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Innovations in post-cancer breast reconstruction: comparative analysis between autologous grafts and the use of implants

Innovaciones en reconstrucción mamaria post-cáncer: análisis comparativo entre injertos autólogos y el uso de implantes

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Abstract

This study aims to analyze and compare innovations in post-cancer breast reconstruction using autologous grafts and implants, evaluating their efficacy, safety, and patient satisfaction. A systematic review of the literature was conducted in recognized scientific databases, selecting studies published between 2014 and 2024 that compared both techniques in terms of aesthetic and functional results and complications. The findings indicate that reconstruction with autologous grafts offers better long-term results, with a more natural appearance and a lower rate of reoperations, although it requires more complex and prolonged surgery. In contrast, implants have evolved through new materials and techniques, such as prepectoral reconstruction assisted by acellular dermal matrices, which has reduced complications such as capsular contracture and facilitated recovery. However, concerns remain about the long-term safety of implants, including possible systemic symptoms and the risk of local cancer recurrence. It is concluded that the choice between the two techniques should be individualized, considering clinical factors and patient preferences, with an emphasis on personalizing treatment to optimize functional and aesthetic outcomes.

Keywords: breast reconstruction, autologous grafts, breast implants.

Resumen

Este estudio tiene como objetivo analizar y comparar las innovaciones en la reconstrucción mamaria postcáncer mediante injertos autólogos y el uso de implantes, evaluando su eficacia, seguridad y satisfacción de las pacientes. Se realizó una revisión sistemática de la literatura en bases de datos científicas reconocidas, seleccionando estudios publicados entre 2014 y 2024 que compararan ambas técnicas en términos de resultados estéticos, funcionales y complicaciones. Los hallazgos indican que la reconstrucción con injertos autólogos ofrece mejores resultados a largo plazo, con una apariencia más natural y una menor tasa de reintervenciones, aunque requiere una cirugía más compleja y prolongada. En contraste, los implantes han evolucionado mediante nuevos materiales y técnicas, como la reconstrucción prepectoral asistida por matrices dérmicas acelulares, lo que ha reducido complicaciones como la contractura capsular y ha facilitado la recuperación. No obstante, persisten preocupaciones sobre la seguridad a largo plazo de los implantes, incluyendo posibles síntomas sistémicos y el riesgo de recurrencia local del cáncer. Se concluye que la elección entre ambas técnicas debe ser individualizada,

considerando factores clínicos y las preferencias de la paciente, con énfasis en la personalización del tratamiento para optimizar los resultados funcionales y estéticos.

Palabras clave: reconstrucción mamaria, injertos autólogos, implantes mamarios.

Introduction

Post-cancer breast reconstruction is a critical procedure for the physical and emotional recovery of patients who have undergone a mastectomy. Currently, two primary approaches to this process exist: the use of autologous grafts and the application of implants. Both methods have significantly evolved over recent decades, incorporating technological and biomedical innovations that have enhanced aesthetic and functional outcomes. However, despite these advancements, the debate persists regarding which of these techniques offers greater long-term benefits.

The research problem addressed by this study lies in the necessity to compare innovations in both techniques of breast reconstruction to determine their advantages and limitations. The choice between autologous grafts and implants is influenced not only by medical criteria but also by factors such as the patient's age, availability of donor tissue, comorbidities, and aesthetic expectations. Although a substantial body of literature exists, gaps remain regarding the comparative efficacy of these two techniques, particularly concerning quality of life and long-term results.

The significance of this study is rooted in its contribution to informed clinical decision-making and the optimization of treatment options for patients. With the increasing survival rates of women diagnosed with breast cancer, it is imperative that breast reconstruction options provide safe, functional, and satisfactory solutions. This research aims to supply updated, evidence-based information to enhance surgical practices and the quality of care in this domain.

From a theoretical standpoint, this study is grounded in the principles of reconstructive plastic surgery and bioengineering as applied to regenerative medicine. It considers the biological foundations of healing, tissue integration, and the biocompatibility of synthetic materials, as well as theories related to cellular regeneration and tissue transfer.

Prior research has extensively explored complication rates, aesthetic outcomes, and patient satisfaction following breast reconstruction. Earlier studies indicate that autologous grafts may yield more natural and durable results, while implants offer the advantage of quicker recovery and reduced surgical morbidity. Nevertheless, the emergence of new techniques, such as nanotechnology-enabled implants and stem cell-enhanced grafts, necessitates a contemporary and detailed analysis.

The context of this study is situated within a landscape of ongoing advancements in reconstructive medicine, driven by the need to enhance functional and aesthetic outcomes for breast cancer patients. The increasing accessibility of personalized treatments and the integration of innovative biomaterials have redefined the therapeutic options available. In this regard, the research seeks to provide a comparative and up-to-date overview of innovations in post-cancer breast reconstruction.

The objective of this work is to analyze and compare innovations in breast reconstruction using autologous grafts versus implants, evaluating their effectiveness, safety, and patient satisfaction. Through a critical review of the literature and analysis of recent studies, the study aims to furnish relevant information to support clinical decision-making and improve reconstructive procedures.

Methodology

This study was conducted using a comparative and descriptive approach, aiming to analyze innovations in post-cancer breast reconstruction with autologous grafts and implants. A systematic review of the literature was employed, considering studies published from 2014 to 2024 in recognized academic databases such as PubMed, Scopus, and ScienceDirect.

Inclusion and exclusion criteria

Articles meeting the following criteria were selected:

- Peer-reviewed publications not older than 10 years (2014–2024).
- Clinical studies, systematic reviews, and meta-analyses concerning post-mastectomy breast reconstruction techniques.

