Early Surgical Management of Medical Tourism Complications Improves Patient Outcomes

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Background: Complications from medical tourism can be significant, requiring aggressive treatment at initial presentation. This study evaluates the effect of early surgical versus conservative management on readmission rates and costs.
Methods: A single-center retrospective review was conducted from May of 2013 to May of 2017 of patients presenting with soft-tissue infections after cosmetic surgery performed abroad. Patients were categorized into two groups based on their management at initial presentation as either conservative or surgical. Demographic information, the procedures performed abroad, and the severity of infection were included. The authors' primary outcome was the incidence of readmission in the two groups. *International Classification of Diseases, Ninth Revision*; *International Classification of Diseases, Tenth Revision*; and CPT codes were used for direct-billed cost analysis.
Results: Fifty-three patients (one man and 52 women) presented with complications after procedures performed abroad, of which 37 were soft-tissue infections. Twenty-four patients with soft-tissue infections at initial presentation were managed conservatively, and 13 patients were treated surgically. The two groups were similar in patient demographics and type of procedure performed abroad. Patients who were managed conservatively at initial presentation had a higher rate of readmission despite having lower severity of infections (OR, 4.7; $p = 0.037$). A significantly lower total cost of treatment was shown with early surgical management of these complications ($p = 0.003$).
Conclusions: Conservative management of complications from medical tourism has resulted in a high incidence of failure, leading to readmission and increased costs. This can contribute to poor outcomes in patients that are already having complications from cosmetic surgery. (*Plast. Reconstr. Surg.* 145: 1147, 2020.)
CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, III.

Over the past 5 years, an increasing number of patients have elected to undergo cosmetic surgery abroad. The annual estimated number of medical tourists is between 10.5 and 23.2 million; this figure has nearly doubled in the past few years.[1] As the number of patients going abroad for cosmetic surgery grows, the complications associated with medical tourism will become more prevalent. Therefore, there need to be appropriate strategies to manage these complications.

The complications from procedures performed abroad can be significant, placing new demands on both the patients and the physicians treating the complications. For patients, the lack of continuity of care can make it difficult to seek treatment at the appropriate time when

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complications arise. Language and cultural differences can also create barriers to proper understanding of postoperative instructions.[2] Patients traveling abroad for a procedure rarely return to the same primary surgeon when complications occur and often seek emergency care at their local hospital. Often, patients may need to see nonsurgical providers before seeing a plastic surgeon, further delaying management and increasing health care costs.[3–5]

The plastic surgeon treating the complication may be unfamiliar with the specific techniques, materials, and approach used by the primary surgeon. In addition, infections may be caused by organisms not commonly found in local hospitals and often have different antibiotic sensitivities.[5–7] These differences may be attributable to the microbiome, antibiotic use, and varying standards of equipment sterility.[8]

Despite the increasing prevalence of medical tourism, and subsequent infectious complications, there is a lack of data on the optimal management of soft-tissue infections from procedures performed abroad. The primary authors previously published a retrospective review of their initial experience with medical tourism, outlining the type of procedures commonly performed, the complications encountered, and the cost to the health care system of treating these complications. During this preliminary study, there was a high incidence of failure following initial conservative management that prompted further investigation into this problem.[9] A shift toward earlier consideration for surgical management of patients presenting with complications encountered from medical tourism was adopted by our hospital. This study aims to compare the effect of our adopted initiative for early surgical intervention versus the conservative management the majority of patients were undergoing previously. Our goal is to determine how these different strategies affect our primary outcome of hospital readmission rates. We believe this is the first step toward establishing a treatment algorithm that improves outcomes for patients with complications from medical tourism, thereby reducing costs for the U.S. health care system.

