IJID Regions 11 (2024) 100378

Contents lists available at ScienceDirect

IJID Regions

journal homepage: www.elsevier.com/locate/ijregi

Case Report

Mycobacterium wolinskyi infection after breast augmentation: A case report and comprehensive review

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ARTICLE INFO

Keywords:
Mycobacterium wolinskyi
Infectious disease
Surgical site infection

ABSTRACT

We present a case report about a 26-year-old female with a *Mycobacterium wolinskyi* surgical site infection after bilateral breast augmentation. In a unique approach compared with previously reported cases, the patient was successfully treated in an outpatient setting using only orally administered cotrimoxazole (trimethoprim-sulfamethoxazole) and ciprofloxacin with one-sided preservation of the breast prothesis. We also provide a comprehensive overview of all report cases of *M. wolinskyi* infections available in the PubMed database until December 2023 and compare the different diagnostic and therapeutic approaches.

Introduction

Mycobacterium wolinskyi is a rapid-growing non-tuberculous Mycobacterium, part of the *Mycobacterium smegmatis* group. Thriving in all sorts of environments, *M. wolinskyi* is ubiquitous in our surroundings. Since its original discovery by Brown et al. [1] in 1999, infections caused by *M. wolinskyi* have seen a rise in prevalence, affecting immunocompetent and immunocompromised patients. Nevertheless, it remains a rare cause of disease with only 35 confirmed cases described in the current literature, mostly affecting patients after the implantation of prosthetic material. In this case report, we present a new case of *M. wolinskyi* infection after the insertion of breast implants and provide a comprehensive review of all reported cases in the PubMed database until December 2023.

Case report

A healthy 26-year-old woman had a bilateral breast prosthesis implantation because of dissymmetrical breast size. She had no relevant medical history and did not use any medication at the time of the procedure.

The immediate post-operative period was uneventful, with proper healing of the surgical wound and absence of clinical symptoms. A total of 2 months after the implantation, the patient was seen in follow-up with complaints of redness, swelling, and tenderness of the right surgical incision site. Diagnosed as a prosthesis infection, the right breast prosthesis was unilaterally removed. Preoperatively, a wound swab culture of the wound was collected. This swab culture was negative for any causative organism and the patient was treated with oral amoxicillin-clavulanate for 7 days. Wound healing was prompt and uncomplicated and, after 2 months, a new prosthesis was implanted. Unexpectedly, the left breast started showing signs of inflammation after 1 month, which was clinically similar to the earlier right-sided infection 5 months after the primary prosthesis implantation. The left prosthesis was removed. This time, a peri-operatively collected tissue sample was sent for culture, which grew *M. wolinskyi,* confirmed using rpoB gene sequencing.

A discussion followed whether the newly placed right-sided prosthesis should also be removed because the likelihood of *M. wolinskyi* being the causative pathogen, which was viewed as most plausible, was not detected due to the limit sensitivity of the initial wound swab culture. In the absence of any clinical suspicion for residual infection, the second right prosthesis was left *in situ* and antibiotic therapy was started consisting of cotrimoxazole 960 mg twice daily and ciprofloxacin 750 mg twice daily. No intravenous antibiotics were given initially because the isolated *M. wolinskyi* strain only showed intermediate sensitivity for imipenem, as shown in Table 1, and there had been no fever. The antibiotic therapy was continued for nearly 7 months. During this period, no signs of systemic infection nor any local inflammation signs in either breast were detected. A total of 2 months after discontinuation of the antibiotic therapy, the breast prosthesis was reimplanted on the left side. In the 7 months of follow-up after the

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https://doi.org/10.1016/j.ijregi.2024.100378
Received 23 March 2024; Accepted 6 May 2024

Table 1
Isolated *M. wolinskyi* antibiogram.

