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Complications Associated with Autologous Fat Transfer: Case Report and Literature Review

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Abstract

Undoubtedly, since its appearance, the interest and use of autologous fat transfer (AFT) as a breast reconstruction technique have been increasing, becoming one of the main surgical alternatives for aesthetic breast augmentation. This increase in its popularity has led to the development of new technologies to increase its efficacy and safety, however, it has inherently implied the inadequate use of this procedure, mainly when performed by unqualified medical personnel. We present the case of a patient with complications following a breast AFT for aesthetic purposes, performed by a general practitioner without a specialty in plastic and reconstructive surgery.

Keywords

Breast, Breast Reconstruction, Breast Surgery, Autologous Fat Transfer, Intramammary Abscess

1. Introduction

To talk about the first antecedent of the use of autologous fat transfer (AFT) as a breast reconstruction technique, we must go back to the past, more than 100 years ago, when Czerny [1], transferred a lipoma obtained from the waist of a patient to the breast, with the aim of restoring symmetry after a partial mastectomy. Later in 1987, Bircoll [2] pioneered the use of autologous fat injection into the breast for aesthetic purposes. Initially, as any innovation, this technique was controversial, so it required the intervention of societies specialized in the subject, which is why in 2007, the American Society of Plastic Surgeons (ASPS) created the “Fat Graft Task Force” to “conduct an evaluation on the safety and efficacy of autologous fat grafting, specifically in the breast, and make recommenda-

tions for future research” (Gutowski, 2009, p. 1) [3], publishing in 2009, a series of statements on the subject, although they did not recommend the use of TGA for breast augmentation, they affirmed that it could be considered for this purpose.

Undoubtedly, since its appearance, the interest and use of AFT have been increasing, becoming one of the main surgical alternatives for aesthetic breast augmentation. This increase in its popularity has led to the development of new technologies to increase its efficacy and safety, however, it has inherently implied the inadequate use of this procedure, mainly when performed by unqualified medical personnel. Having said this, we present the case of a patient with complications following a breast AFT for aesthetic purposes, performed by a general practitioner without a specialty in plastic and reconstructive surgery.

2. Clinical Case

A 41-year-old female presented to the emergency department with pain in both breasts accompanied by unquantified temperature elevation and dyspnea of 12 hours of evolution. As an important antecedent, she presents a history of autologous transfer of fat tissue to increase breast volume 7 days before hospital admission, being the donor site the abdominal wall fat, which was performed by an aesthetic physician. She had no other history of chronic diseases, drug addictions, allergies or oncological conditions (family or personal) and only had a surgical history of a cesarean section 4 years ago.

On clinical examination we found a female patient, with a height of 1.61 meters, weight 82 kilograms, a weight, calculated IMC of 32 (corresponding to Class I Obesity), vital signs of 92 beats per minute, 23 breaths per minute, body temperature of 37.3 Celsius, oriented, conscious, cooperative; on examination of the breasts, there was hyperemia, local increase in temperature, on palpation they were tense, triggering pain secondary to manipulation (**Figure 1**). In the abdomen, changes in color and induration of the fatty tissue donor site were observed (**Figure 2**).

With suspicion of soft tissue infection of the breast, hospitalization was decided, empirical antibiotic therapy was initiated within the first 4 hours of the in-hospital stay (considering the possibility of infection with gram-positive bacteria, intravenous Clindamycin was the antibiotic of choice, with a dose of 300 mg every 6 hours), and imaging studies were requested (simple tomography of the thorax and abdomen).

The CT scan showed liquid collections in soft tissues of both breasts with hydro-aerial level due to exogenous material and thickening of the surrounding subcutaneous cellular tissue (**Figure 3**). In both lung bases there are consolidation areas in posterior segments, with minimal pleural thickening due to liquid collection (**Figure 4**). In the abdominal wall there is an umbilical hernial defect of 30 mm and in the suprapubic region there is a subcutaneous collection of approximately 50 × 10 mm which corresponds to the donor site of fat tissue (**Figure 5**).



Figure 1. Clinical appearance of breasts on admission to the emergency department.

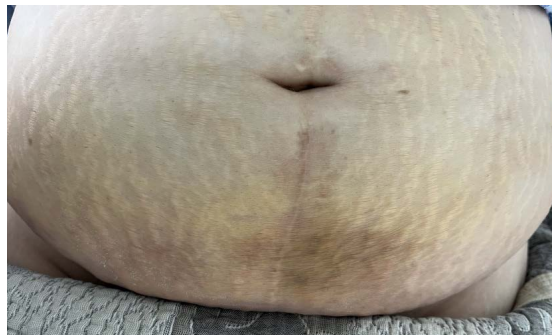


Figure 2. Donor site for the AFT procedure.