PATIENTS AND METHODS

Study Population and Design

A retrospective chart review was performed at a major academic medical center from May of 2013 through May of 2017 (institutional review board 2015-5004). Patients were included that presented to either the office or the emergency room with complications caused by aesthetic surgery procedures performed abroad. Forty-two patients included in a previously published population health analysis study by our group abroad were included in the study population, although our focus here was on developing a clinical algorithm instead of simply describing the patient population. These 42 patients also had a longer follow-up than in our previous study.[8] Patients were excluded if they had other complications without having any soft-tissue infection. All patients with soft-tissue infections were included and divided into two groups based on their initial management: the first group included those that were treated conservatively at their initial presentation, and the second group included patients who were treated surgically from the outset.

Data Collection

Looking Glass Clinical Analytics (Streamline Health, Atlanta, Ga.) is a software application that mines electronic medical records for demographic and clinical data sets, and was used to generate the patient cohort. A retrospective chart review was conducted to identify demographic information, type of procedure, complications encountered, management of complications, and the incidence of readmission.

Soft-Tissue Infection Classification

The soft-tissue infections were divided based on Centers for Disease Control and Prevention standardized categories of surgical-site skin infections: superficial incisional and deep incisional surgical-site infection, and organ/space surgical infection.[9,10] All surgical-site infections occurred within 30 days postoperatively and had at least one clinical sign of infection, which could include a fever greater than 100.4°F, localized pain, or edema. Superficial and deep incisional infections both involved purulent discharge from the incision. Deep incisional infection also included abscess formation or other evidence of deep tissue infection found during examination of incision. Organ/space skin infections involved any other part of the anatomy other than the incision.[11]

Patients that were treated with drainage placement by interventional radiology at first admission were noted. The failure rate for drain placement was defined as requiring surgery after drain placement, whether at that admission or at subsequent admission. Patients with positive wound cultures and the causative organism were identified.

Primary Outcome and Secondary Outcomes

Our primary outcome was readmission rates following initial treatment. The readmission rates for those treated conservatively and those treated surgically were calculated. These readmission rates were further described based on the severity of the infection as categorized by Centers for Disease Control and Prevention classifications mentioned above.[12] The total hospital length of stay and time from initial presentation until the patient was taken to the operating room were included as secondary outcomes.

Financial Analysis

The goal of our cost analysis was to estimate the cost of readmission in this patient population. To ensure similar groups were compared, only patients that underwent surgery either at their initial admission (early) or at their subsequent admission (delayed) were included, and patients that never required operative management were excluded. Because both groups required an operation at some point, we limited our analysis to the direct cost of the emergency room visit and a hospital admission. These costs included but were not limited to emergency room physician fees; room and board; medical supplies; nursing staff; and a wide range ancillary services such as drugs, laboratory testing, blood work, and radiology. Physician billing charges were included and consisted of the amounts billed but did not reflect insurance allowances or the amount collected. Charges were used in these situations because they are believed to be a better proxy of transaction costs than the resource-based relative value scale, which may undervalue these costs. Clinegrity 360 (Nuance Communications, Burlington, Mass.) was used to compile costs based on patient *International Classification of Diseases, Ninth Revision*; *International Classification of Diseases, Tenth Revision*; and the associated procedure CPT codes.

Statistical Analysis

The Wilcoxon rank sum test was used to compare continuous variables between groups; chi-square or Fisher's exact test was used to compare nonparametric variables between groups. For multicategorical data, Fisher's ($2 \times n$) tests were used to assess the independence of associations between variables and outcomes. Values of $p < 0.05$ were considered significant. Statistical analysis was performed with SAS 9.1 software (SAS Institute, Inc., Cary, N.C.) and Microsoft Excel 2003 Office Professional Edition software (Microsoft Corp., Redmond, Wash).