Antibiotic	Sensitivity
Cefoxitin	I
Imipenem	I
Ciprofloxacin	S
Moxifloxacin	S
Trimethoprim-sulfamethoxazole	S
Amikacin	S
Clarithromycin	R
Doxycycline	S
Linezolid	S

This table provides an overview of the sensitivity of the isolated *M. wolinskyi* strain to different types of antibiotics. The decision not to add a carbapenem to the treatment regimen was based on the proven intermediate sensitivity and only ciprofloxacin and trimethoprim-sulfamethoxazole were used. Clarithromycin resistance is typical for *M. wolinskyi*, different from other nontuberculous mycobacteria. Abbreviations: I, intermediate; S, sensitive; R, resistant.

last reimplantation, there was no recurrence of the infection on either side.

Discussion

M. wolinskyi was first identified in 1999 as a new member of the *M. smegmatis* group, next to *Mycobacterium goodii* and *M. smegmatis* strictu sensu [1]. Along with the *Mycobacterium fortuitum* group and the *Mycobacterium abscessus* group, the *M. smegmatis* group is one of three groups of rapid-growing non-tuberculous Mycobacterium (Runyon classification type intravenously administered non-tuberculous mycobacterial [NTM]). Comparable to other rapid-growing non-tuberculous Mycobacteria, *M. wolinskyi* grows in artificial media within 7 days of culture but unlike other *M. smegmatis group* species, it produces no pigment. It is omnipresent in our surroundings, contaminating soil, smooth surfaces, and different sorts of water reservoirs, including swimming pools and other heated water sources.

Only 35 confirmed documented cases of *M. wolinskyi* infections have been published in the PubMed database. A thorough review of the literature shows that *M. wolinskyi* is present as a pathogen worldwide, infecting immunocompromised and immunocompetent patients. Predominantly, surgical site infections were reported, oftentimes with prosthetic or synthetic material present. As listed in Table 2, prosthetic joint infections and infections after (cardio) thoracic surgery are most common, but a wide variety of other soft tissue infections have been described including peritonitis, osteomyelitis, and catheter-related infections. In relation to our case report, Santos Lima et al. [9] have previously described cases of *M. wolinskyi* infections after mammoplasty. As in our case, Rahav et al. [22] reported on several cases of surgical site infection after mammoplasty in the presence and the absence of prosthetic material, suggesting a possible new species of Mycobacteria, *M. jacuzii* due to differences in the 16s RNA, HSP65, RPOB, SODA, and RECA gene sequences, although very closely related to *M. wolinskyi*.

In the laboratory, microbiologists establish *M. wolinskyi* as the causative pathogen based on its growth in cultures from infected samples and polymerase chain reaction sequencing. Cultures will be positive for acid-fast Gram-positive bacilli, which then can be further specified using matrix-assisted laser desorption ionization–time-of-flight mass spectrometry or polymerase chain reaction sequencing. We analyzed the rpoB gene sequence to identify *M. wolinskyi*. In previous reports, the sequence analysis of the 16S rRNA gene was mainly used, whether in combination with the rpoB and hsp65 genes.

Because only scarce literature has been published on this recently discovered pathogen, case reports form the main foundation of our current clinical understanding about *M. wolinskyi* infections. Therefore, many different types of treatment strategies have been suggested and there is a remarkable variation in treatment duration. *M. wolinskyi* is inherently resistant to tobramycin, distinguishing it from other *M. smegmatis group* species. Oftentimes, *M. wolinskyi* also exhibits resistance toward clarithromycin, which is regularly used to treat infections with NTMs. The treatment strategy using ciprofloxacine and trimethoprim/sulfamethoxazole or doxycycline as a definitive treatment, as was the case in our patient, has proven to be a successful approach. However, a multitude of antibiotic combinations have been used and no consensus has been established about the most effective duration of treatment, with treatment periods varying between several weeks and lifetime prophylaxis. In most cases, the removal of the infected prosthetic material is also required to gain source control. In this case, the left breast prosthesis was removed for source control and identification of the causative pathogen. The newly placed right-sided prosthesis, however, was left *in situ* after multidisciplinary discussion. Finally, contrary to our case, which was managed and followed up completely in an outpatient setting, many patients have been extensively hospitalized for an intravenous antibiotic regimen, mostly consisting of amikacin and/or imipenem. The absence of systemic infection signs, the favorable patient profile and the intermediate sensitivity to imipenem of the isolated *M. wolinskyi* stain allowed our patient to be followed up regularly without the need for hospitalization.

