cultures are negative, is again not clear. The American Thoracic Society guidelines suggest

6 months of multidrug therapy including clarithromycin/azithromycin with one parenteral antibiotic (amikacin/cefoxitin/imipenem, of which amikacin is considered most effective).\textsuperscript{17} Wang \textit{et al.}\textsuperscript{9} reported no relapse in 10 months after more than 9 months of ATT. However, there are few reports demonstrating complete cure only after 3 months of therapy.\textsuperscript{3} On the contrary, we treated our patient with total of 5 months of therapy and stopped it after 6 weeks of normal inflammatory markers and negative tissue culture isolate. Nonetheless, this protocol held good for complete cure with good functional results in our patient at 2 years after revision surgery.

To conclude, a high degree of suspicion is required by arthroplasty surgeons in such scenario. M. abscessus should be considered in case of resistant infected TKA with chronic sinus. We recommend that implant removal with appropriate antimicrobial therapy gives complete cure with satisfactory function. The duration of antimicrobial therapy and interval between explantation and reimplantation should be individualized to the patient based on clinical evaluation, inflammatory markers, and tissue culture isolate.

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Conflicts of interest
There are no conflicts of interest.
### Table 1: Review of all cases of prosthetic joint infection due to rapid growing mycobacteria reported in literature

| Patient/ reference | Age (years)/ gender | Year of index procedure | Type of prosthesis | Mycobacteria other than tuberculosis isolated | Surgery performed | Antibiotic (duration) | Followup (duration in weeks) | Outcome |
|--------------------|---------------------|-------------------------|--------------------|-----------------------------------------------|-------------------|-----------------------|-------------------------------|---------|
| 1<sup>1</sup>      | 60/male             | 2003                    | Knee               | M. smegmatis                                  | REA               | DOX + AMK (2 weeks)   | 107                           | No relapse |
|                    |                     |                         |                    |                                               | Debridements at two occasions | CIP + TMP-SMX (16 weeks) |                               |         |
|                    |                     |                         |                    |                                               | Reimplantation at 7.5 months | MRP + CIP (4 weeks)     |                               |         |
|                    |                     |                         |                    |                                               |                   | CIP (6 weeks after reimplantation) |                             |         |
| 2<sup>2</sup>      | 65/female           | 2010                    | Knee               | M. wolinskyi                                  | Debridement, retained prosthesis | CLR (duration not reported) | 24                             | No relapse |
|                    |                     |                         |                    |                                               |                   | AMK + CIP + DOX (not reported) |                             |         |
| 3<sup>3</sup>      | 62/male             | 1975                    | Hip                | M. chelonae                                    | None              | CFL + GEN (3 weeks)   | Not reported                  | Cured   |
| 4<sup>4</sup>      | 78/male             | 1989                    | Knee               | M. chelonae                                    | REA               | Clarithromycin (17 weeks) | 58                             | No relapse |
|                    |                     |                         |                    |                                               | Arthrodesis at 4 months | Cefoxitin + clarithromycin (6 weeks) |                             |         |
|                    |                     |                         |                    |                                               |                   | Clarithromycin (7 months after arthrodesis) |                             |         |
| 5<sup>5</sup>      | 74/female           | 1990                    | Knee               | M. chelonae                                    | REA               | Clarithromycin (16 weeks) | 120                           | No relapse |
|                    |                     |                         |                    |                                               | Arthrodesis at 4.5 months |               |                               |         |
| 6<sup>6</sup>      | 69/male             | 2002                    | Knee               | M. chelonae                                    | REA               | CLR + DOX (38 weeks)  | 23                            | Not reported |
|                    |                     |                         |                    |                                               | Reimplantation at 14.7 weeks | TMP-SMX (3 weeks)     |                               |         |
|                    |                     |                         |                    |                                               |                   | CLR + MOX (Not reported) |                             |         |
| 7<sup>7</sup>      | 70/female           | 2009                    | Knee               | M. chelonae                                    | REA               | AMK (6 weeks) + CLR (12 weeks) | 52                             | No relapse |
|                    |                     |                         |                    |                                               | Reimplantation at 4 months |               |                               |         |
| 8<sup>8</sup>      | 26/female           | Not reported            | Hip                | M. chelonae                                    | REA;            | CIP + IMP (1 week) + TMP-SMX + ERY (16 weeks) | Not reported                  | Not reported |
|                    |                     |                         |                    |                                               | Reimplantation at 24 months |               |                               |         |
| 9<sup>9</sup>      | 66/female           | Not reported            | Knee               | M. chelonae                                    | REA               | CFX + AMK (6 weeks) + TMP – SMX (4 weeks) | 103                           | Not reported |
|                    |                     |                         |                    |                                               | Reimplantation at 4.5 months | CIP (not known)     |                               |         |
| 10<sup>10</sup>    | 73/female           | 1972                    | Hip                | M. fortuitum                                   | REA               | EMB + RIF (4 months)  | 247                           | Persistent infection |
| 11<sup>11</sup>    | 77/female           | 1976                    | Hip                | M. fortuitum                                   | Debridement, retained prosthesis | EMB + INH (3 months) | 86                            | Not reported |
| 12<sup>12</sup>    | 69/female           | 1976                    | Hip                | M. fortuitum                                   | REA               | DOX + AMK (112 weeks) | 126                           | No followup after reimplantation |
|                    |                     |                         |                    |                                               | Reimplantation at 29 months |               |                               |         |
| 13<sup>13</sup>    | 70/male             | 1977                    | Hip                | M. fortuitum                                   | Debridement, retained prosthesis | EMB + INH (7 months) STP (not reported) | 34                             | Persistent infection |
|                    |                     |                         |                    |                                               | Arthrodesis at 29 months |               |                               |         |
| 14<sup>14</sup>    | 62/female           | 1977                    | Knee               | M. fortuitum                                   | REA               | AMK + ERY-TCL + INH (4 weeks) | 30                             | No relapse |
|                    |                     |                         |                    |                                               | Arthrodesis at 29 months | INH + TCL (not reported) |                             |         |
| 15<sup>15</sup>    | 78/female           | 1979                    | Hip                | M. fortuitum                                   | REA               | TOB, GEN, AMK (12 days) | 12 days                      | Died |
|                    |                     |                         |                    |                                               | Reimplantation at 7 weeks |               |                               | Relapse |
| 16<sup>16</sup>    | 30/female           | 1984                    | Knee               | M. fortuitum                                   | REA               | CFX + AMK (6 weeks)   | 87                            | Not reported |
|                    |                     |                         |                    |                                               | Reimplantation at 7 weeks |               |                               |         |
|                    |                     |                         |                    |                                               | REA               | TOB + GEN + AMK (6 weeks) |               |                               |         |
| 17<sup>17</sup>    | 87/female           | 1994                    | Hip                | M. fortuitum                                   | REA               | CLR + AMK (2 weeks)   | 326                           | No relapse |
|                    |                     |                         |                    |                                               | Multiple debridement |               |                               |         |
| 18<sup>18</sup>    | 76/male             | 1995                    | Knee               | M. fortuitum                                   | Debridement (retained prosthesis) | CLR + CIP (53 weeks) | 24                            | Not reported |
|                    |                     |                         |                    |                                               | Debridement (retained prosthesis) |               |                               |         |
| 19<sup>19</sup>    | 66/female           | 2002                    | Knee               | M. fortuitum                                   | Debridement (retained prosthesis) | GAT/LEV + TMP-SMX (not reported) | 189                           | Not reported |

