Journal of Experimental and Clinical Medicine
https://dergipark.org.tr/omujecm

Research Article

J Exp Clin Med
2024; 41(3): 600-605
doi: 10.52142/omujecm.41.3.26

Reconstructive options and analysis in breast reconstruction: Our clinical experience

Ahmet DEMİR [1], İlker ALTUNDAĞ [1,*], Engin SELAMİOĞLU [2], Mustafa Sertaç OCAK [1], Mehmet Berke GÖZTEPE [1], Cihan GENÇTÜRK [1]

[1]Department of Plastic Reconstructive and Aesthetic Surgery, Faculty of Medicine, Ondokuz Mayıs University, Samsun, Türkiye

[2]Department of Plastic Reconstructive and Aesthetic Surgery, Faculty of Medicine, Haliç University, İstanbul, Türkiye

Received: 29.05.2024 • **Accepted/Published Online:** 08.07.2024 • **Final Version:** 30.09.2024

Abstract

Breast cancer ranks first worldwide in cancer-related deaths in women. The percentage of breast cancer in Turkey has almost doubled in the last decade. Breast cancer treatment encompasses a broad spectrum of oncological treatments, including radiotherapy, chemotherapy and oncoplastic surgical treatments. Oncoplastic reconstruction is an integral part of breast cancer treatment, providing favorable aesthetic and psychological outcomes. In our study, the breast reconstructions of 166 patients who underwent mastectomy due to tumoral pathologies, performed by our institute between 2005 and 2023, were analyzed from various aspects. Based on our 19 years of experience, the number of breast reconstruction surgeries has increased dramatically in the last ten years; however, the repair trend has shifted to immediate and also implant-based reconstruction procedures.

Keywords: breast reconstruction, breast cancer, immediate, delayed, alloimplant, autologous

1. Introduction

Breast cancer ranks first worldwide in cancer-related deaths in women (1). In 2018, around 2.1 million new breast cancers were diagnosed worldwide, and 1 in 4 cancer diagnoses was reported as breast cancer (4). Breast cancer is the most commonly diagnosed cancer in the extensive majority of countries (154/185 countries) and is the leading cause of cancer-related deaths in more than 100 countries (5). The incidence of breast cancer in Turkey has nearly doubled in the last decade (24/100,000 in 1994 and 43.8/100,000 in 2015) (2, 3). In addition, in developed countries, mammography screening and increased attention have increased the diagnosis of early-stage and nonpalpable breast cancer (6). Breast cancer treatment is a broad spectrum covering oncological treatments such as radiotherapy, chemotherapy, and oncoplastic surgical treatments. Significant changes have occurred in the surgical modality in our country over time. In 2008, only 35% of patients underwent breast-conserving surgery, while this rate increased to 39% in 2014 and 57% in 2018 (7). Today, breast-conserving surgery is a secure treatment for most females with early-stage breast cancer and can now be safely performed in 70-80% of cases where surgery is required (8). With the evolution of breast ablation therapy to a less aggressive form, the number of breast reconstructions has also increased enormously (1, 9). Breast reconstruction is a major part of breast cancer treatment with favorable aesthetic and psychological outcomes. Reconstruction covers a broad spectrum, from the creation of a breast-like organ after a mastectomy performed years ago to the immediate reconstruction of the patient's breast following a mastectomy completed a few minutes ago. Breast reconstruction can be implant-based, autologous (locoregional, free flap), or a combination. In addition, breast reconstruction is nowadays an individual treatment modality shaped by the timing of surgery (immediate or delayed) and the patient's condition and desire (10).

