Journal of Microbiology, Immunology and Infection (2016) 49, 799—803

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.e-jmii.com

CASE REPORT

A cluster of endophthalmitis caused by *Mycobacterium abscessus* after cataract surgery

Jia-Horung Hung [a], Yi-Hsun Huang [a], Tsung-Chain Chang [b], Sung-Huei Tseng [a], Min-Hsiu Shih [a], Jiunn-Jong Wu [b], Fu-Chin Huang [a,*]

[a] *Department of Ophthalmology, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan*
[b] *Department of Medical Laboratory Science and Biotechnology, College of Medicine, National Cheng Kung University, Tainan, Taiwan*

Received 10 December 2013; received in revised form 29 January 2014; accepted 4 February 2014
Available online 21 March 2014

KEYWORDS
Atypical mycobacteria;
Endophthalmitis;
Mycobacterium abscessus infection;
Nontuberculous mycobacteria

We report two cases of postoperative endophthalmitis after cataract surgery caused by the same strain of *Mycobacterium abscessus* confirmed by arbitrarily primed polymerase chain reaction, sequencing of the erythromycin ribosome methyltransferase gene and pulsed-field gel electrophoresis. The outcomes were poor despite aggressive treatments. This is the first report of nontuberculous mycobacteria as a causative pathogen for a cluster of endophthalmitis.

Introduction

Postoperative endophthalmitis (POE) is a rare but devastating complication after cataract surgery. POE caused by nontuberculous mycobacteria (NTM) is even less common.[1] To date, there have only been seven cases of POE after cataract surgery caused by *Mycobacterium abscessus* reported.[2—7] The present study reports two cases of POE caused by the same strain of *M. abscessus* from an eye clinic. The clinical features and treatment course are discussed.

Case reports

Case 1

A 13-year-old girl underwent an uneventful cataract extraction and intraocular lens (IOL) implantation in her left

* Corresponding author. Department of Ophthalmology, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, 138 Sheng Li Road, Tainan 704, Taiwan.
E-mail address: HFCnckuhoph@gmail.com (F.-C. Huang).

http://dx.doi.org/10.1016/j.jmii.2014.02.001

eye for congenital cataract at a local clinic. During the 2nd postoperative week, she experienced painful visual loss and photophobia in her left eye and was referred to our department. At presentation, her visual acuity in the left eye was only counting fingers at 10 cm. Biomicroscopic examination showed severe anterior chamber inflammation with hypopyon and dense vitritis that precluded fundal view (Fig. 1A). Ocular ultrasonography demonstrated increased vitreous reflectivity with a flat retina and choroid.

As POE was suspected, she underwent an emergency diagnostic vitreous tap and intravitreal injection of 1 mg/0.1 mL of vancomycin, 2.25 mg/0.1 mL of ceftazidime, and 0.4 mg/0.1 mL of amikacin. In addition, the vitreous aspirate was sent for microbiological examination and culture. The postoperative regimens included topical administration of vancomycin 5% and amikacin 2% every 2 hours, intravenous injections of vancomycin 500 mg every 12 hours and ceftazidime 1 g every 8 hours. No microorganism was identified from the smears of the vitreous aspirate using Gram's and acid-fast stains. The intraocular inflammation became more severe despite intravitreal antibiotics injection. She then underwent pars plana vitrectomy as well as further intravitreal injections of vancomycin, ceftazidime, and amikacin 5 days later. Microbiological examination of the vitreous specimen obtained from the vitrectomy revealed acid-fast bacilli. The aerobic culture of the vitreous aspirate of the initial vitreous tap also grew acid-fast bacilli, which was considered to be Runyon Group IV mycobacterium due to its rapid growth. The treatment regimen was then switched to topical application of moxifloxacin 5% and amikacin 2%, and oral administration of clarithromycin 500 mg twice a day.

After vitrectomy and intensified antibiotic therapy, the intraocular inflammation did not subside. Moreover, white

