

## Research Article

### Outcome of Autologous Fat Grafting to Breast: A Simple Procedure for Complex Cases

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#### Abstract

**Background:** Autologous fat grafting to the breast is utilized both as a primary procedure and as an ancillary procedure in complex cases, including oncoplastic breast reconstruction, congenital anomalies, and for patients undergoing revision surgeries.

**Objectives:** The objective of the study is to compare the pre-operative and post-operative quality of life and satisfaction scores of patients using Breast Q undergoing fat grafting to the breast in such complex cases.

**Methodology:** This study was conducted at the Jinnah Burn and Reconstructive Surgery Centre in Lahore, spanning from June 2023 to July 2024. We used a pre-post study design. Fat grafting in breast was done in 33 eligible cases. We compared pre-operative and post-operative satisfaction scores of patients. Outcome measure was calculation of satisfaction score pre-operatively and post-operative at 3 months, 6 months and 9 months. Breast-Q questionnaire was completed prior to surgery and after surgery. Breast-Q was analyzed using Q-score software. Paired t test was used to compare pre and post Breast-Q score with  $p < .05$  as statistically significant.

**Results:** The Breast-Q score software was employed to analyses both pre-operative and post-operative data. The findings revealed a substantial improvement in satisfaction scores across various parameters including breast appearance, psychosocial and sexual well-being. However, slight decline was observed in physical well-being scores following the operation.

**Conclusion:** Autologous fat grafting to the breast for complex cases proves to be a straightforward method with promising outcomes. Patients generally accept the technique well, with statistically significant improvements observed in both quality of life and satisfaction scores.

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#### Introduction

Breast reconstruction procedures are performed to address complex deformities, including defects resulting from tumour excision, congenital anomalies, prior surgical interventions, and sequelae of radiation therapy. The field offers a diverse array of options to meet the unique needs of each case. The options available are breast implants,<sup>1,2</sup> reconstruction with LD, TRAM and DIEP flaps<sup>3,4</sup> autologous fat grafting<sup>5,6</sup> and recently developed BRAVA assisted fat grafting.<sup>7</sup> Even with the

provision of the most optimal available options, patients often necessitate ancillary procedures and revision surgeries, both within the same breast and to attain symmetry in the contralateral breast. Our study highlights complex cases where autologous fat grafting served as the primary procedure for congenital anomalies, as well as ancillary procedures for previous reconstructions and cases of prior failed attempts.

While breast implants are frequently chosen for their aesthetic benefits and often yield promising results<sup>1,2</sup>

they come with notable costs and risks of complications.<sup>8</sup> Deciding on their use as ancillary procedures or in revision surgeries can be challenging. Moreover, patients undergoing post-operative radiation therapy may face heightened risks of complications.<sup>9</sup> Although implants generally enjoy good acceptability among patients, their suitability warrants reconsideration in cases with complex etiologies, involving multiple prior procedures or upcoming radiation therapy.

Breast reconstruction with microvascular flaps has promising results in complex cases.<sup>3,4,10</sup> However, this approach demands microvascular surgery, resulting in extended surgical and hospitalization durations. Moreover, for patients with previous breast reconstruction who subsequently experience volume loss, asymmetry, or radiation-related sequelae, opting for additional flap surgery may not be ideal.

Autologous fat grafting to the breast involves transferring fat from areas such as the thighs and abdomen to address contour deformities. This straightforward day surgery method eliminates the need for microvascular skills, additional costs for patients already undergoing multiple procedures, and has demonstrated promising results<sup>5,7,11</sup>. Utilizing the patient's own fat offers a natural appearance, reduces the risk of rejection, and provides simultaneous contouring benefits.<sup>12</sup> Moreover, studies have shown that autologous fat grafting does not adversely affect patient outcomes in cases of breast cancer<sup>13</sup> or long-term follow-ups of breast reconstruction,<sup>14</sup> making it a simpler and viable option in such scenarios.

Another available option is BRAVA-assisted autologous fat grafting, which allows for the transfer of a larger volume of fat in a single session.<sup>7</sup> However, this method entails significant discomfort for the patient,<sup>12</sup> as it requires wearing a suction device for 10-12 hours daily over a period of several months.

