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Fat graft infection by non-tuberculous Mycobacterium (NTM) in cosmetic and plastic surgery: A Study in Sulaimaniyah, Iraq

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Abstract— **Background:** Fat grafting isone of the common cosmetic procedures for soft tissue augmentation and plastic with reconstructive surgery. However, occasionally, non-tuberculous mycobacterium(NTM) species can be seen secondary to fat grafting. **Objectives:** To identify the infection risk of fat grafting technique by NTM, obtain an antibiogram of NTM isolates and treatment compliance with outcomes. **Patients and Methods:**In this study, 19 female patientswho had received fat grafting for the face, breast, abdominal, buttocks and thigh for cosmeticpurposes were reviewed.After being referred to our diagnostic centre, a specialized laboratory team collected specimens for detailed cultures and microscopic examination.Then, according to drug sensitivity results, targeted antibiotics were implemented for 9-24 months. Local proper wound and abscess debridement were conducted in some cases.On the other hand, repetitive acid-fast bacterium (AFB) smear examinations every 2-4 weeks were done for them.**Results**: The patients presented with local swelling and skin ulceration, many subcutaneous nodules, big lumps with fistula and abscess formation, and some with extensive skin ulceration. Patients received imperial narrow to broad-spectrum antimicrobial therapy, and the primary classical culture was inconclusive.*Mycobacterium abscessus* was the dominant invasive agent in most patients. After a one-year follow-up, all patients' specimens were acid-fast smear-negative. Still, they experienced occasional lump formation and pus discharge, considered liquefied necrotic fat inflammation**. Conclusions:***Mycobacterium abscessu*s infection should be diagnosed and treated accurately after fat grafting. Our experience and proposed treatment might benefit local and national antimicrobial guidelines in similar cases.

Keywords: Fat grafting; liposuction; cosmetic surgery; non-tuberculous mycobacteriuminfection

Introduction

A standard method for soft tissue augmentation is autologous fat transplantation[1]. However, complications associated with fat grafting have gradually enhanced in recent years. Severe infection of *Mycobacterium abscessus* hasbeencausedbythisminimally invasive technique.

As early as 1987, the gentian violet skin marking solution was discovered to be the infection source of *Mycobacterium chelonae* surgical site infections after plastic surgery[2]. It is known that*Mycobacterium abscessus* is present in the environment[3, 4]. This NTM was first described in 1953 by Moore and Frerichs in a woman who had chronic osteoarthritis and developed a gluteal abscess, though it rarely causes disease in humans.

Mycobacterium abscessus has been associated with skin and softtissue infection after trauma and medical procedures such as acupuncture, augmentation mammoplasty, and injections[5]. Treatment of *Mycobacterium abscessus* is complex. Tissue specimens should be sent to the laboratory for culture to ensure an accuratediagnosis. [6].

Since they differ in antimicrobial sensitivities, susceptibility testing is crucial to successful treatment. Yet, no standard treatment for fat grafting associated with *Mycobacterium abscessus* infection[7, 8] has been put forward. We propose a definitive treatment plan.

Patients and Methods

Study setting and design

In this study, 19 femalepatientsaged18 and 62without underlying diseases were presented with a history of fat liposuction and fat grafting for cosmetic and reconstructive surgery after three weeks up to 8 months of primary surgery.Patients were given to a private clinic but referred to Sulaimani Burn, Plastic & Reconstructive Surgery Hospital, Sulaimaniyah, Iraq, for diagnosis, treatment, and follow-up from January 2021 to January 2023.

Case presentation

Patients had early presentation and multiple subcutaneous lumps, nodules,and abscess-like lesions. At the same time, some patients had few tracts of fistula to extensive cutaneous fistula formation. In contrast, some others had ulcer formation to extensive ulceration that might leave marks after scaring and healing (Figure 1).

