MAJOR ARTICLE

Outbreak of *Mycobacterium abscessus* Wound Infections among "Lipotourists" from the United States Who Underwent Abdominoplasty in the Dominican Republic

E. Yoko Furuya,[1,a] Armando Paez,[5,a] Arjun Srinivasan,[7] Robert Cooksey,[8] Michael Augenbraun,[3] Miriam Baron,[6] Karen Brudney,[1] Phyllis Della-Latta,[2] Concepcion Estivariz,[9] Staci Fischer,[10] Mary Flood,[1] Pamela Kellner,[4] Carmen Roman,[4] Mitchell Yakrus,[8] Don Weiss,[4] and Eric V. Granowitz[5]

Departments of [1]Medicine and [2]Pathology, New York–Presbyterian Hospital–Columbia University Medical Center, [3]Department of Medicine, State University New York Downstate Medical Center, and [4]New York City Department of Health and Mental Hygiene, New York, New York; [5]Department of Medicine, Baystate Medical Center–Tufts University School of Medicine, Springfield, and [6]Department of Medicine, Brigham and Women's Hospital, Boston, Massachusetts; Divisions of [7]Healthcare Quality, [8]Tuberculosis Elimination and [9]Office of Workforce and Career Development, Centers for Disease Control and Prevention, Atlanta, Georgia; and [10]Department of Medicine, Rhode Island Hospital, Providence

Background. Some US residents travel abroad to undergo cosmetic surgery for fat removal, a practice referred to as "lipotourism." *Mycobacterium abscessus* can cause postsurgical wound infection.

Methods. US residents who developed *M. abscessus* wound infection after undergoing cosmetic surgery in the Dominican Republic in 2003 and 2004 were identified using the Emerging Infections Network listserv.

Results. Twenty returning US travelers with *M. abscessus* infection were detected. Eight patients had matching isolates, as determined by pulsed-field gel electrophoresis and repetitive element polymerase chain reaction. All 8 patients, who had previously been healthy Hispanic women, underwent abdominoplasties at the same clinic in the Dominican Republic. Symptoms first developed 2–18 weeks after the procedure (median interval, 7 weeks). Only 2 of the 8 patients received a correct diagnosis at the initial presentation. Most patients presented with painful, erythematous, draining subcutaneous abdominal nodules. Seven patients underwent drainage procedures. Six patients received a combination of antibiotics that included a macrolide plus cefoxitin, imipenem, amikacin, and/or linezolid; 2 received clarithromycin monotherapy. All patients but 1 were cured after a median of 9 months of therapy (range, 2–12 months). Because of a lack of access to the surgical clinic, the cause of the outbreak of infection was not identified. The patients who were infected with nonmatching isolates underwent surgeries in different facilities but otherwise had demographic characteristics and clinical presentations similar to those of the 8 patients infected with matching isolates.

Conclusions. This case series of *M. abscessus* infection in US "lipotourists" highlights the risks of traveling abroad for surgery and the potential role of the Internet in identifying and investigating outbreaks.

Many individuals travel abroad to receive medical care. In a 2002 survey of US passengers traveling to Central and South America, 3%–4% of the travelers listed "health treatment" as the purpose of their trip [1]. More recently, offshore surgery has become more common and has received increasing attention in the US Congress and media [2–4]. In some of these instances, individuals travel to undergo cosmetic surgery procedures for fat removal, a practice referred to as "lipotourism" [5]. However, the effects of surgical tourism on the health care system and on individual patients are largely unknown. In 2004, physicians using the Emerging Infections Network (EIN) listserv identified *Mycobacterium abscessus* wound infection in 20 patients who had traveled to the Dominican Republic for cosmetic surgery [6–9]. Further investigation by the Centers for
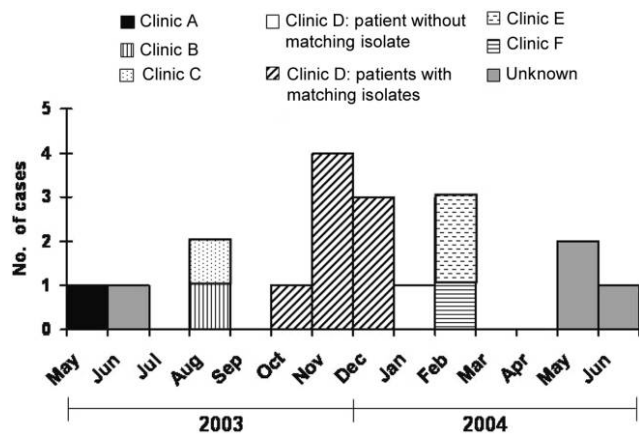
Figure 1. Surgical venues for patients who developed *Mycobacterium abscessus* wound infection after undergoing abdominoplasty in the Dominican Republic.