CASE REPORTS

Case 1: Conservative Management

A 20-year-old woman presented to the emergency department with bullae rupturing along her wound 2 weeks after an abdominoplasty procedure in the Dominican Republic. She was initially treated with antibiotics and discharged with no consultation from the plastic surgery service or consideration for surgical management. Acute worsening occurred 3 months after her procedure, with granuloma formation commonly seen with mycobacterial soft-tissue infection (Fig. 1). The patient was admitted and placed on intravenous antibiotics. At a subsequent admission, she was found to be culture-positive for *Mycobacterium*. She required several operations, including multiple radical débridements of the anterior abdominal wall and tissue rearrangement.

Case 2: Surgical Management

A 34-year-old woman presented with an abdominal wall abscess 3 weeks after an abdominoplasty performed abroad. Although her presentation was relatively indolent with no fever, she did report significant pain over an erythematous area on the abdomen. Imaging confirmed multiple pockets of fluid collection. The plastic surgery service was consulted, the patient was placed on intravenous antibiotics, and the patient underwent operative incision and drainage within 48 hours of presentation. Significant purulent discharge from the abscess was appreciated in the operating room (Fig. 2). The patient had remarkable reduction in pain after the procedure, with no readmission 1 year after the procedure.

RESULTS

Patient Demographics

Over a 48-month period, a total of 53 patients were identified (one man and 52 women), of which 37 had soft-tissue infections (70 percent). Other complications included six seromas (13 percent), five pulmonary embolisms/deep venous thromboses (8 percent), one pyelonephritis (2 percent),

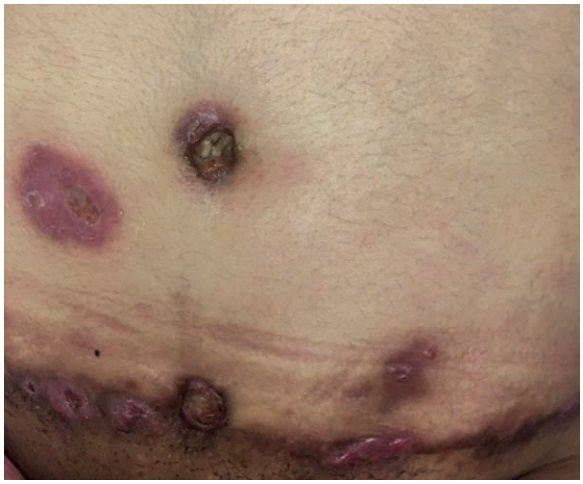

Fig. 1. Example of deforming complications with diffuse granuloma formation caused by nontuberculous *Mycobacterium* organisms initially treated conservatively.

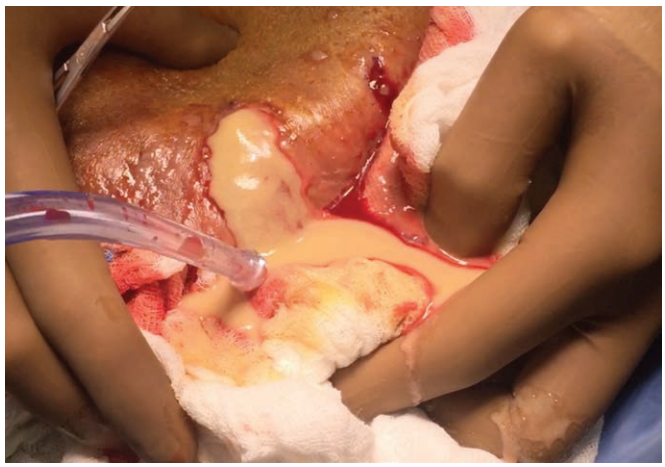

Fig. 2. Purulent discharge from abscess appreciated in the operating room during initial surgical management of a medical tourism complication.

and one fat embolism (2 percent). Three patients (7 percent) reported pain not otherwise specified as their only complaint. This cohort of soft-tissue infections was divided into two groups labeled as *conservative* and *surgical* based on their management at initial presentation (Fig. 3). There were 24 patients in the conservative group and 13 patients in the surgical group. There were a greater number of patients in the conservative group compared with the surgical group. Not surprisingly, most soft-tissue infections, regardless of the cause, were managed using the same clinical algorithm. Only patients who presented with "severe" infections were referred to plastic surgery for evaluation, and only then was consideration given to operative management.

