



Our experience with the love handle and its surroundings as a donor area of autologous fat grafting at the radiotherapy damaged breast

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Abstract

Aim: Patients who had prior breast reconstruction using implants, subsequently underwent radiotherapy resulting in breast damage, and had received at least one session of fat injection were included in the study. This aim of this study was to determine the rationale behind selecting the “love handle” and its adjacent regions as the primary donor site for fat grafting in this patient group.

Materials and Methods: This retrospective study included 86 patients who had undergone either nipple sparing or skin-sparing mastectomy between January 2019 - December 2023. The fat from each side was removed equally. The depressed areas within the fat removal site and patient satisfaction were assessed. The evaluation was performed at least 6 months after the last session.

Results: The mean body mass index was 28.9 kg/m². Of these patients, 26 (30%) underwent a single session, while 60 patients (70%) received two or more sessions of fat injection. An average of 120 cc of pure fat graft was extracted from the “love handle” and its adjacent areas during the initial session. Except for one patient, all other patients reported that they were satisfied with the procedure.

Conclusion: The ‘love handle’ and its surroundings is ideal for these patients due to its proximity to the breast, distance from vital vessels and nerves, ability to yield a sufficient amount of fat in the initial session, the ability for successive sessions as BMI increases, and low complication.



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Introduction

Liposuction is a well-established technique for localized fat reduction with documented efficacy in both cosmetic and reconstructive applications [1]. In certain cases with patients undergoing implant-based breast reconstruction, radiotherapy is included as part of the treatment [2]. Radiotherapy may cause changes in the breast. However, radiotherapy induces tissue fibrosis, and studies have demonstrated the beneficial effects of applying autologous fat grafts in fibrosis management [3,4].

Fat grafting can be used in patients undergoing breast reconstruction post mastectomy [5]. In these patients, it is used not only to address tissue fibrosis but also to rectify issues related to volume and contour deformities [4,6]. The literature identifies various donor areas for fat grafting, including the abdominal region, flanks, back, and both lower and upper extremities [7].

Ongoing studies focus on the selection of donor sites for fat injections [7,8]. This study was designed based on the assumption of the existence of an optimal donor site selection corresponding to the specific indications for fat injection. Patients who had prior breast reconstruction using implants, subsequently underwent radiotherapy resulting in breast damage, and had received at least one session of fat injection were included in the study. This aim of this study was to determine the rationale behind selecting the “love handle” and its adjacent regions as the primary donor site for fat grafting in this patient group, while also establishing the associated complications of using this region.

Materials and Methods

No sample selection was made, this retrospective study included 86 patients, consisted of all patients who had undergone either nipple-sparing or skin-sparing mastectomy due to breast cancer, followed by breast reconstruction using implants and subsequent radiotherapy between January 2019 - December 2023.