2. Materials and Methods

In our study, breast reconstructions of mastectomy patients due to tumoral pathologies performed by our institute between 2005 and 2023 were analyzed from various aspects. Patients who underwent mastectomy caused by breast tumor or genetic predisposition to the tumor and underwent reconstruction between 01.01.2005 and 31.12.2023 were screened using the hospital database program. Our inclusion criteria were that the patients had completed at least six months of follow-up and that the etiology of mastectomy was tumoral pathologies. Patients who did not complete six months follow-up and patients who were operated on for breast agenesis, trauma, or primary aesthetic reasons other than tumoral pathologies were excluded from the study. Thus, 166 patients who fulfilled the criteria were included in our study. One hundred sixty-six patients were operated on from the beginning of 2005 until the end of 2023. All of our patient groups consisted of Caucasian women. The mean age of the screened patients was 44 years, with a minimum of 27 years and a maximum of 70 years. Date,

*Correspondence: ilker_altundag@windowslive.com

age, mean follow-up period, neoplasm histology, immediate and delayed repair, repair method (autologous, implant, or combined repair), and complications were recorded.

2.1. Statistical Analysis

The IBM SPSS 26.0 package program evaluated the collected data. Mean, typical deviation, median, minimum, and maximum values for quantitative (numerical) variables and frequency (%) values for qualitative (categorical) variables were used as descriptive statistics. Yates Chi-Square analyses were performed to compare the proportions. Significance was evaluated at $p<0.05$ level in all comparisons.

3. Results

One hundred sixty-six patients were operated on from the beginning of 2005 until the end of 2023 (Fig. 1). All of our patient groups consisted of women. The mean age of the screened patients was 44 years, with a minimum of 27 years and a maximum of 70 years. The mean follow-up period was 22 months (min. six months – max. 96 months). Seventy-one patients were operated on the right breast, 51 on the left breast, and 44 on both breasts. One hundred twelve patients were operated on immediately, and 54 were operated on as delayed.