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Table 1: Continued...

| Patient/ reference | Age (years)/ gender | Year of index procedure | Type of prosthesis | Mycobacterium other than tuberculosis isolated | Surgery performed | Antibiotic (duration) | Followup (duration in weeks) | Outcome |
|--------------------|---------------------|-------------------------|--------------------|-----------------------------------------------|-------------------|-----------------------|-----------------------------|---------|
| 20°                | 68/male             | Not reported            | Knee               | M. fortuitum                                  | Debridement       | AMK + MRP (2 weeks)   | 36                            | Not reported |
|                    |                     |                         |                    |                                               | Reimplantation at 8 months | MRP + MOX (11 months) |                             | Not reported |
| 21°                | 68/male             | Not reported            | Bilateral knees    | M. fortuitum                                  | REA right knee    | CFX + AMK (not reported) | 36                            | On chronic suppressive antibiotic therapy |
|                    |                     |                         |                    |                                               |                   | CIP + CLR + MRP (not reported) |                             |                     |
|                    |                     |                         |                    |                                               |                   | CLR + LNZ (not reported) |                             |                     |
| 22°                | 72/female           | Not reported            | Knee               | M. abscessus                                  | Reimplantation at 4 months | CFX + CLR + AMK (not reported) | 43                            | No relapse |
|                    |                     |                         |                    |                                               |                   | DOX + CIP + CLR (9 months) |                             |                     |
|                    |                     |                         |                    |                                               |                   | AMK (2 months peri-operatively) |                             |                     |
| 23                  | 71/female           | 1979                    | Knee               | M. abscessus                                  | REA               | CFX + CLR (2 weeks)   | 3                             | Palliative care |
|                    |                     | 1977                    | Elbow              | M. abscessus                                  | REA               | CFX + CLR (2 weeks)   | 3                             | Palliative care |
| 24                  | 70/female           | 2002                    | Hip                | M. abscessus                                  | REA               | MRP + CLR (4 weeks)   | 88                            | No relapse |
|                    |                     |                         |                    |                                               |                   | CFX + CLR (3 months)  |                             |                     |
| 25                  | Not reported        | 2010                    | Knee               | M. abscessus                                  | None              | Not reported          | 104                           | Not reported |
| Our case            | 71/female           |                         | Knee               | M. abscessus                                  | Reimplantation at 4.5 months | CLR + LEV + AMK (3 weeks) | 104                           | No relapse |
|                    |                     |                         |                    |                                               | Reimplantation at 6.5 months | CLR + LEV + IMP (6 weeks) |                             |                     |

AMK=Amikacin, AZM=Azithromycin, CFL=Cefalotin, CFX=Cefoxitin, CIP=Ciprofloxacin, CLR=Clarithromycin, DOX=Doxycycline, EMB=Ethambutol, ERY=Erythromycin, GAT=Gatifloxacin, GEN=Gentamicin, IMP=Imipenem, INH=Isoniazid, LEV=Levofloxacin, LNZ=Linezolid, MOX=Moxifloxacin, MRP=Meropenem, REA=Resection arthroplasty, RIF=Rifampicin, STP=Streptomycin, TCL=Tetracycline, TMP-SMX=Trimethoprim-sulfamethoxazole, TOB= Tobramycin, M. smegmatis=Mycobacterium smegmatis, M. wolinskyi=Mycobacterium wolinskyi, M. abscessus=Mycobacterium abscessus, M. chelonae=Mycobacterium chelonae, M. fortuitum=Mycobacterium fortuitum

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