Figure 2. Representative PFGE patterns for *Mycobacterium abscessus* isolates. *Lane 1, M. abscessus* reference strain ATCC 23007; *lanes 2–5,* predominant cluster (pattern 1; patients 2–4 and 8, as described in tables 1 and 2); *lanes 6–12,* case patients who were not part of the predominant cluster but who had *M. abscessus* infection after undergoing cosmetic surgery in the Dominican Republic (*lanes 6* and *7,* pattern 2A; *lane 8,* pattern 2B; *lanes 9* and *10,* pattern 3; *lane 11,* pattern 4; and *lane 12,* pattern 5); *lane 13,* unrelated isolate (pattern 6); and *lane 14,* 48.5-kb λ ladder.

Disease Control and Prevention (CDC) and the New York City Department of Health and Mental Hygiene confirmed the occurrence of an outbreak of infection involving 8 patients from a single cosmetic surgery clinic in Santo Domingo.

METHODS

Outbreak recognition. This outbreak was first recognized through e-mail communications within the EIN listserv, an electronic network of >800 infectious diseases physicians that was established to detect new infectious diseases and outbreaks [7]. In March 2004, an EIN member in New York used the
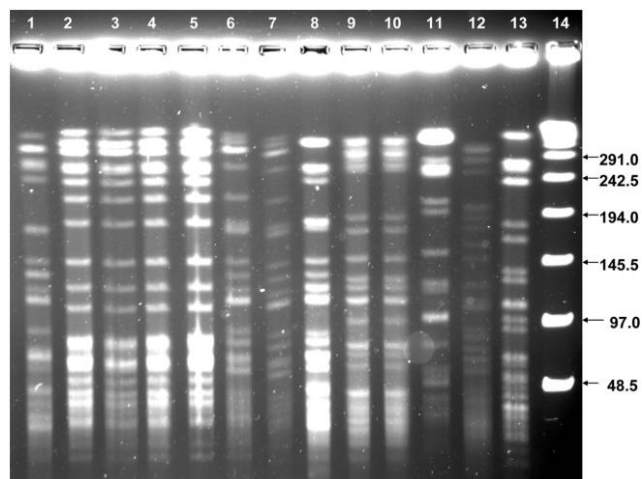
listserv to request advice on treatment of a patient who acquired *M. abscessus* wound infection after undergoing abdominoplasty in the Dominican Republic. This e-mail was seen by another physician who was treating a similar patient. After these 2 physicians communicated, the New York physician reviewed hos-

Table 1. Demographic and clinical characteristics of 8 Hispanic women who developed *Mycobacterium abscessus* wound infections following abdominoplasty at one clinic in the Dominican Republic.

Characteristic	Patient			
	1	2	3	4
Age, years	38	19	44	26
Surgery in addition to abdominoplasty	Upper back liposuction	None	Abdominal liposuction	Breast reduction[a]
Incubation period from surgery to symptom onset, weeks	2	10	6	4
Symptoms and signs precipitating presentation	Abdominal pain, swelling, draining wound	Abdominal pain, nausea, subcutaneous nodules	Abdominal pain, increased girth, draining wound	Fatigue, weight loss, draining wounds
Location of abdominal lesions	Adjacent to periumbilical incision	Multiple lesions scattered on the abdominal wall	Right upper quadrant	Along all incisions (inframammary, umbilical, pubic symphysis)
Description of lesions	Bulla, erythema, swelling, draining wound	Tender, indurated subcutaneous masses	Seropurulent drainage from scar	Draining pustules, induration, erythematous lesions with multiple sinus tracts up to 6 cm in depth
Initial abdominal CT results	Horseshoe-shaped fluid collection in the anterior abdominal wall (maximum dimension, 10.5 × 5 × 2 cm)	2 fluid collections within the subcutaneous fat of the anterior abdominal wall (in aggregate, 6.6 × 1.5 cm)	Abdominal CT scan not done	Multiple fluid collections in the anterior abdominal wall between the xiphoid and umbilicus

pital microbiologic records and identified 4 more patients who developed *M. abscessus* infection after undergoing surgery in the Dominican Republic. The New York City Department of Health and Mental Hygiene and the CDC were notified, and a joint investigation followed [6].