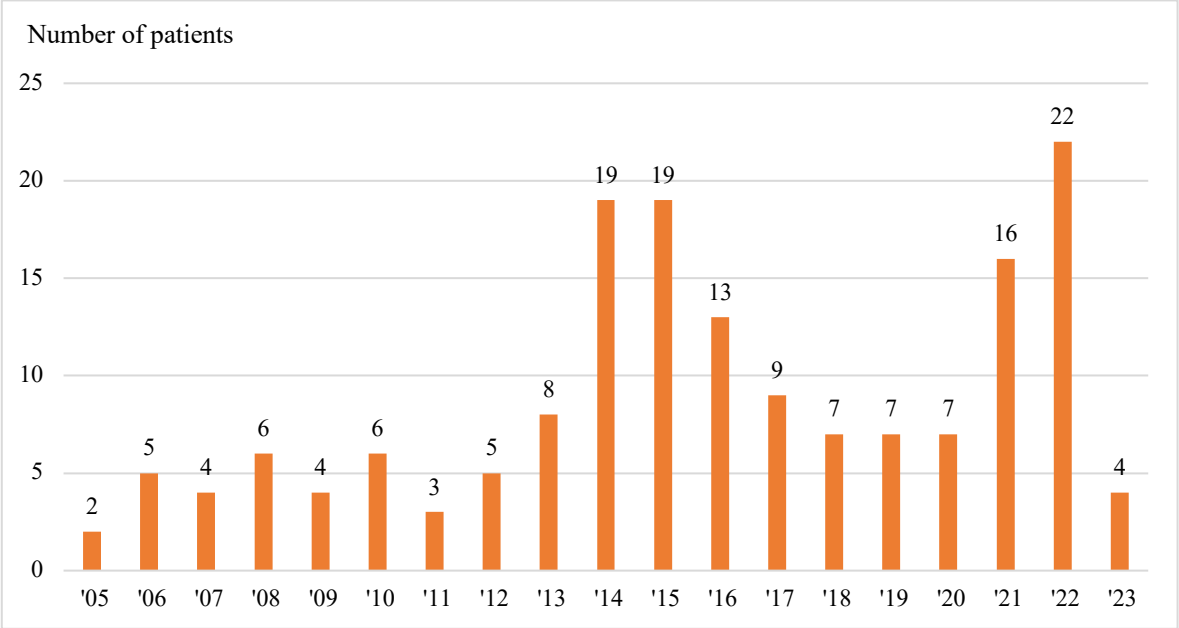

Fig. 1. Distribution of the number of patients by years

Between 2005 and 2013, 43 patients underwent breast reconstruction surgery; this number increased to 123 in 2014-2023 (Fig. 1). A total of 54 patients underwent delayed repair; 26 were performed until 2014, and 28 underwent delayed reconstruction surgery from 2014 to 2023. In contrast, while there were 17 immediate reconstructions until 2013, this number increased to 95 between 2014-2023 (Fig. 2). The number of delayed reconstruction operations performed in the period before 2014 is significantly higher than the period after 2014 ($p<0.001$). The number of immediate reconstruction operations performed after 2014 is significantly higher than before 2014 ($p<0.001$). Twenty-four patients (14%) were operated with autologous flaps (ten free deep inferior epigastric artery-based perforator (DIEP) flap, nine pedicled transverse rectus abdominis myocutaneous (TRAM) flap, three pedicled latissimus dorsi myocutaneous flap, and one free latissimus dorsi muscle flap, 107 patients (64%) were operated with implant-based repair technique (with direct prosthesis (70) or expander (37)), and 35 patients (22%) were operated with the combined repair technique of latissimus dorsi myocutaneous flap and prosthesis, which we mostly use as a salvage method in our clinic (Fig. 3). The flap of one patient who was reconstructed with DIEP was deemed non-viable due to early pedicle thrombosis, the flap was debrided, replaced with an expander and then reconstructed with a final prosthesis.

Of the 24 patients reconstructed with autologous flaps, 16 were performed in the period until 2013 and eight between 2014 - 2023. There will be a dramatic increase in implant-based reconstructions after 2014. Until 2014, 17 patients were reconstructed with implants; this number increased to 90 by 2023. It is observed that all implant-based reconstructions have increased significantly in the last decade.