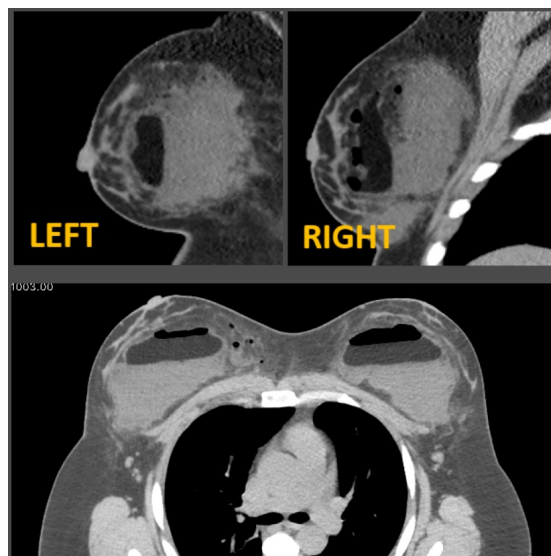


Figure 3. CT scan showing liquid collections in soft tissues of both breasts with hydro-aerial level due to exogenous material and thickening of the surrounding subcutaneous cellular tissue.

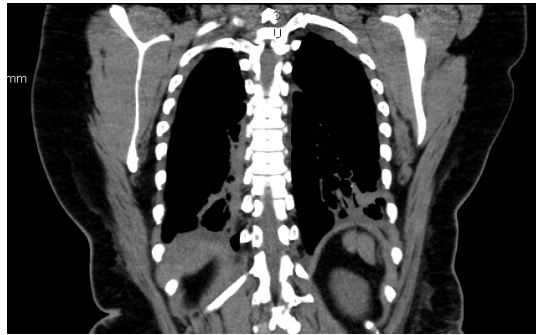


Figure 4. Lungs with minimal pleural thickening due to liquid collection.

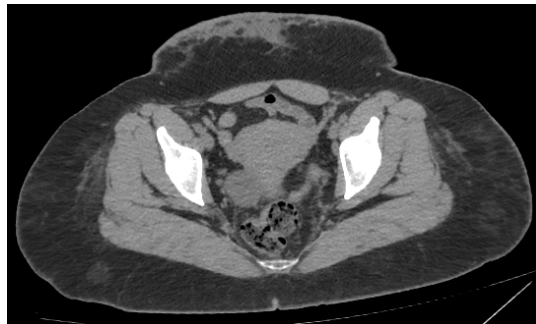


Figure 5. Suprapubic region with subcutaneous collection of approximately 50 × 10 mm which corresponds to the donor site of fat tissue.

Due to the clinical and imaging findings, it was decided to use interventional radiology by means of usg-guided drainage, obtaining 100 cc of fatty-pruritic content from the right breast and 80 cc of fatty-purulent content from the left breast. Part of the content obtained was sent to culture, obtaining 3 days later the development of *Staphylococcus aureus*, sensitive to Vancomycin, for which the treatment was adjusted. The pleural effusion was managed with conservative treatment, with an adequate clinical and imaging response and as the umbilical hernia was an incidental finding, with no relevance to her current condition, it was decided to treat it in a second surgical procedure, after preoperative preconditioning with follow-up in the general surgery outpatient clinic.

With the final diagnosis of intramammary abscess, the patient continued with in-hospital management for 1 week, a control breast ultrasound was performed in which no new intramammary collections were identified, and as she presented adequate evolution, it was decided to discharge her from the hospital with outpatient follow-up. During 3 months of follow-up, no clinical or imaging recurrences have been identified, being reported in the control breast ultrasound, and have been realized in the third month of follow up, findings corresponding to BI-RADS 2.

3. Discussion

Currently, the use of AFT has become popular as a surgical technique for recon-

structive and aesthetic purposes, because it is a less invasive procedure, with a faster recovery. However, inherently, this popularity leads to a disproportionate and inadequate use of this technique, being even performed by professionals not qualified for its use, which results in an inadequate preoperative evaluation of patients, resulting in complications that have a personal and social impact, as it puts at risk the health of the patient undergoing the procedure and increases the hospital expenses of public health systems that attend these complications.