There were no significant differences in sex, mean age, mean body mass index, comorbidities, and smoking status between the two groups (Table 1). All patients were self-identified as Hispanic in ethnicity/race. The majority of patients [$n = 47$ (88.6 percent)] had their procedure performed in the Dominican Republic. Two patients traveled to Mexico, one patient traveled to Panama, and the location of the remaining three procedures was not specified.

Surgical Procedures

Abdominoplasty and liposuction were the most common procedures in both groups (Table 2). There were no significant differences in the number of patients undergoing abdominoplasty, liposuction, buttock augmentation, and breast augmentation. Procedure categories were not exclusive, and patients may have undergone multiple procedures. Combined procedures made up a significant portion of the cases in both groups, with 12 (50 percent) in the conservative group and seven (54 percent) in the surgical group.

Severity of Complications

Deep incisional surgical-site infections were most common in both groups, representing 12 of the 24 cases (50 percent) in the conservative group and nine of the 13 cases (69 percent) in the surgical group. In the conservative group, superficial incisional infections were the second most common complication, representing 10 of the 24 cases (42 percent); in the surgical group, superficial incisional infections were the least common, representing one of 13 cases (8 percent). Organ/space surgical-site infections represented two cases (8 percent) in the conservative group and three cases (23 percent) in the surgical group. Although there were more severe infections in the surgical group, this did not reach statistical significance ($p = 0.07$).

Readmission Data

Of the 37 patients treated for soft-tissue infection after medical tourism, 21 patients (54 percent) required subsequent readmission for treatment. The incidence of readmission was significantly higher in the conservative group compared with the surgical group. Overall, 16 of 24 patients (67 percent) in the conservative group required readmission, compared with four of the 13 patients (31 percent) in the surgical group (OR, 4.7; $p = 0.035$).

Six of 10 superficial incisional infections (60 percent) required readmission; all were within the surgical group. Eight of the 12 deep incisional