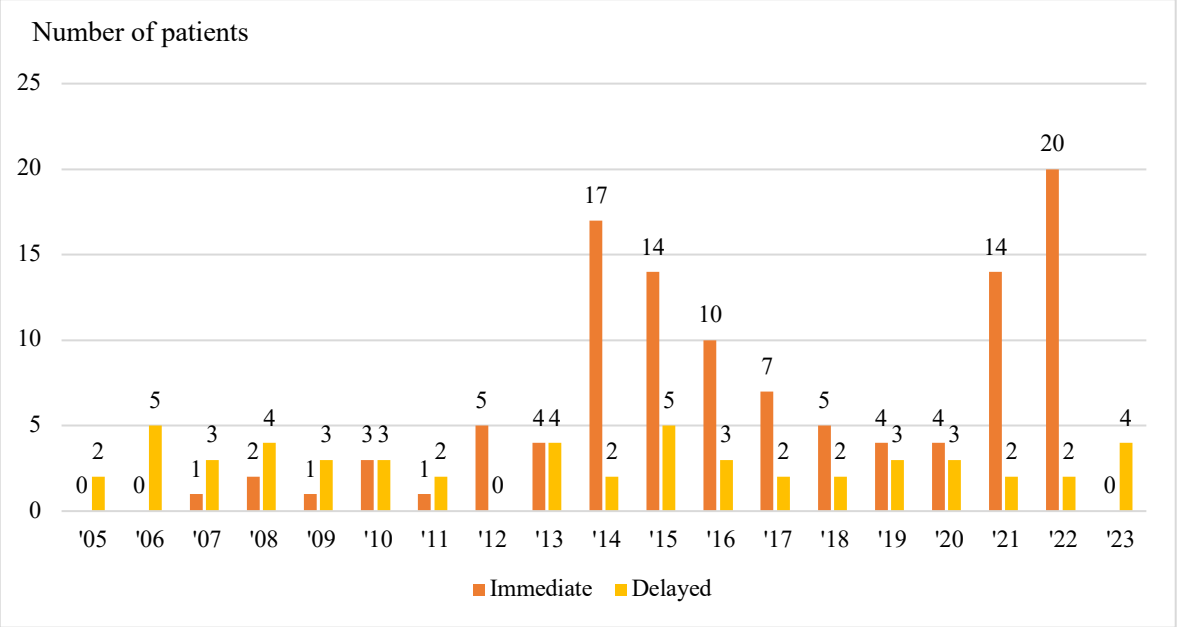

Fig. 2. Comparison of immediate and delayed reconstruction by years

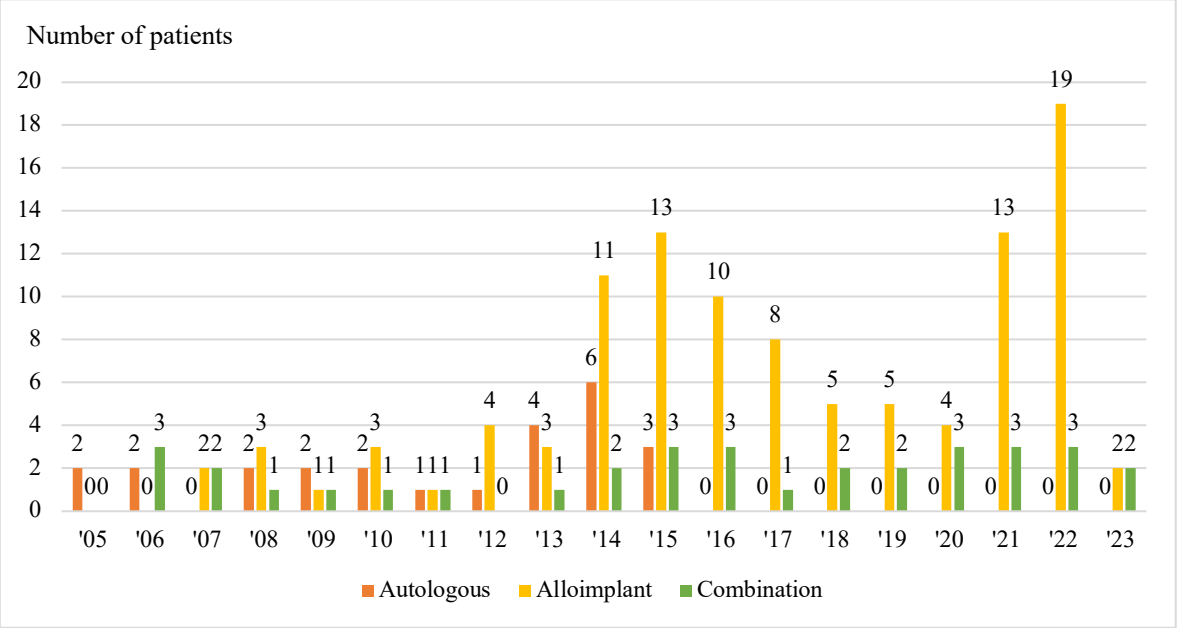

Fig. 3. Type of reconstructive methods by years

One hundred sixteen patients with invasive ductal carcinoma (70%), 17 patients with ductal carcinoma in situ (DCIS) (10%), ten patients with invasive lobular carcinoma (6%), six patients with fibrocystic breast disease (3%), four patients with mucinous carcinoma (2%), four patients with mixed breast carcinoma (2%), three patients underwent mastectomy for phylloides tumor (1.8%), and one patient each for fibroadenoma, bilateral intraductal hyperplasia, sclerosing adenosis, medullary carcinoma, adenoid cystic carcinoma, and reconstruction surgery was performed by us. One patient with BRCA-1 positivity underwent bilateral mastectomy for prophylaxis and reconstruction (Fig. 4).

A whole of 112 patients experienced immediate reconstruction. Seventeen were until 2014; 95 patients underwent immediate reconstruction from 2014 to 2023. After 2014, the number of breast reconstructions performed has shown a statistically significant increase compared to the previous period (p<0.001).

In our study, the use of implants in immediate reconstructions is by far more prominent (92 all implants vs. seven autologous flaps) (p<0.001). The modality of breast reconstruction in our study has significantly shifted towards implants and simultaneous repair over the years.