There are a large number of original articles and meta-analyses in the international literature on AFT for breast augmentation, among which it is worth highlighting the one published in 2009 by the ASPS, which establishes the first statements on the subject by an organization qualified to make them. This article recognizes the use of AFT as an alternative for breast augmentation and, although they do not recommend it due to lack of solid clinical evidence. According to the recommendations of the ASPS Fat Graft Task Force, there is no evidence that specifically addressed patient selection (including age, weight, BMI, history of chronic diseases). Therefore, the only recommendation made was developed by consensus of the taskforce and is considered expert opinion, being this recommendation that, any patient who is considered as high risk for AFT to the breast should be initially evaluated with a baseline mammography, the characteristics for high-risk patients, according to the ASPS Fat Graft Task Force, are shown in **Table 1** [3]. In the case of our patient, even though she did not have any of these conditions, the fact that the procedure was performed by a general practitioner without a specialty in plastic and reconstructive surgery, means that there was not an adequate initial evaluation, and so any of these conditions could have been ignored.

Although the literature reviewed on AFT does not consider other preoperative risk factors, the authors consider that obesity should be taken into account as a risk factor for postoperative complications, in the case of our patient as a risk factor for surgical site infection, intramammary abscess, and pleural effusion. A large study, published in 2023, that analyzed information from the American College of Surgeons National Surgical Quality Improvement database from 2012 to 2018, including all patients from 9 surgical specialties (general, gynecology, neurosurgery, orthopedics, otolaryngology, plastic, thoracic, urology, and vascular) demonstrated that, compared with normal-weight patients, overweight and obese patients in classes I, II, and III had higher adjusted odds of developing infection, venous thromboembolism, and renal complications [4].

There has been much controversy regarding the increased risk of developing breast cancer associated with the use of AFT as a technique of breast augmentation, justifying this risk to the pro-inflammatory state that can generate the increase in local fat and increased estrogen production by aromatases present in

Table 1. High-risk patients characteristics [3].

Consider High-Risk Patients, Any Patient with a History of:

- Presence of BRCA-1 or BRCA-2 gene
 - Personal or familiar history of breast cancer
-

the fatty tissue and the need for an adequate imaging post-operative follow up. In this scenario, the ASPS Fat Graft Task Force does not issue any recommendation stating that there is no evidence that strongly suggests that AFT interferes with breast cancer detection [3], however, some authors recommend that, in addition to the baseline mammogram, patients undergoing AFT should undergo a post-procedure imaging follow-up, being the mammogram screening the best option [5] [6]. Nonetheless, the times at which this follow-up should be performed have not been standardized. In our patient a control breast ultrasound was performed 3 months after the complication presented, with findings corresponding to BI-RADS 2, and a control mammography is expected to be performed at 6 months of follow-up.

There is a need for standardized classification system for complications associated with autologous fat transfer, in order to directly address the causes of each one of them, thus improving the processes of prevention and management of these complications, the authors propose the division of the complications associated with TGA based on their severity, into major and minor complications, this according to their impact on quality of life, short-term and medium-term prognosis and health care system expenditure, this proposal is shown in **Table 2**. But as the literature on the subject is limited, future research is imperative to establish a universally accepted categorization framework. While according to the time of appearance we can divide them into early complications (occurring within 4 weeks after the procedure) and late complications (occurring past the first 4 weeks after the procedure) [7].

Concerning to the *Staphylococcus Aureus* present in the culture of the mammary abscess, a 2023 JAMA Surgical Site Infection Prevention Review, states that approximately 70% to 95% surgical site infections are caused by the patient's endogenous flora, being the most common organisms *Staphylococcus aureus*, coagulase-negative *Staphylococcus*, and *Escherichia coli*. The same literature recognizes modifiable and nonmodifiable factors associated with surgical site infections, patient-related and operation-related, showing that our patient had multiple risk factors for presenting an infection associated with the procedure [8]. The authors recommend that these risk factors should be taken into account when selecting patients for AFT or any other surgical procedure, as it has a direct impact on the patient's health, functionality and the final aesthetic result.

Table 2. Complications associated with autologous fat transfer.

Major	Minor
<ul style="list-style-type: none"> • Surgical site infection (donor or grafted) • Abscess • Hematoma • Fat necrosis • Fat Embolism 	<ul style="list-style-type: none"> • Palpable cysts • Seroma • Unsatisfactory results • Radiological Changes <ul style="list-style-type: none"> - Fatty cysts - Calcifications

Within the existing meta-analyses, it is worth highlighting 2, those published by Mathias Ørholt and Yingjie Wu, the first published in 2020 and the second in 2021, both standing out for the methodology performed. The first meta-analysis is outstanding because it only included studies that reported on at least 10 consecutive patients undergoing bilateral breast augmentation with fat grafting or fat grafting after bilateral breast implant removal, patients were included only if they received fat grafting as the only treatment modality and studies that reported on patients with breast cancer, congenital deformities, unilateral hypoplasia or patients receiving fat grafting as an adjunct to breast augmentation with implants were excluded. This adequate patient selection is important because it adequately assesses the risk of complications after AFT breast augmentation, and the result presented is less biased because it is a nonmixed patient population [9].