The aim of this study was to evaluate the outcomes of autologous fat grafting to the breast in complex cases, focusing on quality of life and patient satisfaction both pre- and post-surgery. The results of this research will offer valuable insights into the feasibility and effectiveness of autologous fat grafting as an alternative technique for breast reconstruction, as well as its utility in ancillary procedures and revision surgeries. These findings have the potential to enhance the understanding of plastic surgeons, aiding them in making informed decisions when selecting the most appropriate approach for individual patients in complex cases.

## Methodology

The study was conducted at Jinnah Burn & Reconstructive Surgery Centre, Lahore from June 2023 to July 2024. The inclusion criteria encompassed female patients aged 18 years and above requiring corrective procedures for various conditions, including congenital deformities, volume loss, asymmetry resulting from previous breast reconstruction, failed implants, correction of surgical defects, and complications from oncoplastic breast surgery such as radiation sequelae or other complex cases. To ensure the study focused on assessing the outcomes of autologous fat grafting specifically in complex cases, patients seeking breast augmentation solely for aesthetic reasons were excluded from participation. Additionally, individuals with uncontrolled co-morbidities that could potentially impact the prognosis of fat uptake were also excluded from the study. The study met all the research protocols, initial study draft was prepared, presented before Ethical Review Board and approval was obtained. Informed consent was obtained following Declaration of Helsinki. An approach was adopted that integrate informed consent and patient education in breast augmentation<sup>15</sup>. The patient underwent thorough counselling regarding autologous fat grafting, including discussions on prognosis, anticipated fat retention rates, the potential necessity of multiple sessions, and potential donor site impacts.

All 33 patients who opted for fat grafting were assessed at the three, six and nine-month mark. Among them, 12 had undergone previous breast reconstruction after tumor surgery and experienced subsequent volume loss and radiation effects. 15 patients sought correction for congenital anomalies, three had experienced failed implant attempts, and one required correction for a surgical defect post-abscess drainage.

During autologous fat grafting procedures, surgeries were conducted under general anesthesia. However, in one case involving a surgical defect post-abscess drainage, local anesthesia was administered. Thighs were predominantly utilized as donor sites to ensure a stable fat source. Fat harvesting was performed using Coleman cannulas and 10ml syringes, employing manual suction to prevent adipocyte damage. The fat preparation involved sedimentation, with only the pure fat layer used for injection. Injection was carried out using 2.5mm transfer cannulas and 10ml syringes, targeting two planes: the deep plane utilizing a reverse liposuction technique and the superficial plane employing a mapping technique. Care was taken to avoid overfilling during

fat transfer, with 150ml to 350ml injected into each breast depending on tissue acceptability. Adhering to the 140% rule, wherein 140ml was transferred for every desired 100ml outcome to counter fat resorption, was paramount. Incisions were closed with rapidly absorbing sutures, and patients were advised to wear customized compression garments for the first week post-operation.

Patients underwent follow-up appointments at 2 weeks, 3 months, 6 months and 9 months post-operation, with the next scheduled follow-up at the one-year mark. The assessment of outcomes was conducted through the utilization of quality of life and patient satisfaction scoring, employing a breast questionnaire. At the 3, 6 and 9-month follow-up, patients responded to additional categories including Satisfaction with Outcome, Satisfaction with Information, Satisfaction with Plastic Surgeon, Satisfaction with Medical Team, and Satisfaction with Office Staff. The raw data collected from the Breast-Q questionnaire was analyzed using the Q-score version 1.0 (Augmentation module). There is no overall or total BREAST-Q<sup>©</sup> score. All BREAST-Q<sup>©</sup> scales were transformed into scores that range from 0-100. The scores are computed by adding the response items together and then converting the raw sum scale score to a score from 0-100. For all BREAST-Q<sup>©</sup> scales, a higher score means greater satisfaction or better QOL (depending on the scale). Breast-Q was analyzed using Q-score software. Statistical analysis was done using SPSS version 21. Paired t test was used to compare pre and post Breast-Q score with  $p < .05$  as statistical significant.

## Results

The Breast Q-score version 1.0, along with its user guide, pre-operative template, and post-operative template, was accessed from the provided link (<https://qportfolio.org/breast-q/breast-q-augmentation/>) (Accessed on 12 December 2022). During the study period, a total of 44 patients met the inclusion criteria. Among them, 33 patients chose autologous fat grafting as their preferred treatment option. Six patients underwent 2nd session of fat graft as well.