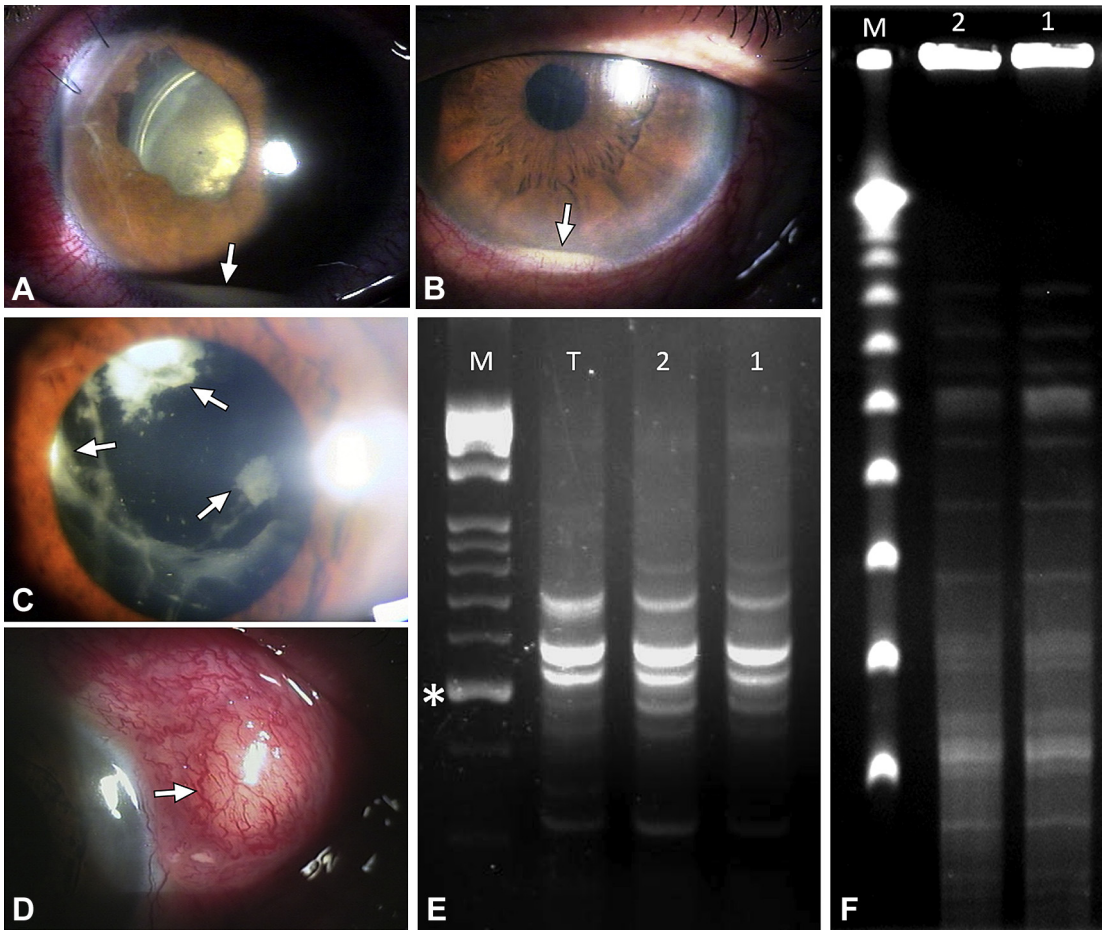

Figure 1. Clinical features of *Mycobacterium abscessus* endophthalmitis. (A) Case 1. Two weeks after cataract surgery, biomicroscopic examinations show conjunctival congestion, distorted pupil, severe fibrinous reaction in front of the intraocular lens, and a 1-mm hypopyon (arrow). (B) Case 2. Four months after cataract surgery, biomicroscopic examinations show congested conjunctiva and a 1-mm hypopyon (arrow). (C) Case 2. After pupil dilation, white plaques (arrows) of various sizes are noted within the capsular bag. (D) Case 2. A subconjunctival abscess just posterior to the limbus at the 3-o'clock position is noted 3 weeks after vitrectomy (arrow). (E) The results of arbitrarily primed polymerase chain reaction: Lanes 1 and 2 are *M. abscessus* from Cases 1 and 2, respectively. Lane T is the type strain, *M. abscessus* CCUG 20993^T. The patterns of *M. abscessus* from Cases 1 and 2 are identical, but different from that of the type strain. M is the DNA molecular weight marker. The band indicated by the asterisk is 500 bp. (F) Species typing by pulsed-field gel electrophoresis patterns of *M. abscessus* digested with *Ase*I: Lane M is the lambda ladder marker. Lanes 1 and 2 are *M. abscessus* from Cases 1 and 2, respectively. The patterns of Cases 1 and 2 are identical.