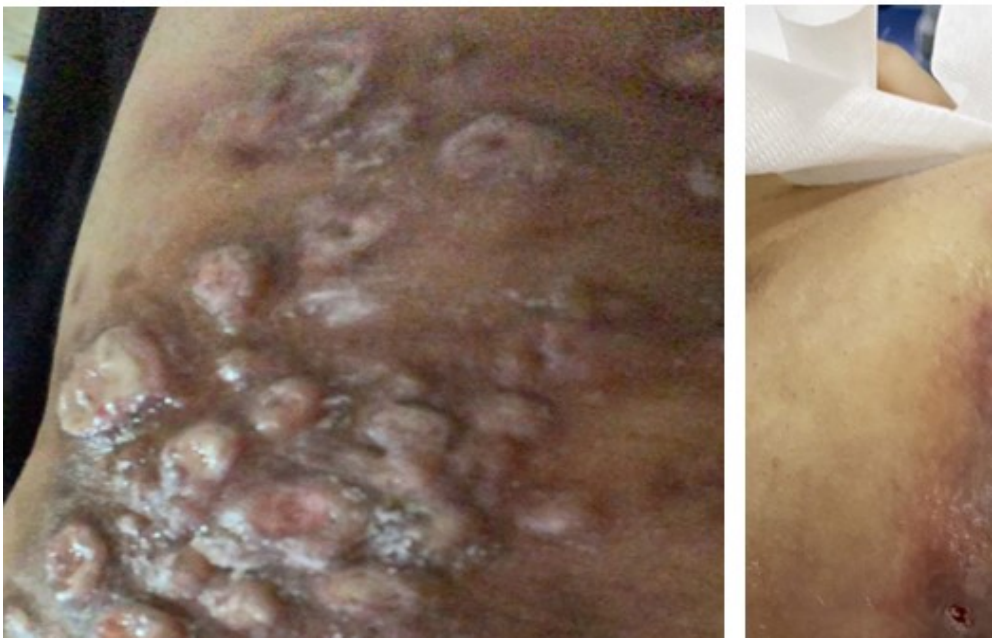

Figure 1. Multiple abscesses and subcutaneous lumps on a patient's buttock (left) and thigh (right) 4 weeks after lipo injection with fat obtained from the abdominal region.

Of the cases, 9cases had fat liposuction from the abdomen and autologous fat grafting into the buttock, and 2 cases underwent fat infiltration to the lateral thigh for cosmetic contouring. While4 cases had autologous fat grafts into the face(especially cheeks) and fat injection to the suborbital area and chin. One case had autologous fat graft intolateral eyebrow sides near the earlobe.Simultaneously, 3cases had autologous fat obtained from the abdominal wall and

injected into the suborbital under the lower lid to hide the periorbital black shadow.Two cases had an autologous fat injection into the breast only for breast lifting and sizing purposes. In contrast, one patient had a fat graft to the right side of the cheek for facial imbalance looking correction.

Patient distribution

The youngest patient was 18 years old. After dieting, she noticed the loss of breast mass and felt like she had a flat chest. She was offered either a breast silicone implant or a fat graft, but she chose an autologous fat implant as it costs less than an implant.The oldest patient was 62 years old with a skinny face and was offered an autologous fat injection to fill out the defect as she felt.

Time to presentation

Most patients (no=17) presented symptoms 2-4 weeks after injection of the fat, including apainful lump of the acne-like lesion, while another 2 cases presented with a painful lump after three months of injection with discharge and evidence of skin and soft tissue infection.
They were sent for primary culture in a non-advanced laboratory, and the results were culture-negative without any smear study.Among 19 cases, only four patients were primarily seen by our team in a specialized microbiology laboratory in a private clinic. Then, sampling/cell culture was done early before progressing for extensive ulceration and more lump formation.

Sampling method

Upon patient referral, multiple pus samples were aspirated from each patient's nodules and lumps or multiple cutaneous fistula. Up to 20 samples from subcutaneous fat lumps infected with skin redness and elevation and unthinkingly were aspirated aseptically using regular 20cc syringes withwide-bore red colour needles (Figure 2).

Figure 2. Multiple left breast abscesses aspirated from an 18-years-old female patient.