Case identification. A case definition was posted on EIN and Epi-X, a secure, public health listserv network. EIN members were asked to report *M. abscessus* infections or postsurgical infections that had not responded to standard antimicrobial therapy in patients who had undergone surgery in the Dominican Republic. The New York City Department of Health and Mental Hygiene held a press conference to encourage patients to report these infections and also sent an alert to New York City clinicians and microbiologists that requested reports regarding any such patients.

A confirmed case was defined as a soft-tissue or bloodstream infection diagnosed after 1 May 2003 that was due to rapidly growing *Mycobacterium* species following cosmetic surgery in the Dominican Republic. A probable case was defined as a soft-tissue infection diagnosed after 1 May 2003 following cosmetic surgery in the Dominican Republic that did not respond to standard antibacterial therapy.

The CDC interviewed potential case patients in the patient's language of choice (English or Spanish) using a standardized collection tool to obtain data on demographic characteristics, the facility where the surgery had been performed, the name of the surgeon, the type of surgery, the patient's observations of operating room procedures, the date of symptom onset, symptoms, and medical treatment.

Institutional review board approval was requested at each hospital and was obtained. Charts for the 8 patients described in this report were reviewed using the same instrument to collect additional demographic, clinical, laboratory, and radiographic data. We defined "cure" as the absence of signs and symptoms of *M. abscessus* infection for at least 6 months after the completion of treatment.

Laboratory testing. At each health care facility, smears from specimens were stained with Auramine O and examined for acid-fast bacilli by fluorescent microscopy. Collected specimens were inoculated in duplicate on 7H11 selective agar biplates or slants, on Lowenstein-Jensen slants (BBL; Becton Dickinson), and in Mycobacterial Growth Indicator Tubes (Bactec MGIT 960; Becton Dickinson). One set was incubated at 30°C and the other at 37°C for up to 6 weeks. Colonies were stained using the Kinyoun method. Mycobacteria were then identified using high-performance liquid chromatography, in which the mycolic acid profile (chromatogram) is compared with a library of known mycobacterial chromatograms.

Specimens were also inoculated onto routine isolation media for detection of aerobic bacteria and fungi. These agar media were either made in the clinical microbiology laboratory or purchased from Becton Dickinson. Media included 5% Columbia sheep blood, chocolate, MacConkey, Sabouraud with chloramphenicol and gentamicin, Mycosel, and brain heart infusion. Aerobic cultures were incubated at 35°C for 4 days, and mycology cultures were incubated at 25°C and 35°C for 4 weeks.

At CDC laboratories, molecular characterization was performed by PFGE and repetitive element PCR, using previously

Table 1. *(Continued.)*

		Patient	
5	6	7	8
35	22	58	45
Breast reduction[a]	Breast elevation	Abdominal liposuction	Upper back liposuction
3	18	8	12
Fever, draining wounds	Painful supraumbilical mass	Abdominal pain, erythema	Fever, swollen erythematous draining wound
Right inframammary, umbilical, right suprapubic	Supraumbilical with 1 lesion distant from incision	Supraumbilical with 1 lesion distant from incision	Multiple lesions on abdominal wall along the original incision, left midepigastric
Ulcerative lesion draining pus	Erythema, tender mass	Erythema, swelling, tenderness	Partially dehisced, tender, erythematous incision with yellow drainage and satellite lesions
Fluid with gas bubbles in the anterior abdominal wall, fascial thickening in the pelvis[b]	Diffuse enlargement of the rectus abdominus muscle extending 24 cm, edematous changes within the adjacent subcutaneous fat[b]	Postsurgical defect with adjacent inflammatory changes, well-circumscribed (13.2 × 7.7 cm) collection within the superficial fascial planes	Numerous enhancing fluid-filled abscesses with gas bubbles in the anterior abdominal wall extending to the skin surface (largest being 2.5 × 4.7 cm), fluid with adjacent subcutaneous edema