The patients underwent follow-up appointments at 15 days, 3 months, 6 months and 9 months post-operatively. The assessment of outcomes in terms of quality of life and patient satisfaction was conducted, once edema had settled and final results were achieved. Due to two patients being lost to follow-up, data from 31 patients were analyzed. The responses were analyzed using Q-score version 1.0 (augmentation module), and statis-

tical analysis was done using SPSS version 21 comparing pre-operative and post-operative responses (Table 1, 2, 3), and calculating post-operative satisfaction scores (Table 4).

**Table 1:** Pre and Post-Op (3 months) quality of life BREAST-Q scores (n=31)

Quality of life BREAST-Q scores	Mean	Std. Deviation	P Value
Satisfaction with Breast Pre-Op	19.0968	11.63144	0.000
Satisfaction with Breast 3 months	60.8387	15.82845	
Psychosocial Well being Pre-Op	5.6129	7.77465	0.000
Psychosocial Well being 3 months	66.8387	19.83784	
Physical well-being Pre-Op	75.7097	12.86907	0.000
Physical Well being 3 months	41.5806	15.08150	
Sexual Well being Pre-Op	12.4839	9.67771	0.000
Sexual Well being 3 months	67.8065	23.32726	

**Table 2:** Pre and Post-Op (6 months) quality of life BREAST-Q scores (n=31)

Quality of life BREAST-Q scores	Mean	Std. Deviation	P Value
Satisfaction with Breast Pre-Op	19.0968	11.63144	0.000
Satisfaction with Breast 6 months	64.6129	18.93089	
Psychosocial Well being Pre-Op	5.6129	7.77465	0.000
Psychosocial Well being 6 months	69.7419	18.99994	
Physical well-being Pre-Op	75.7097	12.86907	0.000
Physical Well being 6 months	60.1290	16.21263	
Sexual Well being Pre-Op	12.4839	9.67771	0.000
Sexual Well being 6 months	74.0968	23.93373	

**Table 3:** Pre and Post-Op (9 months) quality of life BREAST-Q scores (n=31)

Quality of life BREAST-Q scores	Mean	Std. Deviation	P Value
Satisfaction with Breast Pre-Op	19.0968	11.63144	0.000
Satisfaction with Breast 9 months	74.0000	21.15341	
Psychosocial Well being Pre-Op	5.6129	7.77465	0.000
Psychosocial Well being 9 months	72.0968	23.52212	
Physical well-being Pre-Op	75.7097	12.86907	0.006
Physical Well being 9 months	85.5484	15.99133	
Sexual Well being Pre-Op	12.4839	9.67771	0.000
Sexual Well being 9 months	76.3548	22.88893	

Following the intervention, significant improvements were observed in parameters related to satisfaction with breasts, sexual well-being, and psychosocial well-being. However, there was a notable decline in physical well-being, as evidenced by increased symptoms of pain, tightness, and limitations in daily activities. This decline may be attributed to the intervention itself and improved over time.

**Table 4:** Post-Op Satisfaction Score (n=31)

Domain	N	Mean	Std. Deviation
Satisfaction with Outcome 6 months	31	69.3548	25.38313
Satisfaction with information 6 months	31	68.3226	16.83723
Satisfaction with plastic surgeon 6 months	31	75.5161	21.50174
Satisfaction with medical team 6 months	31	81.4194	21.83693
Satisfaction with office staff 6 months	31	80.8065	25.46556

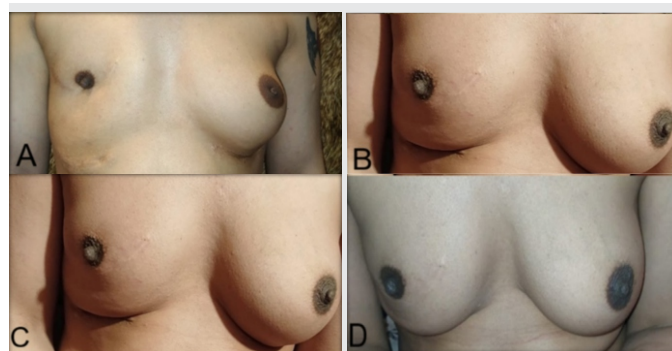
In our post-operative assessment, satisfaction rates were notably high. Given the complexity of cases, often involving patients with previous surgical interventions, it's understandable that the satisfaction with outcome scores were relatively lower. However, patients consistently expressed satisfaction with the surgeon, the medical team, and the overall staff. Representative images are given to show the Results of fat graft (Fig 1 – 5).