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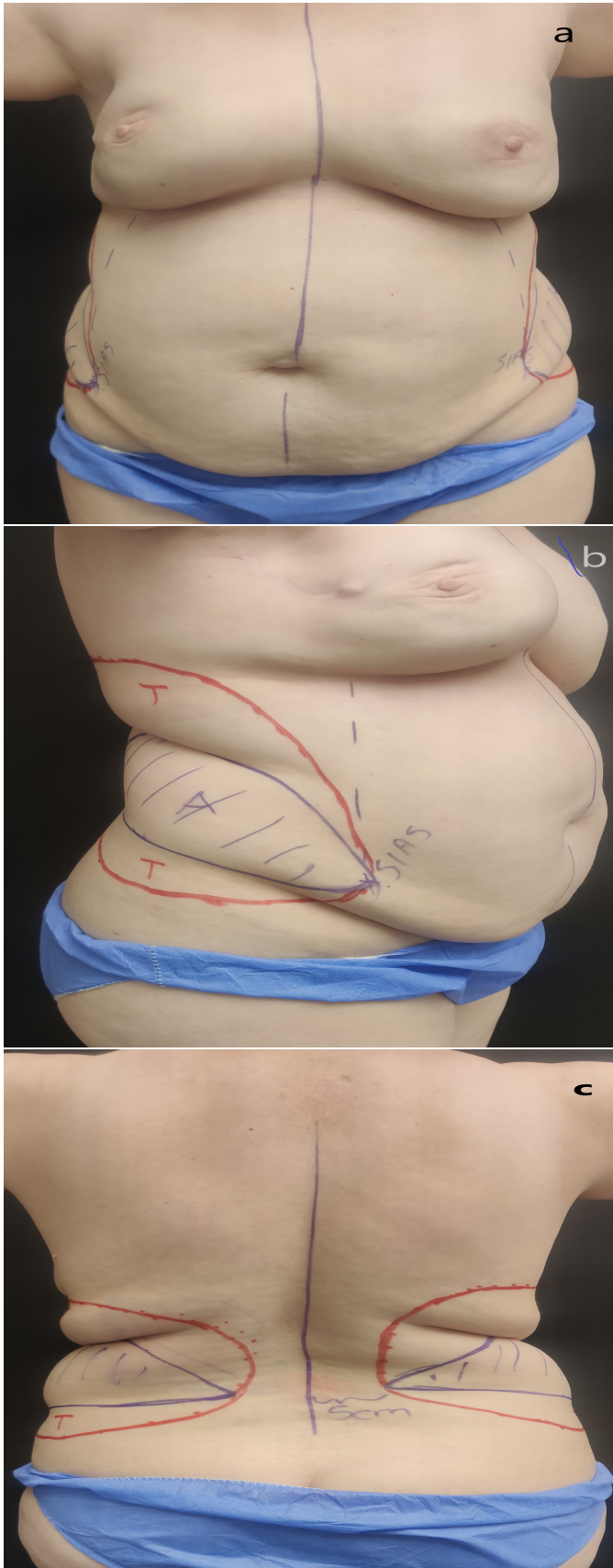


Figure 1. 45-year-old patient with right breast cancer. Nipple-sparing mastectomy followed by breast reconstruction with implant. She received radiotherapy after the surgery, 26 months have passed since the radiotherapy. a: front view. b: side view. (A: The main area where liposuction is performed. T: Transition zone). c: back view.

Fat injection was performed at least 6 months after radiotherapy and all the patients had at least one session. Patients who underwent reconstruction using autologous tissues were excluded; this also included emaciated or extremely thin patients as they were referred for autologous reconstruction. Patients who had previously undergone liposuction in the “love handle” and back regions were also excluded.

Markers were identified for the primary preferred site during the initial session. The designated area was determined as follows: anteriorly, spina iliaca anterior superior (SIAS); posteriorly, 5–10 cm lateral to the midline; superiorly, the level of 11th rib at the posterior axillary line; and inferiorly, the superior border of the iliac bone. An elliptical drawing was made from these land markers. This area is the main area where fat is removed. The transition zone was identified as approximately 8–12 cm superior to the upper line and 5–8 cm inferior to the lower line. The transition zone may extend to the midline on the back. Liposuction was not performed on the anterior part of SIAS. There is a need for fat injection for the second session, and if there is thought to be fat in this area, this area was preferred again. Before liposuction, 150–250 cc of 1:100,000 adrenaline solution was applied to each love handle area and the surrounding area. Then, liposuction was performed. The fat from each side was measured separately and equal fat was removed, thus avoiding asymmetry. The abdominal region below the umbilicus was not used as a donor area in any patient (Figure 1a-c).

Both the quantity of fat harvested from these regions and any complications arising in the donor site were evaluated. The depressed areas within the fat removal site and patient satisfaction were assessed. Patients were asked to indicate whether they were satisfied or dissatisfied with their appearance. The evaluation was performed at least 6 months after the last session of autologous fat grafting.

Patient characteristics of interest included age, body mass index (BMI), smoking status, and comorbidities (i.e., diabetes and hypertension). Smoking status was classified into three different groups: patients who never smoked, patients who quit at least 1 month prior to surgery, and current smokers.