[a] Patient also had *M. abscessus* breast wound infection.
[b] Scanning was performed after patient had undergone aspiration or surgical drainage of abscess.
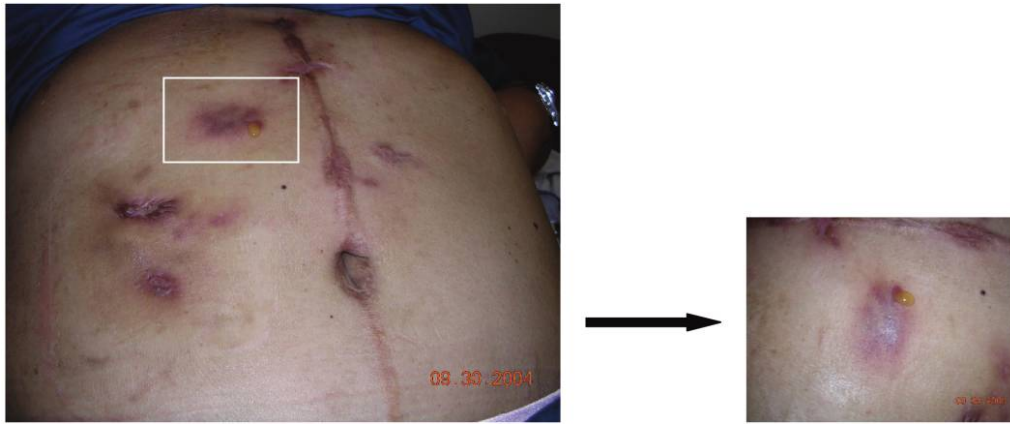
Figure 3. *Mycobacterium abscessus* abdominal wall abscess with magnified view of a draining lesion (from patient 8)

described techniques [10, 11]. A matching pattern was defined as >97% base similarity, as determined by repetitive element PCR. Susceptibility testing was performed at the CDC (Atlanta, GA) using microdilution in cation-supplemented Mueller-Hinton broth. MICs were interpreted on the basis of Clinical Laboratory Standard Institute standards (formerly NCCLS) [12].

RESULTS

Case patients. Twenty confirmed case patients were identified, and 19 were interviewed. The 19 patients were all female, their median age was 33 years (range, 19–57 years), all lived in the eastern United States, and all had infections of abdominoplasty wounds. Ten had also undergone breast surgery, and 8 had also undergone liposuction. Six of the women who underwent breast surgery developed breast infections, and the 2 women who underwent breast augmentation had their breast implants removed. Fifteen of the 19 women underwent a drainage procedure; details regarding antimicrobial therapy and outcome could not be obtained from all patients.

Cluster demographics. Of the 19 patients interviewed, 9 (45%) reported having undergone surgery at the same clinic in Santo Domingo (figure 1). Isolates recovered from 8 of these 9 patients were determined to be related by molecular typing (figure 2). Because the isolates recovered from the other 11 patients were unrelated, the remainder of the discussion focuses on the 8 patient outbreak.

All 8 patients had traveled from the United States to the Dominican Republic for the purpose of having cosmetic surgery. Four patients lived in New York, 2 were from Massachusetts, and the other 2 were from Rhode Island. All were Hispanic (1 was Puerto Rican, and 7 were Dominican); the median age was 35 years (range, 19–58 years). No major comorbidities were identified. All patients underwent surgery between October and December 2003. The operations lasted 3–5 h each, and no more

than 2 patients shared the same primary surgeon (details were not available about assisting surgeons or circulating nurses). As shown in table 1, all patients underwent abdominoplasty; of these patients, 4 also underwent liposuction (abdominal liposuction for 3 and upper back liposuction for 1), and 3 also underwent breast surgery (reduction or elevation). No patient had a foreign body implanted.

Clinical characteristics. All 8 patients from this surgical facility had *M. abscessus* infection of their abdominal wall; 2 also had breast infection. Symptoms first developed 2–18 weeks after the procedure (median interval, 7 weeks). After the onset of their symptoms, patients went a median of 3 weeks (range, <1 to 8 weeks) before being evaluated by a clinician.

All 8 patients had visible cutaneous lesions. Three patients had a single focus of infection evident on abdominal examination; 5 had multiple lesions, including 1 patient with 10 lesions. Palpable lesions ranged in size from 2 to 5 cm in diameter. Five patients presented with spontaneously draining, painful, erythematous, subcutaneous abdominal nodules (figure 3). Four reported systemic symptoms, including subjective fever, weight loss, fatigue, and nausea, but only 2 patients had documented fever with a temperature >38.3°C. No patient had leukocytosis at the time of presentation with infection. Only 2 of the 8 patients received a correct diagnosis at the initial presentation; some patients made multiple visits to physicians over several months before *M. abscessus* was isolated. The delay between initial presentation and administration of the first appropriate antibiotic to treat *M. abscessus* ranged from <1 to 23 weeks (median interval, 3 weeks).

All but 1 patient underwent abdominal CT. The CT typically revealed ⩾1 fluid collection in the anterior abdominal wall (table 1 and figure 4).