plaques began to appear in the capsular bag and vitreous inflammation was persistent, which prompted us to repeat vitrectomy and IOL removal 3 weeks later. During the operation, the vitreous opacities were too dense to be completely removed. At the completion of vitrectomy, 0.6 mg/0.1 mL of amikacin and 0.6 mg/0.1 mL of betamethasone were injected intravitreally. During the postoperative follow-up, the intraocular inflammation gradually subsided; however, the left eye became phthisical and lost light perception. The isolated acid-fast bacilli were later isolated and identified as *M. abscessus* complex by polymerase chain reaction—restriction enzyme analysis (PCR-REA), a method described previously.[8]

Case 2

A 67-year-old man underwent uneventful phacoemulsification and IOL implantation in the left eye. Three weeks after cataract surgery, he started to have blurred vision, which gradually deteriorated despite medical treatment in a local eye clinic. Three months postoperatively, he was referred to us with reduced vision and redness in the left eye. At presentation, his visual acuity in the left eye was 2/200 and biomicroscopic examination showed mild corneal edema, moderate anterior chamber inflammation and hypopyon (Fig. 1B). After pupil dilation, white plaques of various sizes were noted in the capsular bag (Fig. 1C). Fundal view was obscured by severe vitritis.

Further history taking disclosed that he had received cataract surgery at the same clinic on the same day as that in Case 1. Based on this history, we became highly suspicious that he might also have *M. abscessus* endophthalmitis. He then underwent pars plana vitrectomy combined with an intravitreal injection of 1 mg/0.1 mL of vancomycin, 2.25 mg/0.1 mL of ceftazidime, 0.6 mg/0.1 mL of amikacin, and 0.4 mg/0.1 mL of betamethasone. As the opacified vitreous could be removed completely during the vitrectomy, it was decided intentionally not to remove the IOL-capsular bag complex, in the hope of avoiding a secondary IOL implantation. Smear examination of the vitreous specimens revealed acid-fast bacilli, which were also grown from vitreous specimen on blood agar on postoperative Day 4. Even under intensive topical applications of moxifloxacin 0.5%, amikacin 2%, and prednisolone 1% and oral administration of clarithromycin 500 mg and ciprofloxacin 500 mg twice a day, his vision continued to deteriorate after vitrectomy as white plaques reappeared in the capsular bag.

During the postoperative follow-up, subconjunctival abscesses with scleral necrosis occurred consecutively at the 3-o'clock (Fig. 1D) and 5-o'clock positions, respectively. As we performed surgical debridement for abscesses, it was noted that abscesses corresponded to sclerotomy sites created during pars plana vitrectomy. Culture of the scleral specimens again grew acid-fast bacilli. After debridement, the patient was treated with oral moxifloxacin 400 mg daily; however, white plaques in the capsular bag continued to coalesce into a thick fibrinous membrane. The patient received a total of four intravitreal injections within a 1-month period to treat the persistent infection. After resolution of intraocular inflammation, the eye became phthisical. Acid-fast bacilli in the vitreous specimen and the scleral specimen were all identified as *M. abscessus* complex by PCR-REA.[8]

Arbitrarily primed PCR

To identify whether the isolates of *M. abscessus* from the two patients were of the same strain, arbitrarily primed (AP)-PCR was adopted. The DNAs of *M. abscessus* from our cases, and type strain of *M. abscessus* CCUG 20993^T were extracted. AP-PCR was then performed using the primer for amplification of repeat motifs the enterobacterial repetitive intergenic consensus motifs 1R; sequence 5′-ATC-TAAGCTCCTGGGGATTCAC-3′. The details of the procedure are described elsewhere.[9]

The AP-PCR patterns of the two cases are shown in Fig. 1E. The patterns of *M. abscessus* from Case 1 and Case 2 were the same, indicating that they were the same strains, whereas the pattern of the type strain was different.

Sequencing of the erythromycin ribosome methyltransferase gene

To identify the species of the isolates of *M. abscessus* complex from our two patients, sequencing of erythromycin ribosome methyltransferase gene [*erm* (41)] was performed as described by Kim et al.[10] Briefly, the DNAs of *M. abscessus* complex from our cases, type strains of *M. abscessus* subspecies *abscessus* (*M. abscessus* sensu stricto CCUG 20193^T), *M. abscessus* subspecies *bolletii* (*M. bolletii* CCUG 50184^T), and *M. abscessus* subspecies *massiliense* (*M. massiliense* CCUG 48898^T) were extracted and amplified by PCR using the primer pair ermF (5′-GACCGGGGCCTTCTTCGTGAT-3′) and ermR1 (5′-GACTTCCCCGCACCGATTCC-3′). PCR products were then purified and sequenced, and a basic local alignment search tool (BLAST) search for sequence similarities was made in GenBank to determine the species names. The *erm* (41) sequence analysis revealed that both strains of our cases show highest similarities to *M. abscessus* sensu stricto, this indicated that our cases were *M. abscessus* sensu stricto.