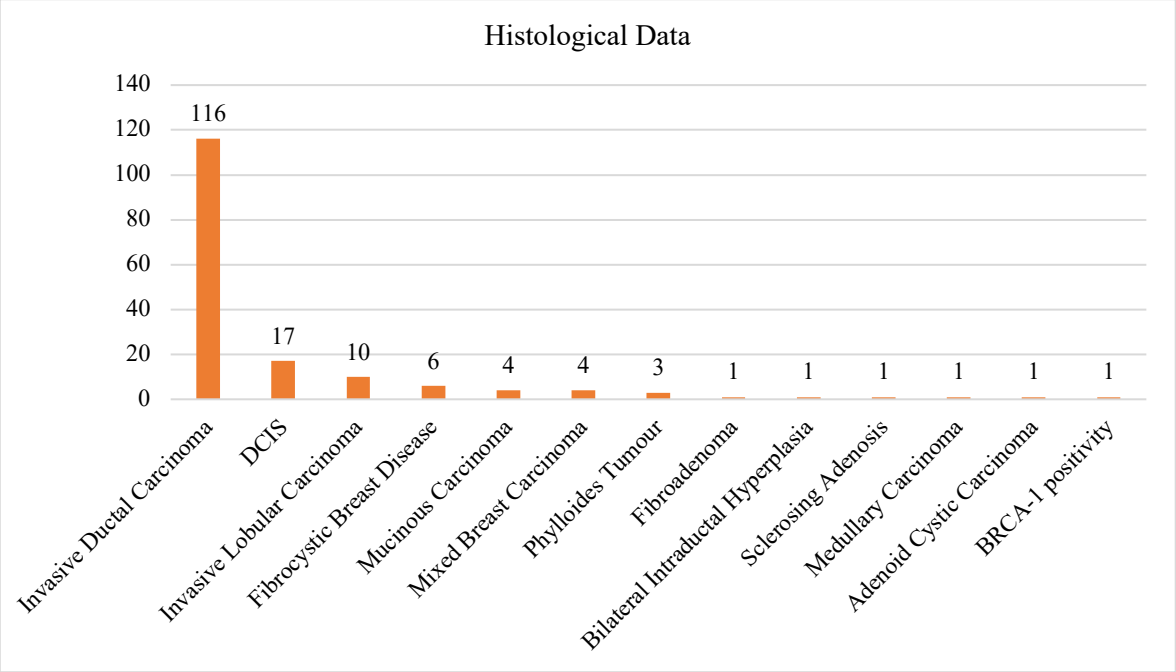

Fig. 4. Etiology of mastectomy

Complications were observed in 45 of 166 patients (27%). Complications were found in 36 immediate and nine delayed reconstruction patients. No statistical significance was observed between the complication rates of our immediate and delayed operations (p>0.05). Various complications were observed in 36 patients who underwent repair with all implants and six patients who underwent repair with autologous flaps. Our complications in cases who underwent repair with autologous flaps are as follows: two total flap necrosis, one seroma, one fat necrosis, and one infection, totaling five DIEP flap complications. The necrotic DIEP flap was replaced with an expander in the early period, and then salvage reconstruction was performed with a final prosthesis. One incisional hernia was observed at the donor site of the patient who underwent reconstruction with a pedicled TRAM flap.

Of the complications seen after repair with alloimplants, 23 occurred in the patient who underwent repair with direct prosthesis and 13 occurred in the patient who underwent expander placement. The prosthesis was exposed after necrosis of the skin flaps in seven of the breasts reconstructed with direct prosthesis in the acute period, and all of them were reconstructed with latissimus dorsi muscle-skin flap as a salvage method. Apart from these, partial necrosis of five nipple-areola complexes, four capsular contractures, two infections, two-incision dehiscence, one fat necrosis, one hematoma, and partial skin necrosis in one breast was observed.

In the patients who were primarily expander implanted, a total of four partial necrosis of the nipple-areola complex, one expander perforation, three expander exposures (implants were removed), two seroma, two capsular contracture, and one wound infection were observed.

It was observed that there was no noteworthy difference between the complication rates of our cases who underwent reconstruction with direct prosthesis and tissue expander placement first (p>0.05).

4. Discussion

One hundred sixty-six patients were operated on from the beginning of 2005 until the end of 2023. The mean age of the screened patients was 44 years. According to a study conducted on 20,000 women in Turkey, the mean age was 45-49 years, and this result is consistent with our study (11).