Microbiologic examination. Specimens for microbiologic examination were either superficial swabs of drainage fluid or
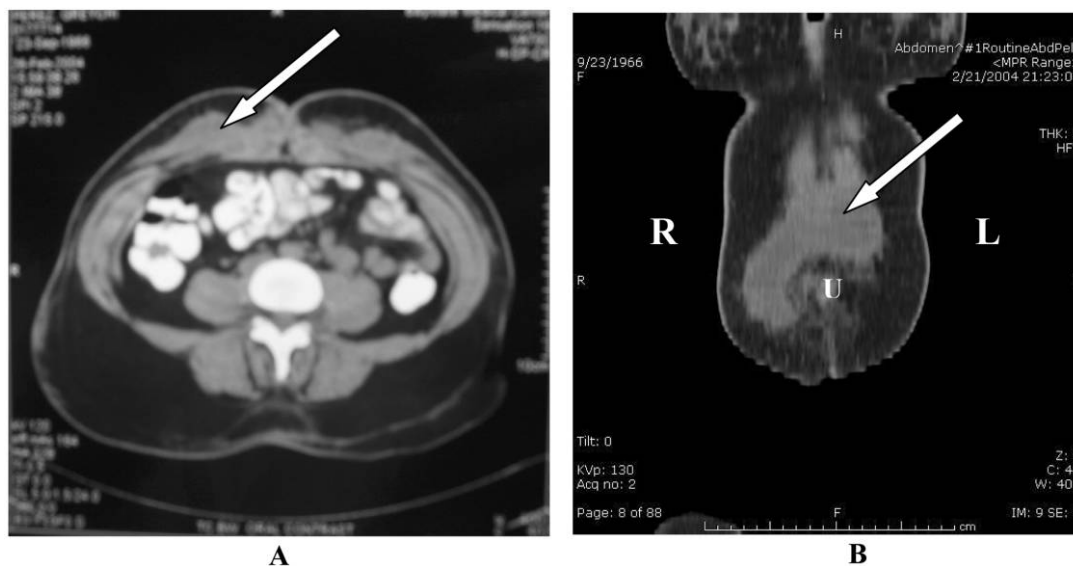
Figure 4. Abdominal CT for patient 1. *A*, Axial section showing *Mycobacterium abscessus* anterior abdominal wall abscess. *B*, Coronal section showing a horseshoe-shaped abscess extending from above the umbilicus to the right lower quadrant of the abdomen. L, left; R, right; U, umbilicus.

swabs collected during drainage procedures. For 7 of the 8 patients, Gram stains revealed polymorphonuclear cells; none of the Gram stains detected organisms. Four patients had organisms visible on acid-fast staining. *M. abscessus* grew 3–28 days after the specimens were plated (median interval, 6 days). In addition to growing on mycobacterial media, *M. abscessus* also grew on blood agar plates for 4 patients and on Sabouraud media for 1 patient.

The CDC performed antimicrobial susceptibility testing for 7 of the 8 isolates (excluding the isolate recovered from patient 3). For these 7 isolates, the MICs (and corresponding Clinical Laboratory Standard Institute interpretations) were as follows, clarithromycin, 4 or 8 μg/mL (intermediate or resistant); imipenem, 8 or 16 μg/mL (intermediate or resistant); cefoxitin, 32 or 64 μg/mL (intermediate); amikacin, 32 μg/mL (intermediate); sulfamethoxazole, 64 μg/mL (resistant); doxycycline, 128 μg/mL (resistant); tobramycin, 16 μg/mL (resistant); and ciprofloxacin, 16 μg/mL (resistant). Compared with *M. abscessus* isolates recovered from the other 12 case patients, isolates recovered from the 7 patients in the outbreak were more frequently resistant to clarithromycin and imipenem (data not shown).

Treatment and outcomes. Five patients were hospitalized. All patients but 1 were eventually cured (treatment details are summarized in table 2). All patients but 1 underwent drainage procedures (median, 1 procedure; range, 1–11 procedures). All patients received prolonged courses of antimicrobial therapy (median duration, 6 months; range, 2 to >12 months). Two patients were treated with clarithromycin alone, whereas the other 6 received combination therapy. Every combination included either azithromycin (1 of 6 patients) or clarithromycin (5 of 6). Five patients received intravenous antibiotics.

DISCUSSION

The practice of traveling to another country for health care is now a large global business [3]. The exact number of individuals who engage in this practice is unknown, but it has been reported that 80% of patients who undergo plastic surgery in the Dominican Republic reside in other countries and that this number includes >1000 US residents every year [13]. Although the reasons patients engage in "lipotourism" have not been formally studied, cost is probably a major consideration. An abdominoplasty, which may cost $5000–$7000 in the United States [14], costs $1500-$2000 (in US dollars) in the Dominican Republic [13]. Familiarity with a country and its culture and language likely influences a person's decision regarding which country he or she visits for the surgery.

