

# 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

**M**ycobacteria other than tuberculosis (MOTT) have been infrequently implicated as a cause of prosthetic joint infection (PJI).<sup>1</sup> 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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Access this article online	
Quick Response Code:	Website: www.ijoonline.com
	DOI: 10.4103/0019-5413.205685

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**How to cite this article:** Amit P, Rastogi S, Marya S. Prosthetic knee joint infection due to *Mycobacterium abscessus*. Indian J Orthop 2017;51:337-42.

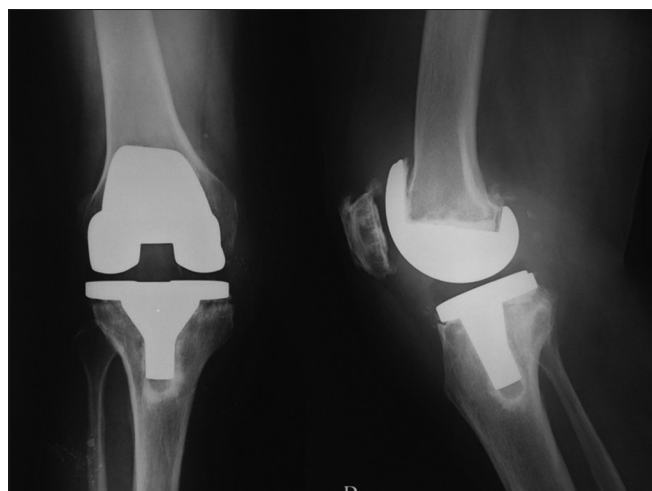
assay using mouse monoclonal anti-MPT antibody tested positive for MOTT. Species identification using Hain test which is based on reverse hybridization of PCR products with their complementary probes targeting 23S rDNA revealed *M. abscessus* [Figure 3]. Subsequently, she was started on second line anti tubercular drugs (clarithromycin, levofloxacin, and amikacin) based on *in vitro* antimicrobial susceptibility test. Amikacin was substituted with imipenem after 3 weeks due to raised creatinine.

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

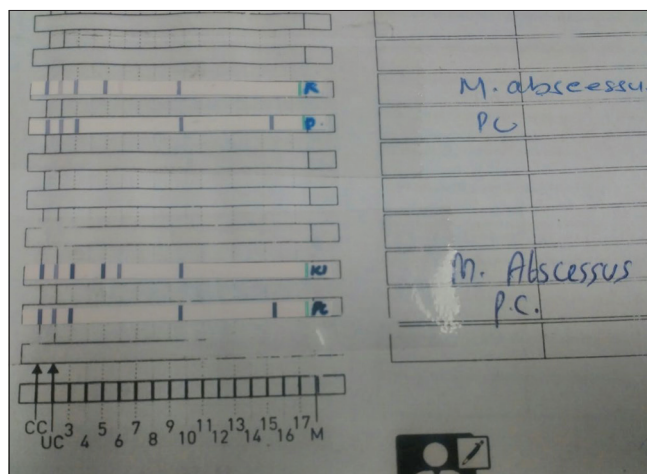
*M. abscessus* belongs to rapid growing *Mycobacterium* (RGM) subgroup of atypical *Mycobacterium* which are ubiquitous in environment and take less than a week to grow on standard blood agar plate.<sup>2</sup> Literature describes total of 25 cases of PJI, including 16 cases of knee-PJI, by RGM species including *Mycobacterium chelonae*, *Mycobacterium smegmatis*, *Mycobacterium fortuitum*,



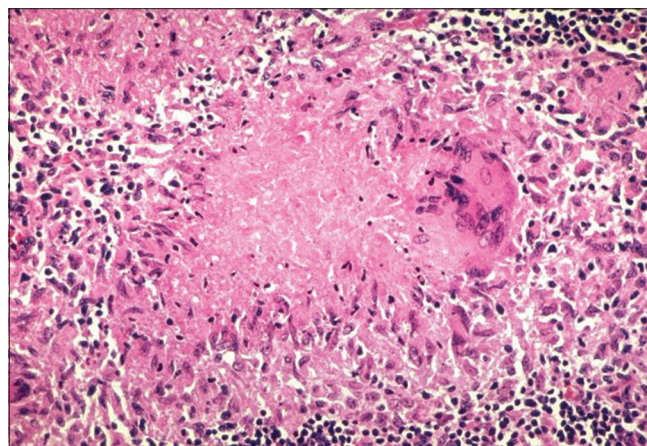
**Figure 1:** Plain anteroposterior and lateral radiograph of the knee prosthesis showing osteolysis with some evidence of loosening at both tibial and femoral components