Ethical approval was evaluated by Acibadem University Ethics Committee (ATADEK) and was found ethically appropriate with the decision number 2024-10/405.

Statistical analysis

Descriptive statistics were calculated for demographic and clinical characteristics. None of the continuous variables were normally distributed, and so medians with interquartile ranges were reported. Categorical variables (smoking status and comorbidities) were compared using a Pearson's Chi-squared test. Mann Whitney U test was performed to determine the association between complications of the donor area and variables such as age, BMI. Statistical significance was set at a p value of ≤ 0.05 . Statistical analyses were performed using SPSS 23 software.

Results

The study included 86 patients. The median body mass index (BMI) of the patients was 28.9 kg/m² (IQR:9.2).

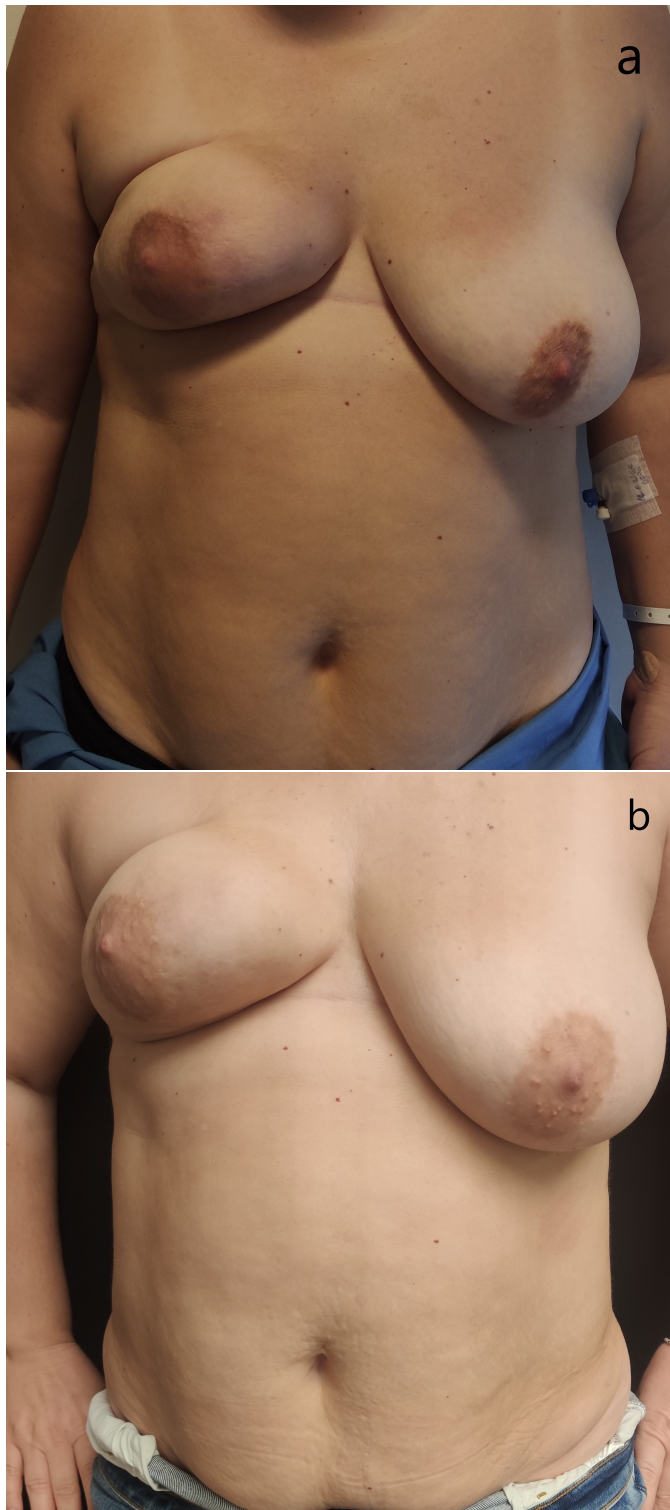


Figure 2. 42-year-old patient with right breast cancer. Nipple-sparing mastectomy followed by breast reconstruction with implant. She received radiotherapy after the surgery, 18 months have passed since the radiotherapy. At the first session total of 132cc of pure fat graft was taken from these areas. a: Image before liposuction. b: 7th month image after surgery.