Pulsed-field gel electrophoresis

Pulsed-field gel electrophoresis (PFGE) was adopted to type the 2 strains. The method is largely based on the methods of Matsumoto et al.[11] Briefly, cells of *M. abscessus* were collected, suspended, and pipetted into disposable plug molds. The plugs containing the genomic DNA were digested with *Ase*I and incubated at 37°C. PFGE was carried out at 14°C for 27 hours. Bacteriophage lambda ladder PFG marker was used as a molecular size standard. The gel photographs were then scanned and analyzed.

The PFGE patterns are shown in Fig. 1F. The patterns reveal that the two strains are identical.

Discussion

Ubiquitous in nature, *M. abscessus* has been discovered in soil, bioaerosols, and municipal tap water.[6] *M. abscessus* tends to form a biofilm, and is one of the most chemotherapy-resistant species of NTM.

Table 1 Summary of cases of *Mycobacterium abscessus* endophthalmitis after cataract surgery

Refs	Age/ Sex	Incubation time[a]	Cataract procedure	Surgical intervention	Final BCVA	Laboratory diagnosis
Roussel, 1989[2]	77/M	4 wk	Secondary IOL	AV	HM	Culture
El-Asrar, 1995[3]	65/M	4 wk	ECCE and IOL	PPV × 2, IOL removal	HM	Culture
Ramaswamy, 2000[4]	66/F	6 wk	Phaco and IOL	PPV, evisceration	NLP	Culture
Marin-Casanova, 2003[5]	65/F	2 wk	Phaco and IOL	PPV without IOL removal	20/80	Culture
Matieli, 2006[6]	76/F	20 d	Phaco and IOL	PPV × 2, IOL removal	NLP	Culture
Palani, 2007[7]	64/F	15 d	Phaco and IOL	Evisceration	NLP	Culture and PCR- REA
	58/M	Immediately postoperative	Phaco and IOL	PK, IOL removal	HM	
Present study	13/F	2 wk	Cataract extraction and IOL	PPV × 2, IOL removal	NLP	Culture, PCR-REA, AP-PCR, *erm* (41) PCR, PFGE
	67/M	3 wk	Phaco and IOL	PPV without IOL removal	NLP	

[a] The time between cataract surgery and the onset of symptoms.
AP-PCR = arbitrarily primed polymerase chain reaction (PCR); AV = anterior vitrectomy; BCVA = best corrected visual acuity; CF = counting fingers; *erm* (41) PCR = erythromycin ribosome methyltransferase gene PCR; IOL = intraocular lens; HM = hand motions; NLP = no light perception; PCR-REA = PCR—restriction enzyme analysis; PFGE = pulsed-field gel electrophoresis; Phaco = phacoemulsification; PK = penetrating keratoplasty; PPV = pars plana vitrectomy.

There has been an increasing incidence of ocular infections caused by NTM in recent years.[1,2] Most common isolates are rapidly growing NTM, especially *M. abscessus* and *Mycobacterium chelonae*. Despite this trend, POE caused by *M. abscessus* after cataract surgery is rarely reported (Table 1).[2–7] POE caused by *M. abscessus* usually has certain characteristics of chronic POE, such as delayed and indolent inflammation, white plaques of the capsular bag, recurrence of inflammation despite initial treatment, and inflammation that could only be partially suppressed by corticosteroids.[3] As for treatment, all cases showed a poor response to topical antibiotics and required surgical interventions to eliminate the infection. However, except for one case[5] that retained useful visual acuity, all of the reported cases had very poor visual outcome.[2–4,6,7]

Our study reconfirms that ocular infection caused by NTM is associated with biomaterials.[1,2] To date, all reported cases of POE caused by *M. abscessus* after cataract surgery involve IOL implantation in the causative procedure (Table 1).

In our experience of managing these two challenging cases, we found that a more aggressive surgical intervention seems to be a requisite for effecting a cure. In Case 1, preservation of the IOL—capsule complex at the first vitrectomy resulted in persistent intraocular inflammation, which was resolved only when the IOL was removed during the second vitrectomy. In Case 2, the intentionally retained IOL—capsule complex resulted in a protracted course of infection and prolonged treatment duration. It has been reported that *M. abscessus* can be obtained from the IOL—capsule complex even after intravitreal injection of amikacin.[3] Therefore, we postulate that *M. abscessus* forms a biofilm in the IOL—capsule complex as an intraocular reservoir, thus impairing the penetration of antibiotics. Removal of the IOL—capsule complex during the first intraocular intervention should be adopted for the treatment of *M. abscessus* endophthalmitis.