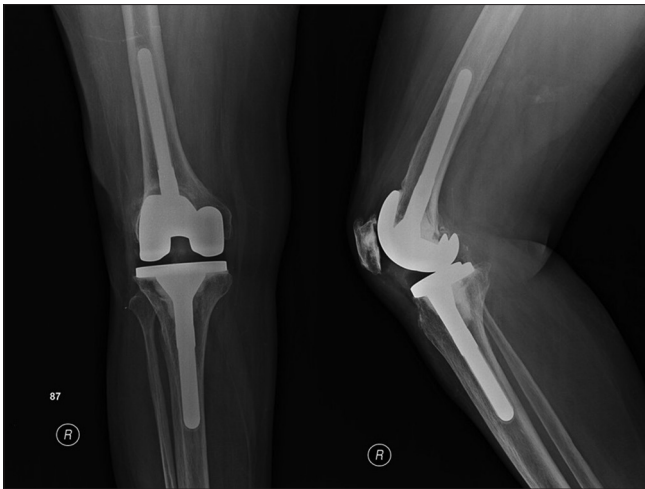
**Figure 2:** Plain anteroposterior and lateral radiograph of the knee joint after debridement with gentamicin loaded cement spacer *in situ*



**Figure 3:** Picture showing *Mycobacterium abscessus* band pattern obtained in Hain test



**Figure 4:** Pictomicrograph depicting necrotizing granuloma characteristic of mycobacterial infection



**Figure 5:** Plain anteroposterior and lateral radiograph of the knee joint after reimplantation

*Mycobacterium wolinskyi*, and *M. abscessus*,<sup>1-9</sup> of which only four were associated with *M. abscessus*<sup>1,4,8,9</sup> [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.<sup>7</sup> Furthermore, co- or super-infections are known to occur with this bacterium.<sup>5</sup> 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,<sup>3,8,9,17,18</sup> especially in case of *M. abscessus* which is considered as one of the most resistant organisms to chemotherapeutic agents.<sup>1,18</sup> 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.<sup>1,2</sup> 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.<sup>1</sup> 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



**Figure 6:** Clinical radiograph showing satisfactory range of movement after reimplantation

6 months of multidrug therapy including clarithromycin/azithromycin with one parenteral antibiotic (amikacin/cefotixin/imipenem, of which amikacin is considered most effective).<sup>17</sup> Wang *et al.*<sup>9</sup> 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.<sup>3</sup> 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.

#### Financial support and sponsorship

Nil.

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

Contd...

Table 1: Contd...

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
20 <sup>6</sup>	68/male	Not reported	Knee	<i>M. fortuitum</i>	Debridement Reimplantation at 8 months	AMK + MRP (2 week) MRP + MOX (11 months)	Not reported	Not reported
21 <sup>5</sup>	68/male	Not reported	Bilateral knees	<i>M. fortuitum</i>	REA right knee	CFX + AMK (not reported) CIP + CLR + MRP (not reported) CLR + LNZ (not reported)	36	On chronic suppressive antibiotic therapy
22 <sup>9</sup>	72/female	Not reported	Knee	<i>M. fortuitum</i> <i>M. abscessus</i>	REA Reimplantation at 4 months	CFX + CLR + AMK (not reported) DOX + CIP + CLR (9 months) AMK (2 months peri-operatively)	43	No relapse
23 <sup>1</sup>	71/female	1979 1977	Knee Elbow	<i>M. abscessus</i> <i>M. abscessus</i>	REA REA	CFX + CLR (2 weeks) CFX + CLR (2 weeks)	3 3	Palliative care Palliative care
24 <sup>8</sup>	70/female	2002	Hip	<i>M. abscessus</i>	REA Reimplantation at 17 weeks	MRP + CLR (4 weeks) CFX + CLR (3 months)	88	No relapse
25 <sup>4</sup>	Not reported	Not reported	Knee	<i>M. abscessus</i>	None	Not reported	Not reported	Not reported
Our case	71/female	2010	Knee	<i>M. abscessus</i>	REA Debridement at 4.5 months Reimplantation at 6.5 months	CLR + LEV + AMK (3 weeks) CLR + LEV + IMP (6 weeks) CLR + LEV (13 weeks)	104	No relapse

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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