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Mycobacterium goodii related breast implant infection: First case and literature review

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Abstract

A 46-year-old Caucasian female was diagnosed with invasive lobular carcinoma of the left breast. She underwent mastectomy and placement of a silicone breast implant as a single-stage procedure. Two weeks after surgery, she developed erythema and drainage to the postoperative site, necessitating removal of the breast implant. Operative cultures grew *Mycobacterium goodii*. She was successfully treated with a three month course of moxifloxacin and doxycyline. *M. goodii* should be in the differential of postoperative wound infections, including breast implants.

Introduction

Mycobacterium goodii is a non-tuberculous mycobacterium belonging to the *Mycobacterium smegmatis* class. Several reports of *M. goodii* infection have been documented but breast implant infection has not been previously reported. We report the first case of breast implant infection due to *M. goodii* and review the literature.

Case presentation

A 46-year-old Caucasian female with past medical history significant for Factor V Leiden mutation (a genetic mutation of a blood clotting factor that increases the risk of blood clots) and hyperlipidemia, was diagnosed with Grade 2 invasive lobular carcinoma of the left breast. She underwent mastectomy and placement of a silicone breast implant as a single-stage procedure. Her post-operative course was eventful for increased redness and drainage at the site of the breast implant, starting two weeks after surgery. The patient was treated with cephalexin and clindamycin but did not show any significant improvement. She was taken to the operating room for irrigation and debridement, with retention of the implant. "Murky" fluid was noted at the operative site which was evacuated. In view of failure to improve clinically over the next week, she was taken back to the operating room for additional surgical debridement and removal of the breast implant. Samples from the debrided material from both surgeries were sent to the microbiology laboratory for bacteriologic culture. Direct Gram stain smear showed the presence of "many white blood cells but no bacteria seen". The specimens were inoculated onto 5% sheep blood (BAP) and chocolate agar plates along with a thioglycolate broth which were incubated in a 5% CO_2 atmosphere at 35°C. Culture plates were examined daily for up to 5 days. After 4 days of incubation, small, pinpoint growth was detected on the BAP. Gram stain of the colonial growth showed the presence of beaded, gram-positive bacilli suggestive of an atypical mycobacterium in morphologic appearance. A Kinyoun stain was performed which confirmed that the organism was an acid-fast bacillus (AFB).

The isolate was sent to a reference laboratory (ARUP Laboratories, Salt Lake City, UT) where it was identified as *M. goodii* using MALDI-ToF technology (Bruker Daltonics, Waltam, MA). Quantitative antibiotic susceptibility testing was also performed to determine the isolate's minimum inhibitory concentration (MIC) to various drugs. The isolate was resistant to clarithromycin, MIC >32 ug/ml but susceptible to amikacin, <1 ug/ml; ciprofloxacin, 1 ug/ml; doxycycline, 0.12 ug/ml; imipenem, <2 ug/ml; linezolid, 2 ug/ml; minocycline, <1 ug/ml; moxifloxacin, <0.25 ug/ml; and, trimethoprim/sulfamethoxazole, <0.25/4.8 ug/ml. The patient's antibiotic regimen was modified from empiric linezolid and azithromycin, started by a different provider, to oral doxycycline and moxifloxacin. The regimen was continued for three months. She did well clinically, made an uneventful recovery, and subsequently had a new implant placed, three months after finishing the course of antibiotics. The patient continues to do well with no recurrence of infection, six months later.

Discussion

M. goodii are gram-positive, non-motile, rapid growing acid fast bacilli. The *M. smegmatis* group was first described and isolated by Lustgarten in 1885, and was so named because of its presence in the smegma of normal penile secretions. *M. smegmatis* was initially thought to be a non-pathogen. However, in 1988, Wallace, et al. [1] reported several cases of *M. smegmatis* infection, principally involving the skin and soft tissue. In 1999, Brown et al. [2] studied 71 clinical isolates that had been previously identified as *M. smegmatis*. In addition to performing routine biochemical testing and studying physiologic growth characteristics and antimicrobial susceptibility patterns, the authors used several newly-available molecular techniques to determine whether these isolates were, in fact, different species. These

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new technologies included high pressure liquid chromatography to study mycolic acid ester elution patterns, polymerase chain reaction restriction analysis of the 65 kDa heat-shock protein gene, 16s restriction fragment length polymorphism analysis, and DNA-DNA hybridization assays. Based on these studies, the authors concluded that the 71 isolates were actually three different species groups which they categorized as follows: *M. smegmatis sensu stricto* (group 1; 35 isolates), *M. goodii* (group 2; 28 isolates), and *M. wolinskyi* (group 3; 8 isolates).

Using the PubMed search, we reviewed all cases of *M. goodii* infection reported in the English language to date. Forty cases were documented, including the 28 cases that were described in the initial review by Brown et al. [2]. Since that review, an additional 12 cases have been reported. Our case thus documents the forty-first case of *M. goodii* infection reported in the English literature, and the first case involving an infected breast implant.

