



Twelve Month Outcomes of Autologous Fat Grafting After Breast Conserving Surgery in Iraqi Women A Prospective Cohort Study

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نتائج حقن الدهون الذاتية خلال اثني عشر شهرًا بعد جراحة المحافظة على الثدي لدى النساء
العراقيات

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Abstract:

Autologous fat grafting may correct residual contour defects after breast-conserving treatment, but prospective outcome data from Iraq are limited. This single-center prospective cohort evaluated volume retention, patient-reported outcomes, complications, imaging findings, and oncologic events in 42 Iraqi women after partial mastectomy. Participants were enrolled at Ghazi Al-Hariri Hospital of Surgical Specialties, Baghdad Medical City, between January 2022 and December 2023, underwent grafting at least six months after completion of radiotherapy, and were followed for 12 months after grafting. Harvested abdominal or thigh fat was centrifuged and injected in multiple tissue planes. Mean injected volume was 85.3 ± 22.7 mL, and reported 12-month retention was $68.4\% \pm 9.3\%$. BREAST-Q breast satisfaction increased from 42.1 ± 8.9 to 81.3 ± 10.2 , and psychosocial well-being from 39.5 ± 7.6 to 78.9 ± 9.8 (both $p < .001$). Recorded minor events included oil cysts (4.8%), fat necrosis (2.4%), contour asymmetry (7.1%), and benign calcifications (9.5%). No graft-related BI-RADS 4–5 finding was recorded. No local recurrence occurred during follow-up; one patient developed distant metastases. The findings indicate favorable 12-month reconstructive outcomes in selected patients. The small uncontrolled cohort, reporting limitations, and short follow-up preclude conclusions about long-term oncologic safety or comparative effectiveness.

Keywords: Autologous fat grafting; Breast reconstruction; Breast-conserving surgery; BREAST-Q; Graft retention; Iraq.

المخلص

هدفت هذه الدراسة الأترابية المستقبلية إلى تقييم احتفاظ الطعم الدهني بالحجم، ورضا المريضات، والمضاعفات، والنتائج الشعاعية والأحداث الورمية خلال اثني عشر شهرًا بعد حقن الدهون الذاتية لترميم الثدي. شملت الدراسة 42 امرأة عراقية خضعن لاستئصال جزئي للثدي بسبب سرطان في مرحلة مبكرة، وأكملن العلاج الإشعاعي قبل الحقن بستة أشهر على الأقل. جرى إدراج المريضات في مستشفى غازي

الحريري للجراحات التخصصية بمدينة الطب في بغداد بين كانون الثاني 2022 وكانون الأول 2023. بلغ متوسط حجم الدهون المحقونة 22.7 ± 85.3 مل، ومتوسط نسبة الاحتفاظ بالطعم المبلغ عنها بعد اثني عشر شهرًا $9.3\% \pm 68.4\%$. ارتفع متوسط رضا المريضات عن الثدي من 8.9 ± 42.1 إلى 81.3 ± 10.2 ، وتحسن الرفاه النفسي والاجتماعي من 7.6 ± 39.5 إلى 9.8 ± 78.9 ، وكان التحسن ذا دلالة إحصائية في المجالين. اقتصرت المضاعفات المسجلة على أحداث بسيطة، ولم تسجل حالات نكس موضعي أو آفات شعاعية مشتبهة من الفئتين الرابعة والخامسة وفق تصنيف BI-RADS مرتبطة بالحقن. سُجلت حالة واحدة من النقائل البعيدة. تشير النتائج إلى تحسن ترميمي قصير الأمد لدى المريضات المختارات، ولكن حجم العينة الصغير وغياب مجموعة مقارنة وقصر المتابعة ونواقص التوثيق لا تسمح بإثبات السلامة الورمية طويلة الأمد.

الكلمات المفتاحية: حقن الدهون الذاتية؛ ترميم الثدي؛ جراحة المحافظة على الثدي؛ رضا المريضات؛ احتفاظ الطعم؛ العراق.