**Fig 1:** Patient with asymmetrical breasts was offered with autologous fat graft on right side, and breast lift on left side. Pre & post-operative frontal view (a & b). Pre & post-operative lateral view (c & d).



**Fig 2:** Poland Syndrome. Pre-op images (a). Post-operative results after fat graft (b). Over grafting to achieve ideal results in complex cases can cause complications.



**Fig 3:** Patient with previous failed implants was offered autologous fat grafting (a). Results after first session are shown (b). Results after second session (c).final results after followup (d).



**Fig 4:** Patient with previous DIEP flap reconstruction, immediate results after fat grafting are shown.



**Fig 5:** Patient with tuberous breasts. Pre and post operative pictures are shown. Pre-operative frontal view (A), post-operative results at frontal view (b), pre & post-operative left lateral view (c & d), pre & post-operative right lateral view (e & f).

## Discussion

Autologous fat grafting for breast augmentation is a well-established practice, historically used to address

aesthetic, symmetry, and contour concerns.<sup>16-19</sup> Its technique is thoroughly documented in existing literature.<sup>11</sup> Our aim in this study was to apply this technique to complex cases, particularly in patients who have undergone multiple surgeries and are dealing with radiation-related sequelae. We aimed to provide them with a minimally invasive procedure, leveraging its well-documented safety, efficacy<sup>19</sup> and outcomes, including acceptability, technique,<sup>11</sup> fat resorption rates,<sup>20</sup> application in breast cancer patients<sup>13</sup> and donor site effects as well. Our study focused on treating patients with complex aetiologies using this minimally invasive fat grafting technique to the breast, and subsequently evaluating the outcomes based on quality of life and patient satisfaction scoring.

In other available options we had implants, microsurgical flaps and BRAVA assisted fat grafting. Among the available options, implants are commonly utilized for breast augmentation, offering aesthetically pleasing and widely accepted outcomes.<sup>12</sup> However, they come with drawbacks such as reported issues of capsular contracture, rippling, rupture, and the need for re-operations.<sup>8,21,22</sup> The usage of breast implants is not safe in patients that are undergoing radiation therapy.<sup>9</sup> Additionally, for individuals who have undergone multiple procedures, the added expense of implants can be a disadvantage. Nevertheless, implants can be combined with autologous fat grafting to optimize results.<sup>20</sup>

Breast reconstruction can also be achieved through techniques such as latissimus dorsi (LD) flap, deep inferior epigastric artery (DIEP) flap<sup>10</sup> and transverse rectus abdominus (TRAM) flap.<sup>3,4</sup> While these flaps offer promising results in breast reconstruction, their use for volume enhancement, correcting contour deformities, and addressing asymmetry in patients who have previously undergone reconstruction or radiation therapy is not always ideal. This is because they necessitate microsurgical procedures with prolonged hospital stays and significant morbidity. Furthermore, performing pedicled or microvascular flaps in tissues already irradiated presents additional challenges.

An alternative option involves pre-expansion using the BRAVA bra system followed by autologous fat grafting<sup>7</sup>. Pre-expansion typically begins several months prior to fat transfer. However, this approach was not widely favored by most patients due to the requirement of wearing the expansion device for 10-12 hours daily over a period of 2-3 months.

The procedure of autologous fat grafting demonstrated

minimal morbidity across all aspects, could be performed as a day case surgery, was cost-effective, and readily accepted by our study population. Long-term follow-up studies in breast cancer patients have shown autologous fat grafting to be safe. While an additional layer of fat might affect physical examination, radiological investigations can effectively distinguish between tumor and normal tissue.<sup>23</sup> Similarly autologous fat grafting has no interference in long term follow up of reconstructive cases as well.<sup>24</sup> In cases of radiation sequelae, offering treatment with autologous fat grafts provides additional benefits over implants. Autologous fat promotes neovascularization,<sup>25,26</sup> contrasting with implants that can lead to tissue thinning, ulceration, and exposure. Additionally, in complex cases where implant insertion or microvascular flap anastomosis options are limited, autologous fat transfer presents a straightforward solution.<sup>6</sup>