The lowest BMI index was 22.1 kg/m² and the highest was 36.8 kg/m². Of these patients, 26 (30%) underwent a single session, while 60 patients (70%) received two or more

Table 1. Demographic characteristics of the patients.

	n (%) median(IQR*)
Number of patients	86
Age (years)	43(IQR:6)
BMI(kg/m ²)	28.9(IQR:9.2)
Smoking	
Never	67(77.9%)
Prior	8(9.3%)
Current	11(12.8%)
Comorbidity	
No	76(88.4%)
Yes	10(11.6%)
Fat obtained from the first session (cc) (n:86)	120 (IQR:40)
Fat obtained from the second session (cc) (n:60)	48 (IQR:31.5)
Fat obtained from the third session (cc) (n:12)	31.5 (IQR:22)

* Interquartile range.

Table 2. Complications.

	Complication	Number
Donor area	Contour irregularity	1
	Seroma	0
	Ecchymosis or bruising	62
	Infection	0
	Abses	0
	Hematoma	0

Table 3. Complications.

	Complication	n (%)
First session (n:86)	None	27(31.4%)
	Ecchymosis/bruising	58 (67.4%)
	Contour irregularity with Ecchymosis	1 (1.2%)
Second session (n:60)	None	18 (30%)
	Ecchymosis/bruising	42 (70%)
Third session (n:12)	None	3 (25%)
	Ecchymosis/bruising	9 (75%)
Complications in any session (n:86)	None	24 (27.9%)
	Ecchymosis/bruising	62 (72.1%)

sessions of fat injection. The “love handle” and its adjacent areas were used in the initial session for all patients. In 60 patients, this area was used again during the second session, and in 12 patients, this region was used in addition to other regions during the third session. The demographic characteristics of the patients and amounts of fat obtained from the sessions are presented in Table 1.

Median value of pure fat graft was 120 cc (IQR:40) extracted from the “love handle” and its adjacent areas during the initial session. This amounts were 48 cc (IQR:31.5) and 31,5 cc (IQR:22) respectively during the second and

Table 4. Complications.

	Complications in any session		p value
	No n (%) median(IQR*)	Yes n (%) median(IQR*)	
Age (years)	43 (8.5)	43 (5)	0.94
BMI	27.3 (9.8)	30.1 (8.6)	0.18
Comorbidity			
No	21(28%)	55(72%)	0.87
Yes	3(30%)	7(70%)	
Smoking			
Never	16(24%)	51(76%)	0.28
Prior	5(46%)	6(54%)	
Current	3(37%)	5(63%)	

* Interquartile range.

third sessions.

Median value of BMI were 28.9 kg/m²(IQR:9.2), 31.8 kg/m²(IQR:4.5) and 32.2 kg/m²(IQR:3.2) among patients at the first, second and third sessions respectively.

Initially, the most common donor site complication was ecchymosis, which spontaneously resolved without requiring any surgical treatment. Seroma and necrosis were not observed in any patient. There were no instances of infection or abscess observed in the donor site among any of the patients. Complications encountered in the donor site are presented in Table 2 and Table 3. There were no significant association was found among variables and complications of the donor area in any sessions (Table 4).

After the initial session, one patient expressed dissatisfaction, reporting more pronounced depression on the left side compared to the right. During the second session, liposuction was conducted both superior and inferior to the depressed area, with additional liposuction performed on the opposite side to address the patient's dissatisfaction. The other patients reported satisfaction with the procedure. In Figure 2, before and after surgery pictures of the patients are given.