Introduction

Breast cancer is one of the most prevalent cancers in Iraq and can be used to evaluate breast cancer outcomes along the breast cancer continuum [1]. Randomized evidence shows that, for certain women with early invasive breast cancer, breast-conserving surgery plus radiotherapy is a viable alternative to mastectomy [2]. But, after treatment there can be volume deficits, asymmetry, and visible scars remaining due to the removal of tissue and radiation effects.

Breast satisfaction and psychosocial function may be impaired by residual deformity. The BREAST-Q has been designed to evaluate outcomes from a patient's perspective [3]. Patient-reported measures can be used in conjunction with volume assessment to evaluate reconstruction beyond the realm of technical correction.

The use of autologous fat grafting involves the transfer of fat from the patient's own body to fill or contour the area that is deficient. Controlled handling and placement of tissue is stressed in established techniques [4]. Patients' perceptions following adjunctive grafting have been investigated as have oncologic outcomes following breast cancer treatment [5, 6]. Imaging changes are also pertinent since benign postoperative changes need to be differentiated from suspicious lesions during surveillance [7].

This study assessed the results of AFAG for 12 months in Iraqi women with partial mastectomy and radiotherapy who had residual deformity. The primary outcomes were volume retention and BREAST-Q scores, with additional outcomes of complications, imaging, oncologic events and scar appearance. Study didn't compare fat grafting with another reconstructive procedure; the study was descriptive with changes within a single cohort.

Materials and methods

Plan and monitor studies

Design and manage studies.

A single center prospective cohort study was performed at Ghazi Al-Hariri Hospital of Surgical Specialties, Baghdad Medical City. The enrollment period was from January 2022 to December 2023 followed by 12-month follow-up post-grafting. The institutional review board (IRB) approved this report, ID GHSS-IRB-2021-017. Written informed consent was obtained after a discussion of the procedure, potential risks, expected benefits and alternatives. Reporting was based on STROBE recommendations.

Eligibility and participants

The study included 42 women with unilateral invasive ductal or ductal carcinoma in situ (DCIS) in Iraq, aged 25-65 years who had gone through partial mastectomy. The surgical margins had to be clear, either by surgery, or adjuvant radiotherapy completed at least six

months prior to grafting, no prior breast reconstruction, stability of body weight within $\pm 5\%$ of the previous 6 months and dissatisfaction with the breast assessed using BREAST-Q. Candidates who did not meet the following criteria were excluded; active infection, uncontrolled diabetes ($\text{HbA1c} > 8.0\%$), $\text{BMI} < 18$ or $> 35 \text{ kg/m}^2$, pregnancy, autoimmune disease, or evidence of cancer recurrence.

The process of harvesting and transplanting fat.

Harvesting and transplanting of fat.

The abdomen or thighs were chosen for adiposuction, performed with tumescent solution and 3-mm blunt cannulas and suction by syringe. The tumescent solution was made up of a mixture of 500 mL saline, 20 mL of 1% lidocaine and 1 mL of 1:1000 epinephrine. The middle layer containing the adipocytes was collected after centrifuging lipoaspirate at 3,000 rpm for 3 minutes. Processed fat was injected in subcutaneous, subglandular, intraparenchymal and submuscular planes using a 16G blunt cannula (0.1-0.3 mL fat per injection).

The amount of injected volume recorded was between 45 and 125 mL breast (Table 2).

Outcome assessment

Primary outcomes included the percentage of grafts retained at 12 months, and the BREAST-Q Reconstruction Module scale scores for Satisfaction with Breasts and Psychosocial Well-being [3]. Surface imaging in three dimensions was performed with the Vectra H2 system to determine the volume. Retention was reported as the percent of the injected volume that was estimated to be retained in the graft. Details of how the retained graft volume was calculated from pre-and post-breast measurements were not completely described. The questionnaire was translated into Arabic and presented as separate scales on a 0–100 scale, namely BREAST-Q. There was no language-specific documentation of validation and score conversion.