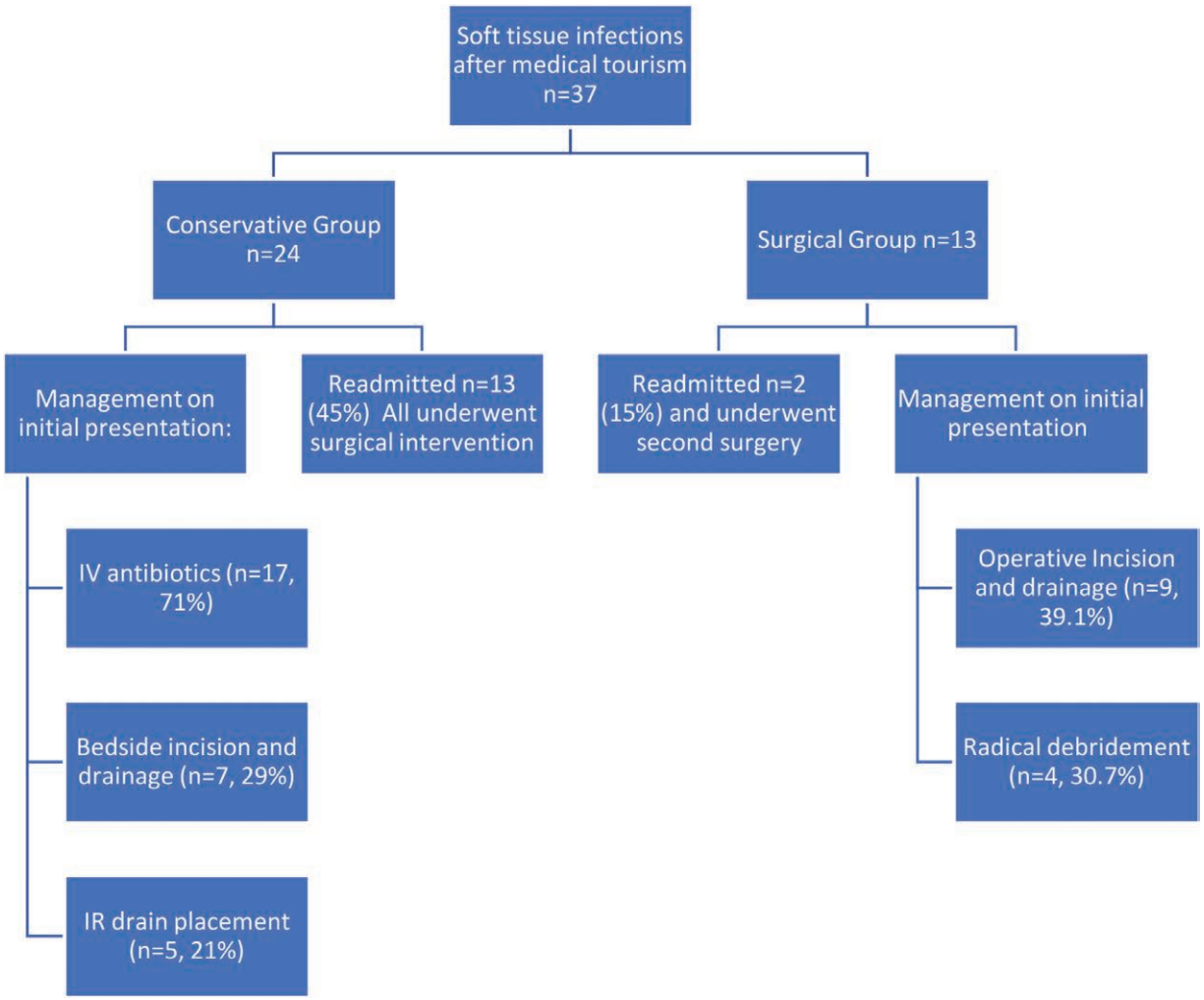

Fig. 3. Study design outlined with our cohort of soft-tissue infections divided into two groups labeled as conservative and surgical based on their management at initial presentation. *IV*, intravenous; *IR*, interventional radiology.

infections (66 percent) in the conservative group required readmission, compared with three of the nine cases (33 percent) in the surgical group. The two organ/space infections in the conservative group, both of which required readmission (100 percent), whereas one of the three cases in the surgical group (33 percent) required readmission.

At readmission, 13 of 24 patients (54 percent) treated conservatively required surgical management at their subsequent admission (Fig. 1). In those treated surgically, two of the 13 (8 percent) required further surgical management at readmission after an inadequate initial operative incision and drainage.

Surgical Management of Complications

Patients in the surgical group underwent either incision and drainage in the operating room [n = 9 (69 percent)], or radical débridement [n = 4 (31 percent)] on initial presentation.

Table 1. Patient Demographics

Characteristic	Conservative (%)	Surgical (%)	p
No. of patients	24	13	
Sex			0.35
Female	24 (100)	12 (92)	
Male		1 (8)	
Diabetes	0 (0)	1 (10)	0.35
Hypertension	3 (13)	0 (0)	0.54
Active smoker	4 (17)	2 (20)	1.0

Table 2. Procedures Performed

Procedure	Conservative (%)	Surgical (%)	p
Abdominoplasty	18 (75)	7 (54)	0.18
Liposuction	8 (33)	7 (54)	0.30
Buttock augmentation	3 (13)	5 (39)	0.10
Breast augmentation	5 (20)	1 (8)	0.39
Other	3 (13)	3 (20)	0.64
Combined procedures	12 (46)	7 (54)	1.0

Of the patients in this group, two (15 percent) underwent further radical débridement at readmission. One patient (8.3 percent) underwent local tissue rearrangement and two patients (15.3 percent) required skin grafting for soft-tissue coverage over the resected area.