In some cases, especially when multiple patients were infected, extensive research was successfully conducted to trace down a reservoir for *M. wolinskyi*. In our standalone case, this possibility was not further explored. Dupont et al. [13] and Nagpal et al. [11] report heater-cooler units for extracorporeal circulation and a cold air blaster as possible environmental sources of contamination. In both cases, several NTM were isolated but not *M.* wolinskyi. More recently, Groenewold et al. [21] isolated a health care worker's hot tub as the source of five *M. wolinskyi* infections in patients receiving joint replacement surgery. Similar findings were reported by Rahav et al. [22] in a case series examining multiple *M. jacuzzii* infections, a strain closely related to *M. wolinskyi*, traced down to the surgeon's hot tub.

Our case provides an interesting, new, and different approach to treating a *M. wolinskyi* infection. First, we were able to successfully treat the infection without using any intravenous antibiotics in a complete outpatient setting. On the other hand, we were able to avoid a new surgical site infection in the right breast after the second prosthesis implantation without new explantation surgery, knowing that the first infection was very likely also caused by the same *M. wolinskyi* strain. Because *M. wolinskyi* was probably still in place after the first prosthesis removal, although wound swab culture could not detect it, our findings might contribute to the clinical evidence that *M. wolinskyi* can be eradicated, even without the removal of the infected foreign material. Naturally, different treatment options should always be evaluated, preferably in a multidisciplinary setting with the infectious disease department for each individual case of *M. wolinskyi* infection, taking into account the immune status of the patient, the presence of prosthetic material, patient characteristics, and symptoms of the infection.

The main goal of this article was to contribute an interesting addition to the growing amount of evidence in treatment of *M. wolinskyi* infections and to provide a detailed overview of the existing evidence. Hopefully, new insights and growing clinical experience will allow clinicians to provide the optimal evidence based clinical care and limit the impact of this emerging pathogen.

Table 2
Review of *M. wolinskyi* case reports in the literature.