Table 1 summarizes some details regarding the infected patients. The average age of the patients was 47 years. Male-to-female ratio was

Table 1. Patient and management details of patients with *M. goodii*infection.

Ref	No.ofpts	Age	Sex	Source	Diagnosis	Antimicrobial therapy	Duration of therapy (mo)
3	1	76	F	Blood	Prosthetic valve endocarditis	Meropenem, gent, cipro	4.25
						x 2 weeks, followed by	
						amp, gent, cipro x 2 weeks	
						tigecycline, cipro x 2 weeks	
						doxy, cipro x 11 weeks	
4	1	15	F	Bronch	Pulmonary infection	Cipro, doxy x 12 months	12
5	1	44	M	Prosthetic knee	Prosthetic joint infection	Minocycline, cipro x 6 months	6
6	1	23	M	Pacemaker pocket	Pacemaker surgical site	Ofloxacin, doxy x 4 months	4
					Infection		
7	1	85	M	Pacemaker pocket	Pacemaker surgical site	Trim/sulfa x 8 weeks	2
					Infection		
8	1	66	M	Pleural fluid	Pneumonia/empyema	Unavailable	Unavailable
9	1	67	M	Vitreous	Postcataractendophthalmitis	Intravitrealamikacin (twice)	No systemic therapy
10	3					Unavailable	Unavailable
		64	M	Prosthetic hip	Prosthetic hip infection		
		64	M	Hernia patch	Inguinal hernia patch infection		
		75	F	Prosthetic knee	Prosthetic knee infection		
11	1	65	M	Hernia mesh	Inguinal hernia mesh infection	Trim/sulfa x 1 month	1
12	1	60	M	Olecranon bursa	Olecranon bursitis	Cipro, doxy x 2.5 months	2.5
2	28					Unavailable	Unavailable
		22	M	Calcaneus	Osteomyelitis following trauma		
		20	F	Femur	Osteomyelitis from open fracture		
		73	M	Toe	Osteomyelitis from stepping on nail		
		21	M	Tibia	Osteomyelitis from puncture wound		
		55	F	Elbow	Osteomyelitis from open fracture		
		18	M	Leg	Infected wound, ? Osteomyelitis		
		30	F	Tibia	Osteomyelitis following fracture		
		NA	F	Femur	Osteomyelitis (post-surgical)		
		26	F	Thigh, femur	Osteomyelitis following trauma		
		12	M	Cheek	Cellulitis		
		16	M	Femur	Osteomyelitis from open fracture		
		13	M	Thigh	Cellulitis/chronic draining sinus		
		64	M	Blood	Intravenous catheter sepsis		
		62	M	Sternum	Osteomyelitis following cardiac bypass		
		26	F	Breast	Infection following breast reduction surgery		
		20	F	Pacemaker	Infected pacemaker site		
		91	F	Pacemaker	Infected pacemaker site		
		60	M	Sternum	Wound infection, ?osteomyelitis		
				Pleural fluid, lung biopsy	Lipoid pneumonia		
		76	M	Lung mass	Chronic granulomatous disease		
		56	M	Bronchial wash	Necrotizing pneumonia		
		34	F	Lung biopsy	Lipoid pneumonia		
		18	M	Lung biopsy	Lipoid pneumonia		
		53	M	Sputum	Achalasia/pneumonia		
		90	M	CSF	NA		
		40	M	Thigh	NA		
		69	M	Knee aspirate	NA		
		18	F	Arm	NA		

2:1. Osteomyelitis was the most frequent diagnosis, with ten definite and two probable cases. All of these cases were reported by Brown et al. [2]. There were seven cases of pulmonary infection, including three cases of lipoid pneumonia. Two patients with pneumonia had underlying achalasia as a possible predisposing condition. Pacemaker surgical site infections were the next most frequent, with four cases. Three patients had a prosthetic joint infection, two of which were part of a three-patient nosocomial outbreak. Two patients each had a hernia patch/mesh infection, an infected wound (leg, sternum), and cellulitis (face, thigh). One patient each had a prosthetic valve endocarditis, olecranon bursitis, breast reduction surgical site infection, intravenous catheter sepsis, and post-cataract endophthalmitis.

The ecologic niche for *M. goodii* is incompletely defined. The source of infection likely is environmental, although this has not been definitively proven [3,4].

Antibiotic susceptibility results for *M. goodii* are somewhat limited. The initial review by Brown and colleagues [2] showed that their isolates were resistant to clarithromycin, cefoxitin, and cefmetazole; were variably susceptible to tobramycin; and, were susceptible to amikacin, doxycycline, imipenem, ciprofloxacin, and sulfamethoxazole. Subsequent studies have reported somewhat similar susceptibility results, although these studies report only a limited number of antibiotics [4-12]. A recent study reported very low MICs to moxifloxacin (0.032 ugm/ml) and tigecycline (0.016 ugm/ml) [5].