The second study is notable for the number of the population included, being the meta-analysis that has analyzed the most studies on the subject; including not only patients with initially healthy breasts, but also patients with micromastia, Poland's syndrome, tuberous breast deformity and atrophic breasts. Although there is diversity in the characteristics of the population studied, this same diversity helps us to identify more broadly the variables that exist in patients prone to complications [10].

Both meta-analyses conclude that the use of AFT as a breast augmentation technique is safe, with a low complication rate, however, they emphasize that proper patient selection and preoperative preparation is essential, but rarely performed.

4. Conclusion

Any surgical procedure carries an inherent risk. However, the probability of complications is lower if there is an adequate pre-operative assessment performed by a qualified surgeon. In the specific case of autologous fat transfer is still a technique that, although it has been perfected over the years, is still under development and, the presented case demonstrates the importance of aesthetic and reconstructive surgeries performed only by a certified plastic surgeon.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Delayed Grafting as a Valid Technique in Burn Management: Experience from a Burn Unit in Oman

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Abstract

Background: Early excision and grafting has been the preferred method of managing major burns around the world since 1970. Considering the advances in health care and the development of new antibiotics over the past 50 years, delayed grafting as a technique for the management of burns over 15% - 20% of total body surface area (TBSA) could have comparable results to that of early excision. This study aims to highlight the outcomes of practicing delayed grafting in burn patients. **Methods:** A case series analysis was performed of 51 patients who were admitted to the burns unit in Sultan Qaboos Hospital Salalah with over 20% TBSA between January 2014 and December 2019. The patients received prophylactic antibiotics and silver sulphadiazine dressing until the burn eschar had completely separated, followed by grafting. **Results:** Two patients were lost during the entire duration of the study. The mortality rate was comparable to that of early excision, while the rate of hypertrophic scarring was lower than the range reported by other studies. **Conclusion:** In the management of patients with over 20% TBSA, delayed grafting after complete separation of eschar is still a valid technique.

Keywords

Burns, Burn Units, Burn Management, Delayed Grafting, Major Burns, Treatment Efficacy

1. Introduction

In 1970, Janžekovič introduced the concept of early tangential excision and grafting of burn wounds with subsequent reduction in mortality [1]. Since then, early excision has become the standard practice in many centers. Concurrently, there were developments in intensive care unit (ICU) facilities and the introduction of new antibiotics. This also improved patient survival. Although early excision is practiced in many centers, the timing of excision of burn wounds is still controversial. A recently published meta-analysis found that most studies that looked into early vs delayed excision were based on very low-certainty evidence [2]. There have been multiple studies conducted in the Middle East regarding Demographic characteristics and outcomes of burn patients requiring skin grafts, Clinical, epidemiological, and management aspects of burn injuries, and Early excision and skin graft [3] [4] [5]. However, no recent studies have been found in the region that concern delayed grafting.

Major burns are defined as burns of more than 15% - 20% TBSA [6]. One of the burns units in Oman is located in Salalah. In this burn unit, delayed grafting is practiced. The patients are managed in a modern burn unit by a multidisciplinary team. In this article, we review the outcome of delayed grafting for major burns in the era of modern intensive care unit (ICU) care and new antibiotics. This study is the first of its kind to be conducted in Oman and brings the perspective of practicing delayed grafting in burn patients in developing countries.

2. Patients and Methods

This retrospective study included 51 burn patients who were admitted to the burns unit in Sultan Qaboos Hospital, Salalah during the period from January 2014 to December 2019. The inclusion criterion was patients with burns involving 20% or more of the total body surface area (TBSA) who required skin grafting.

Wound debridement and skin grafting was performed after a minimum of 3 weeks post-burn. The protocol of management consisted of Intravenous fluid resuscitation, antibiotics, analgesics, dietary supplements, regular wound care and dressing using Silver Sulphadiazine cream (till separation of the eschar), and subsequent wound debridement and skin grafting.