Twelve of 16 patients (75 percent) readmitted from the conservative group required operative incision and drainage. Four patients (25 percent) underwent radical débridement. One patient (37.5 percent) required a local flap and four patients (50 percent) needed skin grafting.

Hospital Course

The average total hospital length of stay in the conservative group was 13.4 ± 12.1 days (range, 2 to 35 days), compared to 8.8 ± 4.2 days (range, 2 to 16 days) in the surgical group, which represented a 4.6-day reduction in hospital length of stay with early surgical management. The average time from initial presentation until the patient was taken to the operating room was 74.5 ± 78 days (range, 1 to 201 days) in the patients in the conservative group that eventually required operative intervention, compared with 2.2 ± 4.2 days (range, 0 to 16 days) in the surgical group. All but one of the patients in the surgical group went to the operating room within 48 hours of their first presentation. One patient was taken to the operating room within her first admission and therefore was included in the surgical group; however, this took 16 days, as the providers waited for culture results and a trial of intravenous antibiotics.

Image-Guided Drain Placement

In total, six patients underwent drain placement by interventional radiology, of which five patients were in the conservative group and one patient was in surgical group. Three of the five patients in the conservative group were taken to the operating room after drain placement at the following admission (7 and 11 days after their initial presentation), representing a failure rate of 60 percent. The one patient in the surgical group who underwent drain placement initially was taken to the operating room within 48 hours of initial presentation because of worsening clinical examination despite drainage. In total, three of six patients that underwent drain placement subsequently required surgery, a 50 percent failure rate.

Wound Cultures

In total, 18 patients had positive wound cultures identified. The most common organisms were nontuberculous mycobacteria (n = 7), of which six were *Mycobacterium abscessus* and one was *Mycobacterium chelonae*. These organisms are commonly associated with procedures performed abroad. There were two cases of methicillin-resistant *Staphylococcus aureus* and three cases of a rare form of multidrug-resistant *Enterococcus*. The remainder of patients were treated without cultures, and all were in the conservative group. Treatment without cultures resulted in more aggressive and broad-spectrum antibiotic treatment. Furthermore, inappropriate antibiotic coverage resulted in delays in management.

Cost Comparison with Early Surgical Management

Financial records were compiled for a total of 12 patients. Six patients were in the conservative group and six patients were in the surgical group (Fig. 4). All of these patients underwent surgery at some point, either at their initial presentation (surgical group) or at their subsequent readmission (conservative group). Patients with incomplete financial records were not included. Only direct costs billed were calculated. The average total cost of emergency room and hospital admission for the treating complications in the conservative group was $25,979. This cost included the initial and all subsequent readmissions, but excluded surgical costs. The average cost of the emergency room and hospital admission for the surgical group was $15,083, which represented a significantly lower ($p = 0.003$) cost with early surgical management.

DISCUSSION

The growing number of patients going abroad for aesthetic surgery and their associated complications highlight the need for clinical guidelines to treat these complications effectively.[13,14] Fifty-three patients presented to our academic medical center with complications from medical tourism over 2 years. Thirty-seven of these patients had soft-tissue infections, and several other patients had other complications such as deep vein thrombosis and pulmonary embolism. Although these were not the focus of our study, they do represent other important complications that need to be considered when evaluating postsurgical patients.[15–18]

Soft-tissue infections following cosmetic surgery can be devastating for all patients, many of whom are young, with few comorbidities, and are