Author	Year of publication	Age	Gender	Infection site	Procedure	Time to symptoms	Diagnosis method	Definitive treatment	Duration of treatment	Surgical intervention	Follow-up
Wallace et al. [2]	1988/1999	NS	M	Axilla	NS	NS	NS	NS	NS	NS	NS
		9	M	Cellulitis/osteomyelitis foot	NS	NS	NS	NS	NS	NS	NS
		29	F	Thigh cellulitis	NS	NS	NS	NS	NS	NS	NS
		35	F	Facial surgical wound infection	Facial plastic surgery, NS	NS	NS	NS	NS	NS	NS
		40	F	Calf cellulitis	NS	NS	NS	NS	NS	NS	NS
		55	F	Cellulitis/osteomyelitis elbow	NS	NS	NS	NS	NS	NS	NS
		55	M	Arteriovenous dialysis shunt infection	NS	NS	NS	NS	NS	NS	NS
		69	F	Osteomyelitis	Cardiac surgery, NS	NS	NS	NS	NS	NS	NS
Pulcini et al. [3]	2006	83	F	Left hip prosthesis site	Total hip arthroplasty	4 months	16s rRNA, hsp65	AMK (IV), MFLX, MINO (1 month) - MFLX, MINO (5 months)	6 months	Redo total hip arthroplasty	1 year
Ohno et al. [4]	2008	55	F	Bacteremia	IFN-alfa/imatinib treatment of CML	Not applicable	16s rRNA, rpoB, hsp65	AMK (IV), MINO, LFLX (1 month) - MINO, LFLX (5 months)	6 months	Not applicable	NS
Karakala et al. [5]	2011	67	F	PD catheter site infection, peritonitis	PD catheter insertion	1 month	16s rRNA	MFLX (IV), DOXY (IV), LZL (IV)	4 weeks	PD catheter removal	4 months
Ariza-Heredia et al. [6]	2011	16	M	Aortic root graft - infectious endocarditis	Ross procedure (valve-sparing aortic root replacement, right ventricular to pulmonary root replacement)	7 months	16s rRNA	AMK (IV), MFLX, DOXY (duration triple therapy NS)- lifelong MFLX, DOXY suppressive therapy	6 months, lifelong suppression	Redo-sternotomy with RV to PA conduit replacement	NS
		28	F	Surgical incision site	Lung transplantation	8 months	16s rRNA	MFLX, DOXY	6 months	Surgical debridement	6 months
		73	M	Pacemaker implantation site	Pacemaker implantation, bioprosthetic valve replacement, CABG	2 months	16s rRNA	MFLX, MINO	6 months	Device and lead removal	6 months
		78	M	Sternal wound with osteomyelitis	CABG	2 months	16s rRNA	TIGE (IV), TMP-SMZ, MFLX (1 month) - MFLX, TMP-SMZ (6 months)	7 months	Surgical debridement	NS
		84	F	Sternum wound, bioprosthetic aortic valve prosthesis endocarditis	aortic valve prosthesis replacement	1 month	16s rRNA	IMI, TMP-SMZ, MFLX (1 month) - MFLX, TMP-SMZ (6 months)	7 months	Double surgical bone and muscle debridement	1 year
Chen et al. [7]	2011	22	F	CLABSI, left knee arthritis	Central venous line insertion	9 months	16s rRNA	AMK (IV), MFLX, MINO (1 month) - MFLX, MINO (5 months)	6 months	Surgical debridement, arthrocentesis	NS
Jeong et al. [8]	2012	65	F	Prosthetic knee infection	Total knee replacement arthroplasty	NS	16s rRNA, rpoB	AMK, CFLX, DOXY	NS	Surgical debridement	NS
Santos Lima et al. [9]	2013	29	F	Surgical incision site	Bilateral reductive mammoplasty	13 months	rpoB	AMK (IM), CFLX, DOXY (10 weeks) - CFLX, DOXY	6 months	Surgical debridement/drainage	NS
Yoo et al. [10]	2013	56	F	Right cheek cellulitis	AccuSculpTM laser procedures, lipolysis, filler injections	NS - months	rpoB	DOXY, CFLX	5 months	Abscess drainage	NS
Nagpal et al. [11]	2014	16	M	Sternal wound infection	Aortic arch repair	NS	16s rRNA	DOXY, MFLX	6 months	Debridement	NS

(*continued on next page*)

Table 2 (*continued*)