Secondary outcomes involved oncologic events, imaging, donor-site morbidity, infection, fat necrosis, and oil cysts (with $>50\%$ loss of graft). Six and 12 months after fat grafting, mammography and ultrasonography were performed and evaluated by a breast radiologist with a dedicated breast specialty training based on BI-RADS categories [8]. Surgeons reported on the Manchester Scar Scale score for evaluating scar appearance. Documentation of the exact version of the scoring of scars and of the masking procedures by assessors was not adequately documented.

Statistical analysis

The data was statistically analyzed using IBM SPSS Statistics version 27. Means $\pm$ standard deviations (SDs) were used to summarize continuous variables and counts and percentages were used to summarize categorical variables. For all analyses, paired t tests were used to compare pre- and 12-month BREAST-Q scores. Two-sided $p < .05$ was considered to be significant. The intraclass correlation coefficient (ICC) was used for interrater reliability of the volume measurements. The relationship of the injected volume with reported retention was analyzed using Pearson correlation.

Results

Cohort characteristics

All 42 enrolled participants were reported to have completed 12-month follow-up. Mean age was 46.2 ± 8.1 years and mean BMI was $26.4 \pm 3.2 \text{ kg/m}^2$. The right breast was affected in 24 patients and the left in 18. Invasive ductal carcinoma accounted for 38 cases and DCIS for four. Grafting occurred a mean of 8.3 ± 2.1 months after completion of radiotherapy (Table 1).

Table 1 Baseline characteristics of the cohort

Characteristic	Value
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Age, years	46.2 ± 8.1 (28–64)
BMI, kg/m ²	26.4 ± 3.2 (20.1–34.7)
Affected breast	Right 24 (57.1%); left 18 (42.9%)
Pathologic stage	I 29 (69.0%); II 13 (31.0%)
Histology	Invasive ductal carcinoma 38 (90.5%); DCIS 4 (9.5%)
Completed radiotherapy	42 (100%)
Interval after radiotherapy, months	8.3 ± 2.1 (6–14)

N = 42. Continuous values are mean ± SD (range). All patients had clear margins ≥2 mm and stable weight for at least six months.

Volume retention

Mean injected volume was 85.3 ± 22.7 mL. At 12 months, the reported mean retained volume was 58.4 ± 17.1 mL and mean retention was 68.4% ± 9.3% (Table 2). Inter-rater agreement was high (ICC 0.93; 95% CI 0.89–0.96). The association between injected volume and retention was not statistically significant ($r = -0.18$, $p = .26$). This result neither establishes the absence of an association nor identifies an optimal injection-volume threshold. Figure 1 provides a synthetic illustration of contour restoration rather than patient-specific measurements.

Table 2 Graft volume and retention at 12 months

Measure	Mean ± SD	Range
Injected volume, mL	85.3 ± 22.7	45–125
Retained volume, mL	58.4 ± 17.1	32–94
Graft retention, %	68.4 ± 9.3	51.2–86.7

N = 42. Measurements used Vectra H2 three-dimensional surface imaging.