Between 2005 and 2013, 43 patients underwent breast reconstruction surgery; this number increased to 123 in 2014-2023. Recent studies also show that an increasing percentage of mastectomy patients are undergoing breast reconstruction, that patients are more informed about breast reconstruction and that they are requesting breast reconstruction (6).

Of the 24 patients reconstructed with autologous flaps, 16 were performed in the period up to 2014 and eight up to 2023. There will be a dramatic increase in implant-based reconstructions after 2014. Until 2014, 17 patients were reconstructed with implants; this number increased to 90 by 2023. In the USA, allogenous reconstructions currently account for about 65% of all breast reconstructions (12). Implant reconstruction is becoming an attractive option Considering advantages such as acceptable, good cosmetic results, and patient satisfaction (13, 14).

One hundred sixteen patients with invasive ductal carcinoma (70%) were identified in our patient group. In a comprehensive study of 20,000 women in Turkey, 77% of the neoplasm histology was reported as invasive ductal carcinoma, which is consistent with our study (11).

After 2014, the number of breast reconstructions performed

has shown a statistically significant increase compared to the previous period (p<0,001). Immediate breast reconstruction has become a more trendy repair method over time (15, 16) , and more than 70% of breast reconstructions are achieved presently with mastectomy (17).

In our study, the use of implants in immediate reconstructions is by far more prominent (92 all implants vs. seven autologous flaps) (p<0.001). The modality of breast reconstruction in our study has significantly shifted towards implants and simultaneous repair over the years. When considered globally, it is undeniable that breast reconstructions have evolved in this direction (6).

Complications were observed in 45 of 166 patients (27%). Complications were found in 36 immediate and nine delayed reconstruction patients. No statistical significance was observed between the complication rates of our immediate and delayed operations (p>0.05). Various complications were observed in 36 patients who underwent repair with all implants and six patients who underwent repair with autologous flaps. Our complications in cases who underwent repair with autologous flaps are as follows: two total flap necrosis, one seroma, one fat necrosis, and one infection, totaling five DIEP flap complications. The necrotic DIEP flap was replaced with an expander in the early period, and then salvage reconstruction was performed with a final prosthesis. One incisional hernia was observed at the donor site of the patient who underwent reconstruction with a pedicled TRAM flap. According to literature, it was found that total flap loss in autologous reconstructions was less than 1-4% (this rate was 8% in our study); major complications such as total-partial flap loss, fat necrosis, donor site morbidity were between 7.7% and 28.3% (17% in our study); total complications were between 22.6% and 44.3% (25% in our study) (Table 1) (18–21). Although some studies have shown that autologous reconstruction is significantly more complicated than implants, no noteworthy difference was found in our study (p>0.05) (6, 22).

Table 1. Comparison of complications of autologous reconstructions

	Related articles	Our study
Total flap loss	<1-4%	8%
Major complications -total-partial flap loss, -fat necrosis, -donor side morbidity	7.7% - 28.3%	17%
Total complications	22.6% - 44.3%	25%

Of the complications seen after repair with alloimplants, 23 occurred in the patient who underwent repair with direct prosthesis and 13 occurred in the patient who underwent expander placement. The prosthesis was exposed after necrosis of the skin flaps in seven of the breasts reconstructed with direct prosthesis in the acute period, and all of them were reconstructed with latissimus dorsi muscle-skin flap as a salvage method. Apart from these, partial necrosis of five nipple-areola complexes, four capsular contractures, two infections, two-incision dehiscence, one fat necrosis, one hematoma, and partial skin necrosis in one breast was observed.

In the patients who were primarily expander implanted, a total of four partial necrosis of the nipple-areola complex, one expander perforation, three expander exposures (implants were removed), two seroma, two capsular contracture, and one wound infection were observed. In studies, the rate of implant explantation in patients undergoing allogeneic reconstruction ranged between 2.7% and 3.8% (3.7% in our study). Major complication rates such as implant extrusion, premature explantation, capsular contracture, migration, and device malfunction ranged from 4% to 30.4% (16% in our study). Total complication rates are between 5.8% and 49% (33.6% in our study) (Table 2) (18, 19, 21). It was observed that there was no noteworthy difference between the complication rates of our cases who underwent reconstruction with direct prosthesis and tissue expander placement first (p>0.05). Ilonzo et al. also reported no distinction between reconstructions performed with direct prosthesis or expander (6). In addition, a systematic review meta-analysis comparing direct implant reconstruction and conventional two-step implant breast reconstruction indicated no significant difference between the two repair methods (23).