Author	Year of publication	Age	Gender	Infection site	Procedure	Time to symptoms	Diagnosis method	Definitive treatment	Duration of treatment	Surgical intervention	Follow-up
Lee et al. [12]	2015	65	F	Left knee prosthesis site	Total knee replacement arthroplasty	3 weeks	non-tuberculosis PCR, NS	CFLX, DOXY	16 weeks	Debridement, liner change	24 months
Dupont et al. [13]	2016	48	M	Aortic vascular graft - infectious endocarditis	Mechanical aortic valve replacement, aortic reconstruction	15 days	16s rRNA, hsp65	AMK (IV), LZL, MFLX, DOXY	6 months	Bioprosthetic valve replacement, aortic prosthesis replacement	6 months
Bossart et al. [14]	2016	72	M	Subcutaneous abdominal wall abscesses/ulcers	Insulin injections	NS - days	16s rRNA	AMK (IV), MFLX, MINO (1 month) - MFLX, MINO (5 months)	6 months	Surgical excision and primary closure ulcers	6 months
Fujikura et al. [15]	2017	66	M	Catheter site infection, peritonitis	PD catheter insertion	1 month	16s rRNA, rpoB	LFLX, MINO	39 days	Peritoneal dialysis catheter removal	6 months
Bhatnagar et al. [16]	2019	62	M	Left knee prosthesis site	Bilateral total knee arthroplasty	6 weeks	PCR - NS	AMK (IV), MFLX, LZL (6 weeks) - MFLX, LZL (3 months)	4.5 months	2 times revision surgery, definitive re-implantation surgery	1 year
Hernandez-Meneses et al. [17]	2021	63	F	CRT implantation site	CRT implantation	1 month	16s rRNA, MALDI-TOF	MFLX, DOXY	6 weeks	CRT removal	1 year
Rauch-Pucher et al. [18]	2021	30	F	Abdominal wound infection	Abdominal ventral herniorrhaphy	1 month	Wound cultures - NS	NS	NS	Wound debridement	NS
Kitajima et al. [19]	2021	82	M	Sternal wound osteomyelitis, prosthetic valve infective endocarditis	Aortic and mitral valve replacement, LAA closure, PVI, redo-thoracotomy	40 days	MALDI-TOF, 16S rNA, rpoB, hsp65	CFLX, MINO	12 months	None	12 months
Muranaka et al. [20]	2022	44	F	CLABSI	PICC insertion	39 days	16s rRNA	AMK (IV), MINO, MFLX (1 month) - MINO, MFLX (3 months) - MINO (2 months)	6 months	PICC removal	1 year
Groenewold et al. [21]	2023	NS	NS	Surgical site infection (possibly 1 discitis)	Joint replacement surgery	NS	16s rRNA, rpoB, hsp65	NS	NS	Possible revision of joint	8 years
		NS	NS	Surgical site infection (possibly 1 discitis)	Joint replacement surgery	NS	16s rRNA, rpoB, hsp65	NS	NS	Possible revision of joint	8 years
		NS	NS	Surgical site infection (possibly 1 discitis)	Joint replacement surgery	NS	16s rRNA, rpoB, hsp65	NS	NS	Possible revision of joint	8 years
		NS	NS	Surgical site infection (possibly 1 discitis)	Joint replacement surgery	NS	16s rRNA, rpoB, hsp65	NS	NS	Possible revision of joint	8 years
		NS	NS	Surgical site infection (possibly 1 discitis)	Joint replacement surgery	NS	16s rRNA, rpoB, hsp65	NS	NS	Possible revision of joint	8 years

This table provides a comprehensive yet summarized overview of all 35 documented cases of *M. wolinskyi* infections from 1988 up until April 2023 in the PubMed database. As shown, surgical site infections are most common, especially after orthopedic and (cardio)thoracic surgery. There is remarkable variability in the time to the development of symptoms, ranging from just 15 days to 13 months after an invasive procedure. The duration of treatment also strongly varies depending on the type of infection and immune status of the patient, with treatment regimens lasting from 4 weeks to lifelong suppression therapy. Almost all infections require redo surgery or the removal and/or replacement of prosthetic material.

AMK, amikacin; CABG, coronary artery bypass graft; CFLX, ciprofloxacin; CLABSI, central line-associated blood stream infection; CRT, cardiac resynchronization therapy device; DOXY, doxycycline; F, female; IV, intravenously administered; LAA, left atrial appendage; LFLX, levofloxacin; LZL, linezolid; M, male; MALDI-TOF, matrix-assisted laser desorption ionization–time-of-flight mass spectrometry; MFLX, moxifloxacin; MINO, minocycline; NS, not specified; PD, peritoneal dialysis; PICC, peripherally inserted central catheter; PVI, pulmonary vein isolation; TIGE, tigecycline; TMP-SMZ, trimethoprim-sulfamethoxazole.

Declarations of competing interest

The authors have no competing interests to declare.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval statement

Patient consent has been provided before the writing and publishing of this case report.

Author contributions

Oscar A. Rommens wrote the main outline of the article and provided the tables to support the discussion and case report. The review of literature was conducted by Oscar A. Rommens and Peter van Wijngaarden. Peter van Wijngaarden also provided patient data and consent, reviewed the original manuscript and made adaptions and additional suggestions. Wilfred F.A. Kolkman was the treating plastic surgeon. He reviewed the article and provided patient data and follow-up.

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