We evaluated the patient reported outcomes based on quality of life and patient satisfaction using the widely accepted Breast-Q scoring system.<sup>27</sup> Patient reported outcome measures (PROM) are very essential to evaluate benefits of surgical techniques.<sup>28</sup> PROMs can be recorded in a paper format and in electronic formats, with some studies showing superiority of e-PROMs.<sup>29</sup> The method we chose is Breast-Q which is a multi scale, multi module patient reported instrument measuring health related quality of life and patient satisfaction in women who underwent breast surgery.<sup>30</sup> The limitation of study was that we did not assess patients based on the percentage of fat take, as our results were consistent with those already documented in the literature.<sup>20</sup> Moreover, the small sample size restricts the ability to identify statistically significant factors that could influence long-term outcomes for this specific group of patients. Comprehensive studies with larger sample sizes for a longer duration will be essential to thoroughly investigate this matter.

The findings of this study can guide plastic surgeons in considering autologous fat grafting as a more dependable and widely accepted option. This approach has the potential to alleviate the burden on patients and the healthcare system by reducing morbidity, improving cost efficiency, and minimizing hospital stays.

## Conclusion

Assessed through the lens of Breast Q Scorer version 1.0, autologous fat grafting in the breast emerges as a substantial advancement in plastic surgery. Our findings

highlight its effectiveness in fostering heightened patient satisfaction and enhancing quality of life post-breast reconstruction, especially in complex cases. By furnishing evidence-based insights, this study aids patients and healthcare providers in making informed decisions, thereby promoting patient-centered care and optimizing outcomes in breast surgery.

#### Ethical Approval

The Institutional Review Board (IRB), Jinnah Burn & Reconstructive Surgery Centre, Lahore approved this study vide letter No. 6770/ED/JP&RSC dated 08-11-2022

**Conflict of Interest:** None

**Source of Funding:** None

#### Authors contribution

**Bilal Umar:** Data collection, Conception and design of the study, analysis and interpretation, Final approval of the version to be published and accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**Ammara Rabbani:** Drafting the work, Study design, Data Collection and analysis and interpretation

**Barira Bashir:** Conception and design of the study, critical revision of the article and final approval of the article to be published

**Hafiz Khalil Ahmad:** Data collection, Manuscript Revision, analysis and interpretation of data

**Muhammad Tariq Iqbal:** Article Editing, Manuscript Revision, analysis and interpretation of data

**Kamran Khalid:** Article Editing, Manuscript Revision analysis and interpretation of data

All authors meet the ICMJE authorship criteria and agree to be accountable for all aspects of the work, ensuring the accuracy and integrity of the research.