Discussion

The present study included patients who underwent nipple-sparing or skin-sparing mastectomy followed by breast reconstruction using implants due to breast cancer and subsequently received autologous fat grafting to correct radiotherapy-induced deformities, for which the "love handle" and its adjacent areas were preferred as the primary donor site. This region stands out among other potential fat donor areas because of its proximity to the breast, distance from critical vessels and nerves, and the consistent ability to obtain a sufficient amount of fat from both sides during the initial session in the all of patients.

Presently, it is understood that a portion of the fat grafts administered to the recipient area undergoes resorption, with this rate ranging between 40% and 50% [8]. There are ongoing efforts aimed at minimizing the resorption rate of fat grafts within the recipient area [9-13]. Although

an optimal method has not been fully agreed upon [8], research in this area remains ongoing.

Additional surgical interventions are sometimes required in reconstructive breast surgery. Radiotherapy can induce fibrosis in the tissue in the long term [14], resulting in breast deformities. Autologous fat grafts are used to reduce or correct these problems [14].

Studies suggest that fat grafts in the recipient area receive nourishment through imbibition from surrounding tissues during the initial days, followed by sustained nourishment through neovascularization [1,15]. The vascularity of the region and the thickness of the fat layer are critical factors. An experimental study suggests that fat grafts survive best within the fat pad, with complications most commonly arising from grafts administered beneath the skin [9]. In a breast reconstructed with an implant, the distance between the dermis and the implant surface is limited. There might be a reduction in vascularization and an increase in fibrosis within the skin flap of the breast area subjected to radiotherapy. Therefore, the amount of fat that can be given to the breast must also be limited. Otherwise, complications are inevitable. In our study, an average of 120 cc (ranging from 82 cc to 226 cc) of fat was administered to each breast. The quantity of fat administered can vary based on the individual size of the breast and the extent of the deformity. Our study demonstrates that this quantity of fat can be acquired from the identified region during the initial session in all patients. It was also shown that as BMI increases, this area can be used as a fat donor area in subsequent sessions.

Researchers have often pondered whether there is a difference in the viability of fat between potential fat donor areas. Rohrich et al. discovered that fat harvested from the abdomen, flank, thigh, and knee areas exhibited comparable viability [16]. Li et al. observed no statistical difference in the volume, weight, and histologic characteristics of fat grafts obtained from various regions [17]. Small et al. demonstrated that fat transfer from various donor sites, notably the abdomen or thighs, did not exhibit statistically significant differences in volumetric retention [8]. The thighs, abdomen, inner knee, flank, back, and buttocks are among the potential areas for fat graft donation in patients undergoing breast reconstruction [7,18]. In their study on total breast reconstruction using fat transfer, Wederfoort et al. noted that the thigh and abdomen regions exhibited the highest incidence of complications, with contour irregularity being the most common among patients [19]. In this study, we consider contour irregularities in the donor area to be an inevitable outcome, given that the entire breast reconstruction relies solely on fat. In our study, the most prevalent complication observed in the donor site was ecchymosis, which resolved spontaneously without requiring any surgical treatment. In one patient, a noticeable disparity in depression was observed after the initial session, potentially attributed to the higher extent of liposuction performed in the "love handle" area and lesser in the transition zones, despite equal fat removal from both sides. This imbalance was rectified in the subsequent session.

During the initial session, we preferred the "love handle" region and its approximately 8–12 cm superior and 5–8 cm

inferior to the donor area. The “love handle” area served as the primary site for fat graft extraction, while the regions both below and above this area were used to establish a more aesthetically pleasing transition. In each patient, an equal amount of fat was removed from the right and left sides to prevent topographic asymmetry. This area is close to the breast and away from vital structures. The thigh region contains critical vessels and nerves that lead to the lower extremities, posing a risk of potential damage with liposuction procedures.