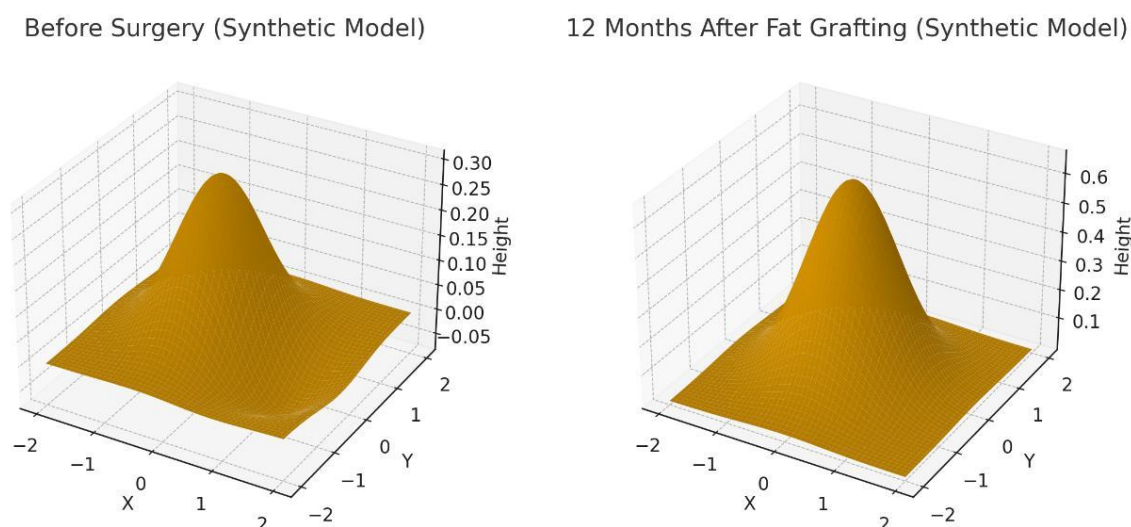


Figure 1 Synthetic surface models illustrating breast contour before and 12 months after fat grafting.

This is a schematic illustration, not patient-specific imaging or measured clinical data. Reproduced from Al-Najjar (2025), European Journal of Medical and Health Research, 3(1), 169–176, DOI 10.59324/ejmhr.2025.3(1).24, under CC BY 4.0; caption revised.

Patient reported outcomes

Breast satisfaction increased by 39.2 points, from 42.1 ± 8.9 before grafting to 81.3 ± 10.2 at 12 months. Psychosocial well-being increased by 39.4 points, from 39.5 ± 7.6 to 78.9 ± 9.8 . Both paired comparisons were statistically significant ($p < .001$; Table 3). Forty patients (95.2%) reported that they would recommend the procedure, and all 42 (100%) reported satisfaction with the reconstructed breast's natural appearance and feel. Figure 2 summarizes the reported scale scores.

Table 3 BREAST-Q scores before grafting and at 12 months

Domain	Before	12 months	Change	p
Breast satisfaction	42.1 ± 8.9	81.3 ± 10.2	+39.2	< .001
Psychosocial well-being	39.5 ± 7.6	78.9 ± 9.8	+39.4	< .001

N = 42. Scores range from 0 to 100; values are mean $\pm$ SD. Comparisons used paired t tests.