#### References

1. Hammond DC, Schmitt WP, O'Connor EA. Treatment of breast animation deformity in implant-based reconstruction with pocket change to the subcutaneous position. *Plast Reconstr Surg.* 2015 Jun;135(6):1540-1544. doi: 10.1097/PRS.0000000000001277. PMID: 26017590.
2. Sigalove S, Maxwell GP, Sigalove NM, Storm-Dickerson TL, Pope N, Rice J, Gabriel A. Prepectoral Implant-Based Breast Reconstruction: Rationale, Indications, and Preliminary Results. *Plast Reconstr Surg.* 2017 Feb;139(2):287-294. doi: 10.1097/PRS.0000000000002950. PMID: 28121858.
3. Knox ADC, Ho AL, Leung L, Tashakkor AY, Lennox PA, Van Laeken N, Macadam SA. Comparison of Outcomes following Autologous Breast Reconstruction Using the DIEP and Pedicled TRAM Flaps: A 12-Year Clinical Retrospective Study and Literature Review. *Plast Reconstr Surg.* 2016 Jul;138(1):16-28. doi: 10.1097/PRS.0000000000001747. PMID: 26267400.
4. Selber JC, Nelson J, Fosnot J, Goldstein J, Bergey M, Sonnad SS, Serletti JM. A prospective study comparing the functional impact of SIEA, DIEP, and muscle-sparing free TRAM flaps on the abdominal wall: part I. unilateral reconstruction. *Plast Reconstr Surg.* 2010 Oct;126(4):1142-1153. doi: 10.1097/PRS.0b013e3181f02520. PMID: 20885239.
5. Coleman SR. Structural fat grafting: more than a permanent filler. *Plast Reconstr Surg.* 2006 Sep;118(3 Suppl):108S-120S. doi: 10.1097/01.prs.0000234610.81672.e7. PMID: 16936550.
6. Claro F Jr, Pereira FL, Pinto-Neto AM. Fat Grafting to the Breast, a Simple Procedure for a Very Complex Reconstruction. *Plast Reconstr Surg Glob Open.* 2016 Feb 5;4(1):e594. doi: 10.1097/GOX.0000000000000580. PMID: 27104093; PMCID: PMC4801102.
7. Khouri RK, Eisenmann-Klein M, Cardoso E, Cooley BC, Kacher D, Gombos E, Baker TJ. Brava and autologous fat transfer is a safe and effective breast augmentation alternative: results of a 6-year, 81-patient, prospective multicenter study. *Plast Reconstr Surg.* 2012 May;129(5):1173-1187. doi: 10.1097/PRS.0b013e31824a2db6. PMID: 22261565.
8. Yang S, Klietz ML, Harren AK, Wei Q, Hirsch T, Aitzetmüller MM. Understanding Breast Implant Illness: Etiology is the Key. *Aesthet Surg J.* 2022 Mar 15;42(4):370-377. doi: 10.1093/asj/sjab197. PMID: 33871569.
9. Muresan H, Lam G, Cooper BT, Perez CA, Hazen A, Levine JP, Saadeh PB, Choi M, Karp NS, Ceradini DJ. Impact of Evolving Radiation Therapy Techniques on Implant-Based Breast Reconstruction. *Plast Reconstr Surg.* 2017 Jun;139(6):1232e-1239e. doi: 10.1097/PRS.0000000000003341. PMID: 28538549.
10. van Rooij JAF, Bijkerk E, van der Hulst RRJW, van Kuijk SMJ, Tuinder SMH. Replacing an Implant-Based with a DIEP Flap Breast Reconstruction: Breast Sensation and Quality of Life. *Plast Reconstr Surg.* 2023 Aug 1;152(2):293-304. doi: 10.1097/PRS.0000000000010315. Epub 2023 Feb 27. PMID: 36827485.
11. Delay E, Garson S, Tousson G, Sinna R. Fat injection to the breast: technique, results, and indications based on 880 procedures over 10 years. *Aesthet Surg J.* 2009 Sep-Oct;29(5):360-76. doi: 10.1016/j.asj.2009.08.010. PMID: 19825464.