Scleritis is rarely seen as a complication in vitreoretinal surgeries. In Case 2, *M. abscessus* extended extraocularly and manifested as scleritis after vitrectomy. In the literature, scleritis after vitrectomy has also been reported in POE associated with *M. abscessus*.[4,6] The mechanism might be direct inoculation of the pathogens into scleral tissues during vitrectomy. We proved this hypothesis by culture of the scleral tissue in Case 2.

To our knowledge, this is the first report of a cluster POE caused by the same strain of *M. abscessus*. A review of nosocomial outbreaks caused by NTM[13] found that inadequate sterilization of equipment and the use of contaminated water and reused needles to extract medication to be the major causes. Due to the poor prognosis, we emphasize the importance of a strict sterilization procedure to prevent such outbreaks.

References

1. Moorthy RS, Valluri S, Rao NA. Nontuberculous mycobacterial ocular and adnexal infections. *Surv Ophthalmol* 2012;**57**:202—35.
2. Roussel TJ, Stern WH, Goodman DF, Whitcher JP. Postoperative mycobacterial endophthalmitis. *Am J Ophthalmol* 1989;**107**:403—6.
3. El-Asrar AM, Tabbara KF. Chronic endophthalmitis after extracapsular cataract extraction caused by *Mycobacterium chelonae* subspecies abscessus. *Eye* 1995;**9**:798—801.
4. Ramaswamy AA, Biswas J, Bhaskar V, Gopal L, Rajagopal R, Madhavan HN. Postoperative *Mycobacterium chelonae* endophthalmitis after extracapsular cataract extraction and posterior chamber intraocular lens implantation. *Ophthalmology* 2000;**107**:1283—6.

5. Marin-Casanova P, Calandria Amiguetti JL, Garcia-Martos P, Lozano Dominguez C, Sanabria BH, Puerto Alonso JL, et al. Endophthalmitis caused by *Mycobacterium abscessus*. *Eur J Ophthalmol* 2003;**13**:800—2.
6. Matieli LC, De Freitas D, Sampaio J, Moraes NS, Yu MC, Hofling-Lima AL. *Mycobacterium abscessus* endophthalmitis: treatment dilemma and review of the literature. *Retina* 2006;**26**:826—9.
7. Palani D, Kulandai LT, Naraharirao MH, Guruswami S, Ramendra B. Application of polymerase chain reaction-based restriction fragment length polymorphism in typing ocular rapid-growing nontuberculous mycobacterial isolates from three patients with postoperative endophthalmitis. *Cornea* 2007;**26**:729—35.
8. Brunello F, Ligozzi M, Cristelli E, Bonora S, Tortoli E, Fontana R. Identification of 54 mycobacterial species by PCR-restriction fragment length polymorphism analysis of the *hsp65* gene. *J Clin Microbiol* 2001;**39**:2799—806.
9. Wu JJ, Lee YC, Leaw SN, Lin MC, Chang TC. Evaluation of an impedance method for subtyping of *Pseudomonas aeruginosa*. *Diagn Microbiol Infect Dis* 2004;**48**:181—9.
10. Kim HY, Kim BJ, Kook Y, Yun YJ, Shin JH, Kim BJ, et al. *Mycobacterium massiliense* is differentiated from *Mycobacterium abscessus* and *Mycobacterium bolletii* by erythromycin ribosome methyltransferase gene (*erm*) and clarithromycin susceptibility patterns. *Microbiol Immunol* 2010;**54**:347—53.
11. Matsumoto CK, Chimara E, Bombarda S, Duarte RS, Leão SC. Diversity of pulsed-field gel electrophoresis patterns of *Mycobacterium abscessus* type 2 clinical isolates. *J Clin Microbiol* 2011;**49**:62—8.
12. Girgis DO, Karp CL, Miller D. Ocular infections caused by nontuberculous mycobacteria: update on epidemiology and management. *Clin Experiment Ophthalmol* 2012;**40**:467—75.
13. Wallace Jr RJ, Brown BA, Griffith DE. Nosocomial outbreaks/pseudo-outbreaks caused by nontuberculous mycobacteria. *Annu Rev Microbiol* 1998;**52**:453—90.