The fat in this area is sufficient for this patient group during the initial session. One of the most important features that distinguish the “love handle” area from other potential donor sites is its capacity for aggressive liposuction and reduction if required. Indeed, while the primary focus of the article is not to reduce waist circumference, it is plausible to achieve a slimmer waistline following the surgery. In our study, we did not objectively evaluate waist thinning due to potential weight fluctuations that patients might experience during the follow-up period. One of the objectives of the present study was to demonstrate that the selected area provided sufficient fat during the initial session, even among individuals with a low BMI.

Patients who had undergone previous liposuction in the back and “love handle” area for aesthetic reasons were not included due to the lack of information regarding the extent of liposuction performed in these areas. If it is believed that there is sufficient fat in this region, it can be considered the primary choice for fat extraction in subsequent harvesting.

The gold standard for autologous breast reconstruction is the abdominal DIEP flap [20]. When abdominal flaps are unsuitable, alternative options, such as superior gluteal artery perforator (SGAP), inferior gluteal artery perforator (IGAP), transverse upper gracilis (TUG), profunda artery perforator (PAP), and anterolateral thigh perforator (ALT) flaps, are used for breast reconstruction [21]. As recorded in the literature, these donor areas are used for fat injection in patients undergoing breast reconstruction given their anatomy. The lumbar artery perforator (LAP) flap is used in breast reconstruction, mostly originating from the L4 lumbar artery [22]. The pedicle of this flap is short and reconstruction is usually performed using a vascular graft [22]. Peters et al. said that this flap is a good option for young patients who are BRCA positive with insufficient abdominal tissues for bilateral reconstruction [22]. Although Opsomer et al. argue that this flap is a good alternative in cases where DIEP cannot be used, the flap failure rate is very high compared to DIEP [20]. Greensun opposes Opsomer et al. by emphasizing the high perpetrator rate [23]. When the LAP flap failure rate is compared with TUG and PAP flaps, it is still very high [20,24]. In our study, liposuction was performed in the area where the LAP flap was created. LAP flap is not the only reconstruction option in breast reconstruction. When reviewing the literature, it appears that LAP is trailing behind other autologous reconstruction alternatives. We advocate for allowing the use of autologous flaps in at least one area for these patients as a rational approach in the event of potential failure of fat injection because fat injection may not effectively alleviate the negative impacts

of radiotherapy. Therefore, the donor sites for abdominal flaps were preserved in our study.

The retrospective nature of our study represents a limitation. To access the back area, an elevation in the buttock area is required, potentially leading to back discomfort in the patients. In some patients with a low BMI, initiating the procedure in the prone position poses limitations, thereby extending the duration of the surgery.

Conclusion

Fat injection is one of the methods used to overcome the negative effects of radiotherapy. The selection of the donor area is a topic that is constantly questioned and studied in fat injection [7,8]. The ‘love handle’ and its surroundings stand out due to its proximity to the breast, distance from vital vessels and nerves, ability to yield a sufficient amount of fat in the initial session, and the ability for successive sessions as BMI increases. The feasibility of performing aggressive liposuction in the “love handle” area, coupled with liposuction in its superior and inferior parts to ensure a seamless transition, along with the accessibility to obtain fat from these regions, adds to the attractiveness of this area. The waist becomes thinner. Despite these notable advantages, it might be premature to declare the region presented in our study as the definitive gold standard donor site for fat injection in addressing radiotherapy-induced damage in the breast. Further studies should be undertaken on this subject. In the context of contemporary aesthetic perception, our study introduces a distinct perspective in the selection of the donor site for fat injection. Similar to many other donor sites, the potential for a flap (LAP flap) to create the breast from this region may be considered a disadvantage of this donor site. However, compared to flaps from other potential donor sites, the LAP flap is inferior due to some disadvantages. It is also important to preserve at least one potential flap donor area in these patients in case the effects of radiotherapy cannot be resolved by fat injection.

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Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

Ethical approval was evaluated by Acibadem University Ethics Committee (ATADEK) and was found ethically appropriate with the decision number 2024-10/405.

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