12. Zhang X, Cai L, Yin B, Han X, Li F. Total breast reconstruction using large-volume condensed and viable fat grafting after mastectomy. *J Plast Reconstr Aesthet Surg.* 2021 May;74(5):966-973. doi: 10.1016/j.bjps.2020.10.109. Epub 2020 Nov 26. PMID: 33341385.
13. Hamza A, Lohsiriwat V, Rietjens M. Lipofilling in breast cancer surgery. *Gland Surg.* 2013 Feb;2(1):7-14. doi: 10.3978/j.issn.2227-684X.2013.02.03. PMID: 25083450; PMCID: PMC4115722.
14. Kanchwala SK, Glatt BS, Conant EF, Bucky LP. Autologous fat grafting to the reconstructed breast: the management of acquired contour deformities. *Plast Reconstr Surg.* 2009 Aug;124(2):409-418. doi: 10.1097/PRS.0b013e3181aeadd. PMID: 19644255.
15. Tebbetts JB, Tebbetts TB. An approach that integrates patient education and informed consent in breast augmentation. *Plast Reconstr Surg.* 2002 Sep 1; 110 (3): 971-8; discussion 979-81. doi: 10.1097/00006534-200209010-00039. PMID: 12172168.
16. Bartsich S, Ascherman JA, Whittier S, Yao CA, Rohde C. The breast: a clean-contaminated surgical site. *Aesthet Surg J.* 2011 Sep;31(7):802-6. doi: 10.1177/1090820X11417428. PMID: 21908811.
17. Bircoll M. Cosmetic breast augmentation utilizing autologous fat and liposuction techniques. *Plast Reconstr Surg.* 1987 Feb;79(2):267-71. doi: 10.1097/00006534-198702000-00022. PMID: 3809274.
18. Bircoll M, Novack BH. Autologous fat transplantation employing liposuction techniques. *Ann Plast Surg.* 1987 Apr;18(4):327-9. doi: 10.1097/0000637-198704000-00011. PMID: 3579174.
19. Coleman SR, Saboeiro AP. Fat grafting to the breast revisited: safety and efficacy. *Plast Reconstr Surg.* 2007 Mar;119(3):775-85; discussion 786-7. doi: 10.1097/01.prs.0000252001.59162.c9. PMID: 17312477.
20. Sommeling CE, Van Landuyt K, Depypere H, Van den Broecke R, Monstrey S, Blondeel PN, Morrison WA, Stillaert FB. Composite breast reconstruction: Implant-based breast reconstruction with adjunctive lipofilling. *J Plast Reconstr Aesthet Surg.* 2017 Aug;70(8):1051-1058. doi: 10.1016/j.bjps.2017.05.019. Epub 2017 May 22. PMID: 28599842.
21. Hall-Findlay EJ. Breast implant complication review: double capsules and late seromas. *Plast Reconstr Surg.* 2011 Jan;127(1):56-66. doi: 10.1097/PRS.0b013e3181fad34d. PMID: 21200201.
22. Handel N, Cordray T, Gutierrez J, Jensen JA. A long-term study of outcomes, complications, and patient satisfaction with breast implants. *Plast Reconstr Surg.* 2006 Mar;117(3):757-67; discussion 768-72. doi: 10.1097/01.prs.0000201457.00772.1d. PMID: 16525261.
23. Gutowski KA; ASPS Fat Graft Task Force. Current applications and safety of autologous fat grafts: a report of the ASPS fat graft task force. *Plast Reconstr Surg.* 2009 Jul;124(1):272-280. doi: 10.1097/PRS.0b013e3181a09506. PMID: 19346997.
24. Claro F Jr, Figueiredo JC, Zampar AG, Pinto-Neto AM. Applicability and safety of autologous fat for reconstruction of the breast. *Br J Surg.* 2012 Jun;99(6):768-80. doi: 10.1002/bjs.8722. Epub 2012 Apr 4. PMID: 22488516.
25. Claro F Jr, Figueiredo JC, Zampar AG, Pinto-Neto AM. Applicability and safety of autologous fat for reconstruction of the breast. *Br J Surg.* 2012 Jun;99(6):768-80. doi: 10.1002/bjs.8722. Epub 2012 Apr 4. PMID: 22488516.
26. de Figueiredo JC, Naufal RR, Claro de Oliveira F Jr, Arias V, Bueno Pereira PR, Inaco Cirino LM. Prefabricated flap composed by skin and terminal gastromental vessels. Experimental study in rabbits. *J Plast Reconstr Aesthet Surg.* 2010 Jun;63(6):e525-8. doi: 10.1016/j.bjps.2010.01.033. Epub 2010 Feb 16. PMID: 20163997.
27. Pusic AL, Reavey PL, Klassen AF, Scott A, McCarthy C, Cano SJ. Measuring patient outcomes in breast augmentation: introducing the BREAST-Q Augmentation module. *Clin Plast Surg.* 2009 Jan;36(1):23-32, v. doi: 10.1016/j.cps.2008.07.005. PMID: 19055958.
28. Voineskos SH, Nelson JA, Klassen AF, Pusic AL. Measuring Patient-Reported Outcomes: Key Metrics in Reconstructive Surgery. *Annu Rev Med.* 2018 Jan 29; 69: 467-479. doi: 10.1146/annurev-med-060116-022831. PMID: 29414263.
29. Kaur M, Pusic A, Gibbons C, Klassen AF. Implementing Electronic Patient-Reported Outcome Measures in Outpatient Cosmetic Surgery Clinics: An Exploratory Qualitative Study. *Aesthet Surg J.* 2019 May 16; 39(6): 687-695. doi: 10.1093/asj/sjy280. PMID: 30335134.
30. Cano SJ, Klassen AF, Scott AM, Pusic AL. A closer look at the BREAST-Q(®). *Clin Plast Surg.* 2013 Apr; 40 (2):287-96. doi: 10.1016/j.cps.2012.12.002. PMID: 23506769.