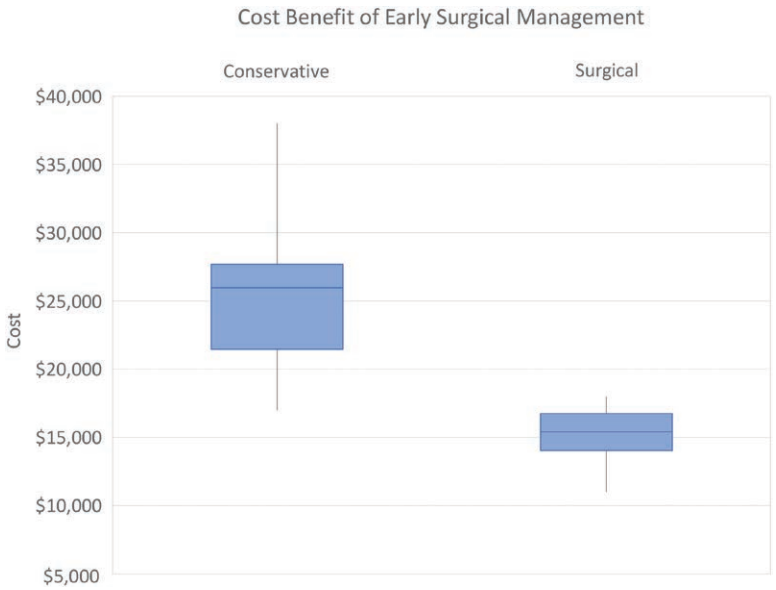

Fig. 4. Cost benefit of early surgical management illustrated by means of box plot using financial records of patients with complications from medical tourism.

seeking surgery to enhance their appearance. When complications arise, patients have already left the country where they had their aesthetic procedure, and are no longer in contact with their primary surgeon. Therefore, they must seek care at their local primary care physician, urgent care, or emergency room. Plastic surgeons who are left treating these "orphan" patients must be familiar with the types of complications and best approach to minimize permanent deformities and morbidity from infections and salvage the aesthetic result when possible.[19,20]

Our cohort is similar to many cosmetic surgery patients in the United States and is not more likely to have an infectious complication caused by patient disease and underlying comorbidities. Furthermore, although the incidence of infections may be similar in patients undergoing cosmetic procedures abroad and in the United States, our study shows that the severity of the complications is likely much greater, requiring careful evaluation on initial presentation and consideration for surgical management.

The primary outcome was the readmission rate after initial management of soft-tissue infections. There was a significantly higher readmission rate for all surgical-site infections in the conservative group compared with the surgical group despite presenting with less severe infections initially. Patients treated conservatively were 4.7 times more likely to be readmitted than those who underwent operative intervention early.

The increased prevalence of nontuberculous mycobacterial organisms seen in this patient population creates greater challenges during the management of these complications.[15–18] Often associated with poor water sanitation and equipment sterility, these organisms can cause deforming complications with diffuse granuloma formation (Fig. 2). Patients remain culture-negative even at the onset of symptoms or become culture-negative after antibiotic treatment while still manifesting symptoms. It remains unknown whether the symptoms are directly caused by the organism, a result of the host's immunologic response to the infection, or some combination of the two.[17,18] There are no established guidelines or randomized trials for treatment of mycobacterial infections. Antibiotic treatment for these organisms requires infectious diseases consultation, and remains complex, long, and costly. Because cultures are often negative in these infections, early surgical evaluation for all patients with complications encountered from aesthetic procedures abroad is required to rule out infection by one of these organisms, and consideration should be given to prophylactic treatment.[18,20–24]

We aimed to better understand both the success and failures associated with management of infectious complications performed abroad. However, this study represents a relatively small sample size from one urban area, and the results may not be applicable to larger patient populations who are not from similar cultural and ethnic

backgrounds, as many patients elect to undergo surgery in a country that is familiar to them or where they have a support network. Types of infections do vary based on location, and that should be taken into account when evaluating patients.[25–30] In addition, this was a retrospective review, and results are subject to inherent study limitations such as initial provider, plastic surgeon evaluation, and prior knowledge and experience with treating these patients. Multicenter studies examining complications and readmission rates are required to further develop optimal algorithms for treatment of patients returning from aesthetic surgery abroad.

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