Only limited data on the outcomes of cosmetic surgeries performed in other countries are available. In a 2005 electronic survey of infectious disease specialists in North America, 6% of the 425 respondents indicated that they or their colleagues had encountered infectious complications of cosmetic procedures performed outside of the United States in the previous year [15]. The frequency of *M. abscessus* as a cause of these infections is unknown. We suspect that the 20 cases we report are only the proverbial tip of the iceberg, because case identification relied on voluntary reporting from US clinicians and microbiology laboratories, and we did not search for infections among Dominicans or "lipotourists" from other countries. The

Table 2. Treatment and outcomes of 8 women who developed *Mycobacterium abscessus* postoperative wound infection.

	Patient			
Treatment	1	2	3	4
Initial antibiotic regimen (duration)	Cfox (3 weeks), Amik (3 weeks), Clm (26 weeks)	Clm (9 weeks)	Clm (26 weeks)	Cfox (4 weeks), Clm (4 weeks)
Reason for changing antibiotic(s)	Cfox-related rash and leukopenia; Amik-related nephrotoxicity	No change	No change	Treatment failure
Changes in antibiotic regimen (duration)	Linezolid (3 weeks)	None	None	Increased Clm dosage (34 weeks)
Total duration of antibiotic treatment, months	6	2	6	9
Interventional radiology procedures (no. of surgeries)	Bedside incision and drainage, incision and drainage, second look operation without intervention (3)	CT-guided catheter drainage (1)	None	Ultrasound-guided catheter placement (1)
Outcome	Cured	Cured	Cured	Cured

NOTE. Amik, amikacin; Cfox, cefoxitin; Clm, clarithromycin; Imi, imipenem.

Internet was essential to the discovery of this outbreak and identification of case patients. Internet communication networks will undoubtedly help identify other outbreaks in the future.

Although an outbreak of rapidly growing mycobacterial wound infections following liposuction in California was reported previously [16], systematic data on the rates of *M. abscessus* infection after cosmetic surgery in the United States are unavailable. Consequently, definitive comparisons with data from other countries are not possible. A review of microbiology reports from 2000–2005 at New York–Presbyterian Hospital–Columbia University Medical Center found 8 patients who received a diagnosis of *M. abscessus* postoperative wound infection. All 8 of these patients had undergone cosmetic surgery in the Dominican Republic (3 are described in this article). During that same period, there were no reported cases of *M. abscessus* wound infection complicating >230,000 surgical procedures performed at this medical center or the >60,000 performed at Baystate Medical Center (Springfield, MA). Although these data suggest that *M. abscessus* infection may occur more frequently after surgery in the Dominican Republic than in the United States, we cannot make a definite conclusion without more information.

There are several potential explanations for the association of *M. abscessus* and wound infection after cosmetic surgery [17–21]. Environmental contamination of water systems [22–24], surgical instruments, Gentian violet [17], injectable medications [25–31], and antiseptic solutions [32] has been reported to cause outbreaks and pseudo-outbreaks of *M. abscessus* infection. Use of tap water to irrigate postoperative wounds, as at least 1 patient in this investigation was instructed to do, is a possible explanation for this outbreak. Unfortunately, we were unable to culture water samples or specimens from other possible sources in the clinic.

These cases represent one of the larger published series and highlight the diagnostic and therapeutic challenges posed by *M. abscessus* soft-tissue infection. Many of the presenting signs and symptoms of *M. abscessus* infections are nonspecific. The median 7-week delay from surgery to the onset of symptoms seen in our cases is similar to that reported in previous outbreaks of postsurgical *M. abscessus* infection [17, 22–24, 33, 34]. Abscesses without fever or leukocytosis, a finding reportedly suggestive of postoperative *M. abscessus* infection [23, 34], were seen in almost all of our patients. Low clinical suspicion contributes to difficulties in making a microbiologic diagnosis of *M. abscessus* infection; the organism grows best in specific mycobacterial media that are not often used during initial evaluations. In our cases, *M. abscessus* was recovered from standard bacterial cultures for only 4 of 8 patients.

Treatment is difficult, because the organism responds very slowly to antimicrobial therapy. Recommended therapy generally consists of drainage of abscesses along with a prolonged course of combination antimicrobial therapy. Seven (88%) of the 8 patients in our study were cured, of whom 6 underwent drainage procedures and received clarithromycin-based combination antimicrobial therapy. One patient with less severe disease was cured with macrolide monotherapy, without drainage. Previous reports also noted high success rates with drainage and clarithromycin-based therapy [25, 34]. Interestingly, the type and timing of the drainage procedures did not appear to influence outcome. Patients were cured after surgical or percutaneous drainage, even when drainage was performed 4 weeks after the initial presentation.