Table 2. Comparison of complications of alloimplant based reconstructions

	Related Articles	Our Study
Implant explantation	2.7% - 3.8%	3.7%
Major complications -implant extrusion, -premature explantation, -capsular contracture, -device malfunction	4% - 30.4%	16%
Total complications	5.8% - 49%	33.6%

This study is retrospective and represents patients from a single center. Also, 2005 was the year of transition of our institution from the classical file system to the digital database programme. Therefore, demographic information such as residence, occupation, marital status, job, socioeconomic status and education level of some patients could not be obtained because they were not entered into the digital database programme. These demographic parameters could not be included in our study. For the same reason, the use of dermal substitute or mesh in patients undergoing allomimplant-based reconstruction was not evaluated as it could not be confirmed.

Treatment planning and management of an individual diagnosed with breast cancer is a complex process involving oncological, socioeconomic, psychological, and reconstructive variables. Breast reconstruction is an integral part of holistic breast cancer treatment. While reconstructive surgery is an oncologically safe treatment, it reduces the impact of the

diagnosis and treatment of breast cancer on the patient's mental health, thereby improving the patient's quality of life, social participation, and self-esteem. According to our 19 years of experience, the number of breast reconstruction surgeries has increased greatly in the last ten years; however, the repair trend has shifted to immediate and also implant-based reconstruction procedures.

Ethical Statement

The study protocol was approved by the Clinical Research Ethics Committee of Ondokuz Mayıs University (Date: 27.03.2024/No:2024/153).

Conflict of interest

The authors declared no conflict of interest.

Funding

No funding was used for the study.

Acknowledgments

None to declare.

Authors' contributions

Concept: A.D., İ.A., Design: A.D., İ.A., Data Collection or Processing: İ.A., M.S.O., Analysis or Interpretation: İ.A., E.S., M.S.O., M.B.G., Literature Search: İ.A., C.G., Writing: İ.A.