Sample processing

The samples wereimmediatelyand aseptically cultivated on different culture media agar plates and into thioglycolate broth, then incubated in most recommended atmospheric conditions, including aerobic, anaerobic, microaerophilic and capnophilic states as planned for a total of 2-3 weeks for fastidious and slow growing microbial agents including fungal elements.

Antimicrobials applied in the test.

Ampicillin, ampicillin-sulbactam, amoxicillin, amoxicillin-clavulanate, penicillin-G, piperacillin, piperacillin-tazobactam, cephalexin, cefuroxime, cefotaxime, ceftriaxone, ceftazidime, cefpodoxime, cefpodoxime-clavulanate, ceftazidime, cefepime, meropenem, ertapenem, imipenem, aztreonam, gentamicin, amikacin, streptomycin, ciprofloxacin, levofloxacin, moxifloxacin, clindamycin, lincomycin, azithromycin, clarithromycin, erythromycin, doxycycline, tetracycline, tigecycline, trimethoprim-sulfamethoxazole, chloramphenicol, nitrofurantoin, rifampin, colistin, linezolid, vancomycin, and teicoplanin.

Treatment review

All patients were being reviewed by the surgical operator early after complaining of lumping. They were empirically managed by antibiotics, especiallyamoxicillin-clavulanate, when their primary microscopic examination revealed AFB until culture confirmation and obtaining an antibiogram so their lesion would not extend and become more challenging to manage. However, levofloxacin, cefdinir, Bactrim or meropenem were used a few days after not responding to amoxicillin-clavulanate and when the results of the primary culture were negative. Thus, 1st three patients were diagnosed in an early stage of infection and treated with single antibiotics, while other patients used a combination antibiotic treatment.

Results and Discussion

Samples from 1stcasewere incubated for two days, and no growth was found, then left for a longer duration and growth of small white colonies was noted on day 5. Smear examination, including Gram's and Ziehl–Neelsen stains, showed regular bacilli with no filament formation. Acid-fast examination of the colonies was strongly positive, so rapidly growing non-tuberculous mycobacteria (RGNTM) was expected, and an antibiotic sensitivity test was performed using the disc diffusion method. After 48hrsincubation, an antibiogram revealed a multidrug-resistant RGNTM isolate with unknown strain due to the lack of facility/service to identify the strain of the isolated *Mycobacterium.*

Another three patients underwent a similar procedure in the exact centre with a short time interval of the cosmetic procedure of fat aspiration and grafting into the buttock, lateral thigh,and breast.One of the patients returned to the United Kingdom (UK) before being diagnosed. Still, we could contact infectious disease doctorsthere and inform them that she might have had a similar agent in the lesion. Then, they investigated her sample and the results were obtained to be *Mycobacterium abscesses* with a highly resistant profile (Figure 3).