The variables investigated in the study are total hospital stay, requirement for blood transfusion, positive blood culture for pathogenic bacteria, depigmentation, hypertrophic scarring, and contractures. The data was obtained from reviewing the hospital's electronic health record (EHR) software.

3. Results

There were 51 patients (35 male and 16 female) admitted to the burn unit during the 6-year period. Of these, 12 patients (23%) were under the age of 10. 7 patients (14%) were in the age group 10 - 19 years. 12 patients (23%) were in the age group 20 - 29 years. 10 patients (20%) were in the age group 30 - 39 years. 6 patients (12%) were in the age group 40 - 49 years, and the remaining 4 patients

(8%) were 50 and above. The range of TBSA was 20% to 70% (mean: 35%).

Of the study sample, 49 patients survived and 2 patients died (mortality rate: 3.9%). The time till first surgery ranged from 8 to 68 days (mean: 27.3 days), while total hospital stay ranged from 16 to 142 days (mean: 49 days). Blood transfusion range was 0 to 37 units (mean: 2.9 units), and intraoperative blood transfusion was required for 31 (60%) patients. Positive blood cultures were found in 10 (20%) patients—1 (10%) patient grew *Acinetobacter*, 1 (10%) patient grew Methicillin-Resistant *Staphylococcus Aureus* (MRSA), 2 (20%) patients grew Carbamazepine-Resistant *Enterobacter* (CRE), 3 (30%) patients grew Multi-drug Resistant *Klebsiella*, and 3 (30%) patients grew *Pseudomonas*. Of the survivors, 13 (27%) patients had hypertrophic scarring, 9 (18%) patients had contractures, 37 (76%) had hyperpigmentation and 7 (14%) had hypopigmentation (Table 1).

4. Discussion

In this review, we excluded burns which were less than 20% TBSA to observe the effectiveness of our protocol on major burns. The mortality rate was only 3.9%, which is very low and is comparable to reported mortality from centers that practice early excision. A study on the Dutch population showed a 3.2% mortality rate [7]. Outcome and Mortality depend on many factors besides the practice of early excision. Some of these are resources, fluid resuscitation, the arrival of the patient to the facility in time without delay, adequate intensive care facilities, availability of proper antibiotics, presence of multidrug-resistant organisms, and adequate nutrition. Keshavarzi *et al.* expressed in their 2016 study of early excision, “Early excision and grafting is limited by several factors such as anemia, resuscitation, malnutrition, unstable hemodynamics and unavailability of the skin graft. According to these limitations, early excision and grafting is not considered the standard of care” [8]. Mortality rate is higher in centers with lesser resources, evident through reports from Cameroon and Iraq that showed a mortality rate of 23.4% and 29% respectively [9] [10]. A multicenter study concluded that in modern highly specialized burn centers, adults with more than 40% TBSA burns and children with more than 60% TBSA burns were at high risk of mortality [11]. In general, there is a trend of reduction of mortality over time which can be attributed to many reasons apart from the development of burns care. These factors include awareness, education, and prevention programs [12] [13].

Table 1. Post-surgical complications observed in the surviving patients.

Complication	Number	Percentage
Hypertrophic scarring	13	27%
Contractures	9	18%
Hyperpigmentation	37	76%
Hypopigmentation	7	14%

There is no consensus regarding the threshold of blood transfusion since the decision to transfuse is affected by multiple elements [14]. There are two approaches to blood transfusion—liberal and restrictive [15]. Our practice borders on the liberal approach. Due to variations in practice and a lack of international standards, it is not possible to draw a conclusion regarding the blood requirement in this study. MDR and MRSA colonization and infection is a global issue and has a negative impact on the survival of burn patients. As with any other country, Oman has these organisms present and they are typically difficult to eradicate [16].

The high rate of hyperpigmentation can be explained by the skin type of the study population. It is very common to have hyperpigmentation after burns and after grafting. Similarly, the hypopigmentation rate can be explained by skin type, but could also be the result of delayed grafting. The rate of hypertrophic scars is on the lower side of reported figures from other studies, which is 32% to 94% [17]. This indicates that hypertrophic scarring is part of the burn process itself and is not necessarily reduced by early intervention.

5. Conclusion

Delayed grafting after complete separation of eschar is still a valid technique for the management of burns. The mortality rate in our review is comparable to that of early excision, on account of the development of new antibiotics, availability of intensive care unit, multidisciplinary team care, and modern techniques of patient care.

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Ethics Approval

Ethical approval was waived by the local Ethics Committee of Sultan Qaboos Hospital in view of the study's retrospective nature and all the procedures being performed were part of the routine care.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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