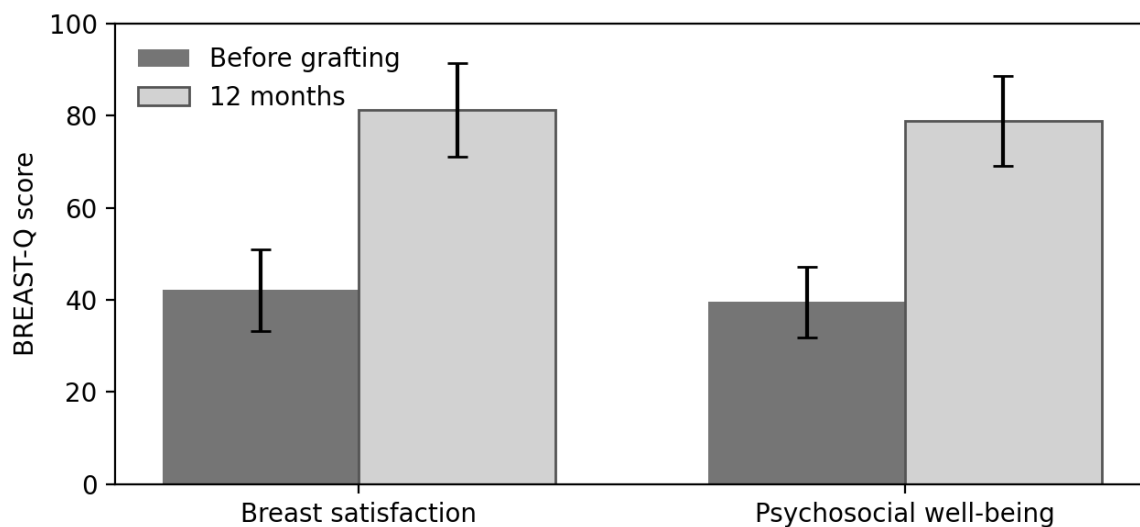


Figure 2 BREAST-Q domain means before grafting and at 12 months. Error bars show standard deviations, not confidence intervals. Both paired comparisons had $p < .001$.

Complications and imaging

Recorded adverse events were minor and did not require surgical intervention (Table 4). Two patients had asymptomatic oil cysts managed by observation. One developed a painless fat-necrosis nodule at six months, with benign mammographic features that remained stable at 12 months. Three patients had contour asymmetry below 1.5 cm on surface imaging, accepted by both patient and surgeon. Four had benign calcifications. No infection, hematoma, seroma, graft loss exceeding 50%, or donor-site morbidity requiring intervention was reported.

Table 4 Recorded postoperative adverse events

Event	n (%)	Management
Oil cysts	2 (4.8%)	Observation
Localized fat necrosis	1 (2.4%)	Stable imaging; no intervention
Minor asymmetry	3 (7.1%)	Accepted by patient and surgeon
Benign calcifications	4 (9.5%)	Routine surveillance; BI-RADS 2
Infection	0 (0%)	—
Graft loss >50%	0 (0%)	—
Donor-site complications	0 (0%)	—

Total recorded events	10 events	All minor
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N = 42. The total is a count of recorded events, not necessarily distinct affected patients; categories may overlap.

Four patients had benign calcifications and two had oil cysts, classified as BI-RADS 2. Mild localized architectural distortion in two patients was classified as BI-RADS 3 and improved or remained stable on three-month interval imaging. No graft-related BI-RADS 4 or 5 finding was recorded. No interference with cancer detection was documented (Table 5); diagnostic sensitivity was not formally evaluated. Figure 3 reproduces an ultrasound illustration from the previous report.

Table 5 Findings during imaging surveillance

Finding	n (%)	BI-RADS	Follow-up
Benign calcifications	4 (9.5%)	2	Routine annual screening
Oil cysts	2 (4.8%)	2	No additional action
Architectural distortion	2 (4.8%)	3	Three-month interval imaging
Suspicious lesions	0 (0%)	4–5	—
Interference with detection	0 (0%)	—	—

N = 42. Assessments used mammography and ultrasound at six and 12 months.

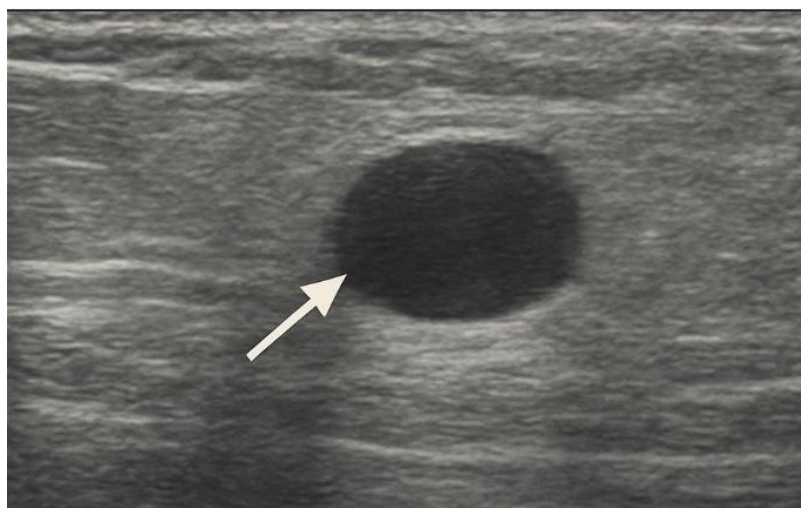


Figure 3 Ultrasound image presented as a benign oil cyst following fat grafting in the previous report.