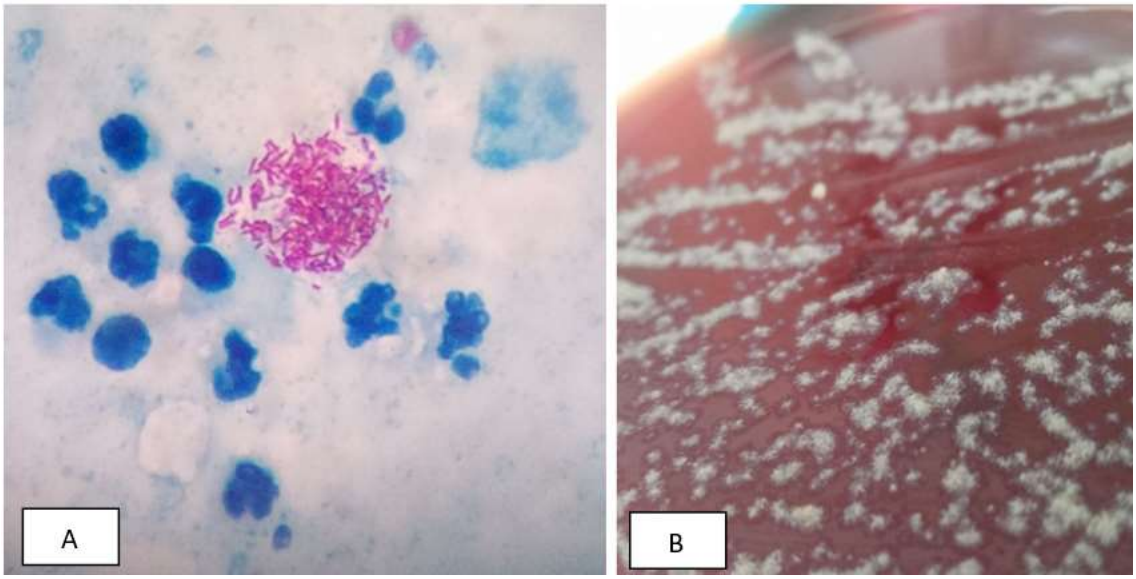

Figure 3. Acid-fast smear examination of the pus with the cluster of the red acid-fast bacterium (A) and Colonial morphology of rapidly growing Mycobacterium from the aspirated pus (B).

All patients showed similar colonial morphology and antibiotic sensitivity patterns, in which 42 antimicrobial discs were applied in the test, and all of them showed sensitivity from the best to least sensitive, such as clarithromycin, linezolid, amikacin, and imipenem. However, the two patients had different colonial appearances, and their antibiogramwas not similar to other cases as they had better sensitivity to more than ten antibiotics.

All patients were clinically responding very well early in the course of treatment. After oneweek, cellulitis was diminished, fistula discharges were dried out, and lump size reduced drastically lump. Two weeks later, the patient's AFB examination and culture were negative in samples aspirated from pus and cutaneous fistula discharge.Then, patients were followed up in 2-week intervals, up to 3 months. From 3rd month, follow-ups were made monthly.

In most cases, healing of the lesions was optimal after 2 to 3 months, but a disfigured scar and skin discolouration were left, and in some cases, dimples and notches were formed.Only two patients with extensive multiple lumps and lesions with cutaneous ulcersdid not respond. Initially, fat necrosis was suspected, but after rechecking their subsequent samples, they were AFB negative; however,extensive discharge and new lump formation were continued for up to 9-12months. After that, the occasional lump was left, and they partially recoveredafter 18 months of treatment and hideous scar and skin hyperpigmentation were left(Figure 4).

Figure 4. Healing of the wounds from infected patients after 30 months of combined treatment showing disfigured extensive scar dimpling and hyperpigmentation.

Regarding the tolerance to treatment, all patients were initially treated withintravenous amikacin for two weeks, followed by intramuscular amikacin for two weeks. However, 2 cases had a very extensive lesion and were received intramuscular amikacin for two more months.At the same time, Clarithromycin (500)mg twice a day for 9-18 months was given in some cases, based on the severity and healing of the lesions, and the patients tolerated it.Linezolid tablet (600mg) twice a day for 3-6 months also were prescribed, based on response and patient compliance, but three patients have not tolerated linezolid for more than 2-3 months due to its adverse effects, including gastrointestinaldisturbance, tongue blackening and facial skin maculopapular rashes as sandpaper-like hindered rashes on the face and forehead.

Conclusions

RGNTM outbreak occurred after fat liposuction and grafting,which alarmed plastic surgeons and dermatologists not to perform fat grafting for 3-6 months in the locality to investigate the reason and source of the infection. Most patientswere distressful and unsatisfied with the outcome of scaring, pitting and skin discolouration of the fat graft site, the cost of treatment, and follow-up.

Ethical considerations

This study was conducted based on the declaration of Helsinki, and the experimental protocol was approved by the scientific and ethical committees of the College of Medicine, University

of Sulaimani, Iraq (No. 144 in 18/12/2021-CoM-UoS) after intensive revision. Written patient consent was obtained to conduct the study and publish it.

Conflict of interest

The authors declare no conflict of interest in this study.

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Author's contribution

SOM: Conceptualization, data collection, resources, study registration, writing the original manuscript. SSZ: Study validation, study protocol, patient follow-up, and revising the original manuscript.

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