As "lipotourism" becomes increasingly popular, more patients will present to US clinicians with complications resulting from surgery performed overseas, including infections. Internet listservs, such as the EIN listserv, can help identify outbreaks of infection. Mycobacteria—particularly *M. abscessus*—should be considered in the differential diagnosis of postoperative infection, especially if the onset of symptoms is delayed and if the infection does not respond to standard antimicrobial therapy.

Table 2. *(Continued.)*

	Patient		
5	6	7	8
Clm (52 weeks), Imi (3 days)	Clm (34 weeks),[a] Amik (7 weeks)[a]	Levofloxacin (5 days), Clm (25 weeks)[b]	Azithromycin (84 weeks)[a]
Imi-related rash	Treatment failures	Less expensive home regimen	Treatment failures
Amik (6 weeks), Cfox (6 weeks)	Cfox (6 weeks), Imi (1 week)	Ciprofloxacin (2 weeks)	Cfox (3 weeks), Amik (44 weeks), Imi (5 weeks)
12	9	6	22 (ongoing)
Incisions and drainages, ultrasound-guided drainage (11)	Needle aspiration (1)	Incision and drainage (1)	Incisions and drainages (6)
Cured	Cured	Cured	Not improved

NOTE. Amik, amikacin; Cfox, cefoxitin; Clm, clarithromycin; Imi, imipenem.
[a] Interrupted secondary to physician decision.
[b] Interrupted secondary to nonadherence.

References

1. US Department of Commerce, International Trade Administration, Office of Travel and Tourism Industries. In-flight survey of international air travelers, US travelers to overseas countries, January-December **2002**. Available at: http://tinet.ita.doc.gov. Accessed 23 July 2007.
2. The globalization of healthcare: can medical tourism reduce health care costs? Senate Special Committee on Aging witness testimonies, June **2006**. Available at: http://aging.senate.gov/hearing_detail.cfm?id=27 0728&. Accessed 23 July 2007.
3. Milstein A, Smith M. America's new refugees—seeking affordable surgery offshore. N Engl J Med **2006**; 355:1637–40.
4. The New York Times. Case study: vanity, location: Bangkok; nip, tuck and frequent-flier miles. May **2001**. Available at: http://www.nytimes.com. Accessed 23 July 2007.
5. E-sthetics website. Lipotourism: combining cosmetic plastic surgery and tourism. Available at: http://www.e-sthetics.com/tourism/lipo tourism.html. Accessed 23 July 2007.
6. Centers for Disease Control and Prevention. Nontuberculous mycobacterial infections after cosmetic surgery—Santo Domingo, Dominican Republic, 2003−2004. MMWR Morb Mortal Wkly Rep **2004**; 53: 509.
7. Granowitz EV, Srinivasan A, Clynes ND. Using the internet to identify infectious-disease outbreaks. N Engl J Med **2004**; 351:2558–9.
8. Newman MI, Camberos AE, Clynes ND, Ascherman JA. Outbreak of atypical mycobacteria infections in U.S. patients traveling abroad for cosmetic surgery. Plast Reconstr Surg **2005**; 115:964–5.
9. Newman MI, Camberos AE, Ascherman JA. *Mycobacteria abscessus* outbreak in US patients linked to offshore surgicenter. Ann Plast Surg **2005**; 55:107–10.
10. Hector JS, Pang Y, Mazurek GH, Zhang Y, Brown BA, Wallace RJ. Large restriction patterns of genomic *Mycobacterium fortuitum* DNA as strain-specific markers and their use in epidemiologic investigation of four nosocomial outbreaks. J Clin Microbiol **1992**; 30:1250–5.
11. Healy M, Huong J, Bittner T, et al. Microbial DNA typing by automated repetitive-sequence-based PCR. J Clin Microbiol **2005**; 43:199–207.
12. NCCLS. Susceptibility testing of mycobacteria, nocardia, and other aerobic actinomycetes. Approved standard M24-A. Wayne, PA: NCCLS, **2002**.
13. MSNBC. Plastic surgery tourism? Dangers of going under the knife on the cheap. March **2005**. Available at: http://www.msnbc.msn.com. Accessed 23 July 2007.
14. Plastic surgery costs. Available at: http://www.plasticsurgerycosts.com/pricebounds.cfm. Accessed 20 February 2007.
15. Sunenshine RH, Liedtke LA, Srinivasan A, et al. Complications of lipotourism: infectious complications of cosmetic procedures and lipotourism—experience of infectious diseases consultants [abstract 145]. In: Program and abstracts of the 16th Annual Scientific Meeting of The Society for Healthcare Epidemiology of America (Chicago). Arlington, VA: The Society for Healthcare Epidemiology of America, **2006**:106.
16. Meyers H, Brown-Elliott BA, Moore D, et al. An outbreak of *Mycobacterium chelonae* infection following liposuction. Clin Infect Dis **2002**; 34:1500–7.
17. Safranek TJ, Jarvis WR, Carson LA, et al. *Mycobacterium chelonae* wound infections after plastic surgery employing contaminated gentian violet skin-marking solution. N Engl J Med **1987**; 317:197–201.
18. Centers for Disease Control and Prevention. Rapidly growing mycobacterial infection following liposuction and liposculpture—Caracas, Venezuela, 1996–1998. MMWR Morb Mortal Wkly Rep **1998**; 47: 1065–67.
19. Toy BR, Frank PJ. Outbreak of *Mycobacterium abscessus* infection after soft tissue augmentation. Dermatol Surg **2003**; 29:971–3.
20. Centers for Disease Control. *Mycobacterium chelonae* infections associated with face lifts—New Jersey, 2002–2003. MMWR Morb Mortal Wkly Rep **2004**; 53:192–4 (erratum: MMWR Morb Mortal Wkly Rep 2004;53:246).
21. De Groote MA, Huitt G. Infections due to rapidly growing mycobacteria. Clin Infect Dis **2006**; 42:1756–63.
22. Kuritsky JN, Bullen MG, Broome CV, Silcox VA, Good RC, Wallace RJ. Sternal wound infections and endocarditis due to organisms of the *Mycobacterium fortuitum* complex. Ann Intern Med **1983**; 98:938–9.
23. Chadha R, Grover M, Sharma A, et al. An outbreak of post-surgical