References

1. Schmauss D, Machens HG, Harder Y. Breast Reconstruction after Mastectomy. Vol. 2, Frontiers in Surgery. Frontiers Media S.A.; 2016.
2. Ozmen V. Breast Cancer in Turkey: Clinical and Histopathological Characteristics (Analysis of 13.240 Patients). J Breast Health. 2014 May 3;10(2):98–105.
3. Ozmen V, Boylu S, Ok E, Canturk NZ, Celik V, Kapkac M, et al. Factors affecting breast cancer treatment delay in Turkey: a study from Turkish Federation of Breast Diseases Societies. Eur J Public Health. 2015 Feb 1;25(1):9–14.
4. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018 Nov;68(6):394–424.
5. Ferlay J, Colombet M, Soerjomataram I, Mathers C, Parkin DM, Piñeros M, et al. Estimating the global cancer incidence and mortality in 2018: GLOBOCAN sources and methods. Int J Cancer. 2019 Apr 15;144(8):1941–53.
6. Ilonzo N, Tsang A, Tsantes S, Estabrook A, Thu Ma AM. Breast reconstruction after mastectomy: A ten-year analysis of trends and immediate postoperative outcomes. Breast. 2017 Apr 1;32:7–12.
7. Çakmak GK, Emiroğlu S, Sezer A, Canturk NZ, Yeniay L, Kuru B, et al. Surgical Trends in Breast Cancer in Turkey: An Increase in Breast-Conserving Surgery. JCO Glob Oncol. 2020 Feb 28(6):285-292. doi:10.1200/JGO.19.00275.
8. Effect of radiotherapy after breast-conserving surgery on 10-year recurrence and 15-year breast cancer death: meta-analysis of individual patient data for 10 801 women in 17 randomised trials. The Lancet. 2011;378(9804):1707–16.
9. Seidel W, Bins-Ely J, Ongaratto Barazzetti D, Della Giustina R, Walter GP, Ferri TA, et al. Breast reconstruction after mastectomy for breast cancer: Comparative analysis of early and delayed reconstruction. Minerva Chir. 2017 Jun 1;72(3):188–99.
10. Bertozzi N, Pesce M, Santi P, Raposio E. One-Stage Immediate Breast Reconstruction: A Concise Review. Vol. 2017, BioMed Research International. Hindawi Limited; 2017.
11. Özmen V, Özmen T, Doğru V. Breast Cancer in Turkey; An Analysis of 20.000 Patients with Breast Cancer. Eur J Breast Health. 2019 Jul 1;15(3):141–6.
12. Cemal Y, Albornoz CR, Disa JJ, McCarthy CM, Mehrara BJ, Pusic AL, et al. A Paradigm Shift in U.S. Breast Reconstruction: Part 2. The Influence of Changing Mastectomy Patterns on Reconstructive Rate and Method. Plast Reconstr Surg. 2013;131(3).
13. Gardani M, Bertozzi N, Grieco MP, Pesce M, Simonacci F, Santi P, et al. Breast reconstruction with anatomical implants: A review of indications and techniques based on current literature. Annals of Medicine and Surgery. 2017;21:96–104.
14. Veronesi U, Stafyla V, Petit JY, Veronesi P. Conservative mastectomy: Extending the idea of breast conservation. Vol. 13, The Lancet Oncology. 2012.
15. Butler PD, Nelson JA, Fischer JP, Wink JD, Chang B, Fosnot J, et al. Racial and age disparities persist in immediate breast reconstruction: an updated analysis of 48,564 patients from the 2005 to 2011 American College of Surgeons National Surgery Quality Improvement Program data sets. The American Journal of Surgery. 2016;212(1):96–101.
16. Albornoz CR, Bach PB, Mehrara BJ, Disa JJ, Pusic AL, McCarthy CM, et al. A Paradigm Shift in U.S. Breast Reconstruction: Increasing Implant Rates. Plast Reconstr Surg. 2013;131(1).
17. Yoon AP, Qi J, Brown DL, Kim HM, Hamill JB, Erdmann-Sager J, et al. Outcomes of immediate versus delayed breast reconstruction: Results of a multicenter prospective study. The Breast. 2018;37:72–9.
18. Alderman AK, Wilkins EG, Kim HM, Lowery JC. Complications in Postmastectomy Breast Reconstruction: Two-Year Results of the Michigan Breast Reconstruction Outcome Study. Plast Reconstr Surg. 2002;109(7).
19. Cordeiro PG, McCarthy CM. A Single Surgeon's 12-Year Experience with Tissue Expander/Implant Breast Reconstruction: Part I. A Prospective Analysis of Early Complications. Plast Reconstr Surg. 2006;118(4).
20. Mehrara BJ, Santoro TD, Arcilla E, Watson JP, Shaw WW, Da Lio AL. Complications after Microvascular Breast Reconstruction: Experience with 1195 Flaps. Plast Reconstr Surg. 2006;118(5).
21. Cordeiro PG, McCarthy CM. A Single Surgeon's 12-Year Experience with Tissue Expander/Implant Breast Reconstruction: Part II. An Analysis of Long-Term Complications, Aesthetic Outcomes, and Patient Satisfaction. Plast Reconstr Surg. 2006;118(4).
22. Jagsi R, Jiang J, Momoh AO, Alderman A, Giordano SH, Buchholz TA, et al. Complications after mastectomy and immediate breast reconstruction for breast cancer a claims-bas ed analysis. Ann Surg. 2016;263(2):219–27.
23. Basta MN, Gerety PA, Serletti JM, Kovach SJ, Fischer JP. A Systematic Review and Head-to-Head Meta-Analysis of Outcomes following Direct-to-Implant versus Conventional Two-Stage Implant Reconstruction. Plast Reconstr Surg. 2015;136(6).