Reproduced from Al-Najjar (2025), *European Journal of Medical and Health Research*, 3(1), 169–176, DOI 10.59324/ejmhr.2025.3(1).24, under CC BY 4.0; caption revised. The image is an illustration from that report; original imaging records were not independently reviewed.

Oncologic and scar outcomes

No local or regional recurrence was recorded during 12-month follow-up. One patient developed bone and liver metastases eight months after grafting. Her primary tumor was triple-negative, with Ki-67 > 40% and lymphovascular invasion. The multidisciplinary tumor board attributed the event to underlying tumor biology rather than grafting; this clinical attribution does not establish causality. No cancer-related deaths were recorded. The reported proportion

without a disease event at 12 months was 41/42 (97.6%; Table 6), rather than a time-to-event survival estimate.

Table 6 Oncologic events through 12 months

Outcome	n (%)
Local recurrence	0 (0%)
Regional nodal recurrence	0 (0%)
Distant metastases	1 (2.4%)
Cancer-related death	0 (0%)
Disease-free at 12 months	41/42 (97.6%)

N = 42. The metastatic event occurred at eight months in a patient with aggressive triple-negative disease.

The reported scar score decreased from 9.2 ± 1.8 before grafting to 4.1 ± 1.3 postoperatively ($p < .001$). Interpretation requires confirmation of the Manchester Scar Scale version, permissible score range, and assessment time point. Clinical photographs were reported to show improved contour, symmetry, and scar camouflage; Figure 1 is a synthetic illustration and does not provide photographic evidence of those clinical changes.

Discussion

Reconstructive and patient reported outcomes

In this group, there was reported volume retention and patient-reported outcomes in improvement after 12 months of fat grafting with a delay. If this is the case, then there was mean retention of 68.4% of injected volume at follow-up, despite the limitations of the measurement method. When talking about expected correction it is relevant that the variation in retention matters, as there is no way to predict a person's result from the cohort's mean.

Breast satisfaction and psychosocial well-being improvements indicate other than a measured volume increase. In an inter-institutional series, the BREAST-Q was evaluated after adjunctive fat grafting, but this study included postmastectomy reconstruction, and is not directly comparable to the present series [5]. No judgment was made on cultural beliefs or marital or religious views here, nor can they be deduced from questionnaire change.

This harvesting, processing and microdroplet placement is typical of fat transfer principles [4]. No effects of regeneration were actually observed and no specific mechanism at the cellular level was shown. The lack of an association between volume and retention should also be taken with a grain of salt, as small relationships with volume can only be detected in a small sample of 42 patients.

Clinical events and surveillance

Oil cysts and focal necrosis of fat, asymmetry and benign calcifications were treated conservatively. There were no significant complications reported. Patients with active infection, poorly controlled diabetes or recurrent cancer were not included, so the results are only applicable to these patients. It is not advisable to claim that the chosen group is representative of all those women seeking reconstruction.

Various imaging changes that have been described following fat grafting in breast cancer patients are benign [7]. In this group, BI-RADS assessment was able to differentiate between benign and probably benign changes that did not need immediate removal, but rather short interval surveillance [8]. It is encouraging that no suspicious lesions were seen that could be connected to the graft, but it is not a measure of the preservation of the diagnostic sensitivity of the lesion, since this has not been formally measured.

Care must be taken with oncologic observations. During a follow-up period of 12 months, no patient had local recurrence, and one patient had distant metastases. In a longer term follow-up

of a matched cohort, there was no statistically significant difference in locoregional recurrence between patients undergoing fat transfer and those who were not [6]. That study is as informative as it is, but it cannot prove safety in this small uncontrolled population. The attribution of the metastatic event to disease biology at the time of the tumor board is only a clinical decision, not a proof of causality.