wound infections due to *Mycobacterium abscessus*. Pediatr Surg Int **1998**; 13:406–10.

24. Soto LE, Bobadilla M, Villalobos Y, et al. Post-surgical nasal cellulitis outbreak due to *Mycobacterium chelonae*. J Hosp Infect **1991**; 19: 99–106.

25. Villanueva A, Calderon RV, Vargas BA, et al. Report on an outbreak of postinjection abscesses due to *Mycobacterium abscessus,* including management with surgery and clarithromycin therapy and comparison of strains by random amplified polymorphic DNA polymerase chain reaction. Clin Infect Dis **1997**; 24:1147–53.

26. Fox LP, Geyer AS, Husain S, Della-Latta P, Grossman ME. *Mycobacterium abscessus* cellulitis and multifocal abscesses of the breasts in a transsexual from illicit intramammary injections of silicone. J Am Acad Dermatol **2004**; 50:450–4.

27. Prado AC, Castillo PF. Lay clinics and an epidemic outbreak of mycobacterium skin and soft-tissue infection. Plast Reconstr Surg **2004**; 113:800–1.

28. CDC. Infection with *Mycobacterium abscessus* associated with intra-muscular injection of adrenal cortex extract—Colorado and Wyoming, 1995–1996. MMWR Morb Mortal Wkly Rep **1996**; 45:713–5.

29. Camargo D, Saad C, Ruiz F, et al. Iatrogenic outbreak of *M. chelonae* skin abscesses. Epidemiol Infect **1996**; 117:113–9.

30. Wenger JD, Spika JS, Smithwick RW, et al. Outbreak of *Mycobacterium chelonae* infection associated with use of jet injectors. JAMA **1990**; 264: 373–6.

31. Inman PM, Beck A, Brown AE, Stanford JL. Outbreak of injection abscesses due to *Mycobacterium abscessus*. Arch Dermatol **1969**; 100: 141–7.

32. Foz A, Roy C, Jurado J, Arteaga E, Ruiz JM, Moragas A. *Mycobacterium chelonei* iatrogenic infections. J Clin Microbiol **1978**; 7:319–21.

33. Szabo I, Sarkozi K. *Mycobacterium chelonei* endemy after heart surgery with fatal consequences. Am Rev Respir Dis **1980**; 121:607.

34. Murillo J, Torres J, Bofill L, et al. Skin and wound infection by rapidly growing mycobacteria: an unexpected complication of liposuction and liposculpture. Arch Dermatol **2000**; 136:1347–52.