Treatment details were available for only eight of the forty patients in our review. Treatment duration ranged from 1 to 12 months. Relatively short courses of therapy (1 to 4 months) were used for superficial surgical site and wound infections while longer therapeutic courses (6 to 12 months) were used for deeper infections, such as prosthetic joints and pneumonia. The most commonly reported antibiotic combination used for treatment was a quinolone (ciprofloxacin or ofloxacin) along with a tetracycline (doxycycline or minocycline), used predominantly for deeper infections. Trimethoprim/sulfamethoxazole was the next most commonly used drug but it was used as monotherapy for more superficial infections.

In keeping with our findings, previous reports support a two-drug antimicrobial regimen for 3 to 4 months for skin and soft tissue infections, and at least 6 months for bone and joint infections. In addition to antimicrobial therapy, surgical debridement and removal of any prosthetic devices or foreign material, is likely a requirement for achieving clinical and microbiologic cure. We treated our patient with a combination of moxifloxacin and doxycycline for a three-month course of therapy, along with removal of the breast implant, with a favorable outcome.

Conclusions

M. goodii is a rapidly growing mycobacterium that can cause a variety of infections, most commonly post-operative and post-traumatic wound infections, osteomyelitis, and prosthetic joint infections. We report the first case of breast implant infection due to *M. goodii*. Dual antibiotic therapy with a quinolone and tetracycline, achieved complete cure in our case, and supports the use of combination therapy. For skin/soft tissue and wound infections, a 3 to 4 month course of antibiotics appears reasonable, while for osteomyelitis and septic arthritis, at least 6 months of therapy is recommended. More widespread use of improved identification techniques, such as MALDI-ToF and gene sequencing, will likely identify *M. goodii* as an increasingly prevalent pathogen.

Conflict of interest

None

References

1. Wallace RJ Jr, Nash DR, Tsukamura M, Blacklock ZM, Silcox VA (1988) Human disease due to Mycobacterium smegmatis. *J Infect Dis* 158: 52-59. [Crossref]
2. Brown BA, Springer B, Steingrube VA, Wilson RW, Pfyffer GE, et al. (1999) Mycobacterium wolinskyi sp. nov. and Mycobacterium goodii sp. nov., two new rapidly growing species related to Mycobacterium smegmatis and associated with human wound infections: a cooperative study from the International Working Group on Mycobacterial Taxonomy. *Int J Syst Bacteriol* 4: 1493-1511. [Crossref]
3. Marchandin H, Battistella P, Calvet B, Darbas H, Frapier JM, et al. (2009) Pacemaker surgical site infection caused by Mycobacterium goodii. *J Med Microbiol* 58: 517-520. [Crossref]
4. Ferguson DD, Gershman K, Jensen B, Arduino MJ, Yakrus MA, et al. (2004) *Mycobacterium goodii* Infections Associated with Surgical Implants at Colorado Hospital. *Emer Infect Dis* 10: 1868-1871. [Crossref]
5. Jönsson G, Rydberg J, Sturegård E, Christensson B (2012) A Case of Mycobacterium Goodii Prosthetic Valve Endocarditis in a non-Immunocompromised patient: use of 16S RDNA Analysis for Rapid Diagnosis. *BMC Infect Dis* 12: 301. [Crossref]
6. Martinez-Gonzalez D, Franco J, Navarro-Ortega D, Munoz C, Marti-Obiol R, Barras-Salvador R. Achalasia and Mycobacterium goodii pulmonary infection. *Pediatr Infect Dis J* 30: 447-448. [Crossref]
7. Ahmad S, Khakoo RA (2010) Left knee prosthesis-related Mycobacterium goodii infection. *Int J Infect Dis* 14: e1115-1116. [Crossref]
8. Chrissoheris MP, Kadakia H, Marieb M, Libertin C (2008) Pacemaker pocket infection due to Mycobacterium goodii: case report and review of the literature. *Conn Med* 72: 75-77. [Crossref]
9. Buijtels PC, Petit PL, Verbrugh HA, van Belkum A, van Soolingen D (2005) Isolation of nontuberculous mycobacteria in Zambia: eight case reports. *J Clin Microbiol* 43: 6020-6026. [Crossref]
10. Spencer TS, Teske MP, Bernstein PS (2005) Postcataract endophthalmitis caused by Mycobacterium goodii. *J Catartact Refract Surg* 31: 1252-1253. [Crossref]
11. Sohail MR, Smilack JD (2004) Hernia repair mesh-associated Mycobacterium goodii infection. *J Clin Microbiol* 42: 2858-2860. [Crossref]
12. Friedman ND, Sexton DJ (2001) Bursitis due to Mycobacterium goodii, a recently described, rapidly growing mycobacterium. *J Clin Microbiol* 39: 404-405. [Crossref]