Limitations and implications

Limitations include small sample size, single center setting, lack of a comparison group, and a limited follow-up period. Changes within the patient could be due to the procedure, recovery over time, and patient expectations. The study cannot prove superiority over implant or flap reconstruction or observation. A sufficient sample size calculation and detailed sub-group analysis was not provided and adequate statistical power should therefore not be claimed. No confidence interval was reported for paired changes and the reporting of multiple primary outcomes was inadequate.

The originally described procedure called for a 100-mL injection maximum, while the reported range was up to 125 mL. This inconsistency should be resolved with operative records. The complication total is an event count and cannot be used to define the number of distinct patients affected if categories overlap. Other reporting issues include the stage distribution of the cohort of DCIS, the calculation of retained graft volume, BREAST-Q scoring and Arabic version validation, interpretation of the scar-scale, and assessor masking. No record of the registration was available for verification. Reproducibility and interpretation are hindered by these issues. More, larger, multi-center studies with shorter and longer follow-up, comparative studies, uniform outcome measures, and economic analysis are required.

Conclusion

Autologous fat grafting was reported to be associated with volume retention and with an improvement in BREAST-Q scores at 12-months post-surgery in 42 selected Iraqi women who had undergone partial mastectomy and radiotherapy. There were no local recurrence or significant complications. The results of this study support further investigation and because of the uncontrolled design, the short duration of follow-up, and the unclear reporting, long-term oncologic safety and/or comparative effectiveness cannot be drawn.

References

- [1] Alwan, N. A. S., Lami, F., Al Nsoor, M., & Kerr, D. (2022). Trends in the incidence and mortality of the most common cancers in Iraq (Iraqi Cancer Registry 1999–2019). *Gulf Journal of Oncology*, 1(40), 47–57. <https://pubmed.ncbi.nlm.nih.gov/36448070/>
- [2] Fisher, B., Anderson, S., Bryant, J., Margolese, R. G., Deutsch, M., Fisher, E. R., Jeong, J.-H., & Wolmark, N. (2002). Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. *New England Journal of Medicine*, 347(16), 1233–1241. <https://doi.org/10.1056/NEJMoa022152>
- [3] Pusic, A. L., Klassen, A. F., Scott, A. M., Klok, J. A., Cordeiro, P. G., & Cano, S. J. (2009). Development of a new patient-reported outcome measure for breast surgery: The BREAST-Q. *Plastic and Reconstructive Surgery*, 124(2), 345–353. <https://doi.org/10.1097/PRS.0b013e3181aee807>
- [4] Coleman, S. R. (1995). Long-term survival of fat transplants: Controlled demonstrations. *Aesthetic Plastic Surgery*, 19(5), 421–425. <https://doi.org/10.1007/BF00453875>

- [5] Bennett, K. G., Qi, J., Kim, H. M., Hamill, J. B., Wilkins, E. G., Mehrara, B. J., & Kozlow, J. H. (2017). Association of fat grafting with patient-reported outcomes in postmastectomy breast reconstruction. *JAMA Surgery*, 152(10), 944–950. <https://doi.org/10.1001/jamasurg.2017.1716>
- [6] Krastev, T., van Turnhout, A., Vriens, E., Smits, L., & van der Hulst, R. (2019). Long-term follow-up of autologous fat transfer vs conventional breast reconstruction and association with cancer relapse in patients with breast cancer. *JAMA Surgery*, 154(1), 56–63. <https://doi.org/10.1001/jamasurg.2018.3744>
- [7] Noor, L., Reeves, H. R., Kumar, D., Alozairi, O., & Bhaskar, P. (2016). Imaging changes after breast reconstruction with fat grafting—Retrospective study of 90 breast cancer. *Pakistan Journal of Medical Sciences*, 32(1), 8–12. <https://doi.org/10.12669/pjms.321.9460>
- [8] American College of Radiology. (2013). *ACR BI-RADS atlas: Breast imaging reporting and data system* (5th ed.).

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