- Research comparing autologous grafts and implants in terms of safety, aesthetic outcomes, and patient satisfaction.

The following were excluded:

- Studies published before 2014.
- Case reports or articles lacking clearly defined methodologies.
- Research focused on non-oncological breast reconstruction.

Search and selection process

The search was conducted using keywords such as "breast reconstruction post-mastectomy," "autologous tissue vs. implants," "long-term outcomes of breast reconstruction," among others, employing Boolean operators (AND, OR) and publication year filters.

The final selection included 20 articles, which were qualitatively analyzed to identify patterns, advantages, disadvantages, and advancements in both reconstructive techniques.

Analytical focus

The analysis of the studies was structured around two main axes:

- Innovations in autologous grafts (use of DIEP, TRAM, SGAP flaps, advancements in lipoinjection, etc.).
- Innovations in implants (next-generation materials, nanotechnology, use of acellular dermal matrices, etc.).

Figure 1.
PRISMA diagram

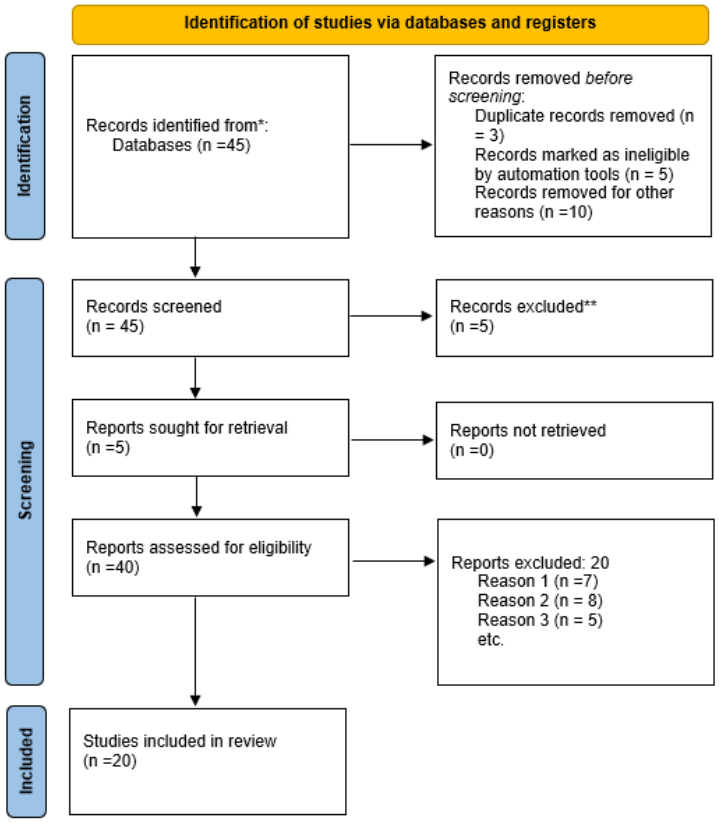


Table 1

Studies included on autologous skin graft

Articles on autologous skin graft	
(Albornoz et al., 2023)	Immediate Breast Reconstruction Alternatives
(Christopher et al., 2022)	Managing locoregional breast cancer recurrence after autologous free flap reconstruction: A retrospective review of 2,734 procedures
(Corpuz et al., 2024)	Existing Psychiatric Diagnoses Among Breast Cancer Patients Interact with Outcomes After Autologous and Implant-Based Bilateral Breast Reconstruction: A Propensity Score Matched Analysis
(De Kerckhove et al., 2023)	Tertiary Autologous Breast Reconstruction After Implant-Based Reconstruction: Safety and Patient-Related Outcomes
(Gort et al., 2024)	Sleep quality after autologous breast reconstruction
(Mayr-Riedler et al., 2025)	One-Year Quality of Life Outcomes of Delayed Unilateral Autologous Breast Reconstruction and Associated Patient Factors
(Nag et al., 2024)	Effects of Neoadjuvant Chemotherapy on Autologous and Implant-Based Breast Reconstruction: A Systematic Review and Meta-Analysis of the Literature
(Nava et al., 2025)	The Impact of Preoperative Radiotherapy and Chemotherapy on Autologous Breast Reconstruction Outcomes—A Retrospective Single-Center Study
(Navarro et al., 2024)	Oncologic safety of autologous fat grafting in primary breast reconstruction after mastectomy for cancer
(Yu et al., 2024)	Autologous fat grafting for postoperative breast reconstruction: A systemic review

Table 2

Studies included on the use of implants

Articles on the use of implants	
(Lieffering et al., 2025)	Breast implant illness revisited: A cohort study of health symptoms in women with implant-based reconstruction
(Mario et al., 2025)	Breast reconstructive surgery: A systematic literature review of adjustable expander implant in one stage breast reconstruction
(Mazzolai et al., 2025)	Advancing women's health with a pioneering implant to treat breast cancer related lymphedema
(Kullab et al., 2024)	Breast reconstruction with mentor anatomical implants and the risk of implant rotation: A retrospective study of 1134 women
(Kidd et al., 2024)	Implant reconstruction after mastectomy–A review and summary of current literature
(Joo et al., 2022)	The patterns and spatial locations of local recurrence in breast cancer with implant-based reconstruction after mastectomy
(Guliyeva et al., 2022)	The Impact of implant-based reconstruction on persistent pain after breast cancer surgery: A systematic review
(Zhang et al., 2025)	Direct-to-implant and tissue expander-based immediate breast reconstruction in Chinese women: A comparison of surgical complications and patient-reported outcomes
(Arellano et al., 2018)	Postmastectomy breast reconstruction: Analysis and outcomes in a tertiary care hospital in Mexico
(Said et al., 2022)	Experience with irradiated implants in reconstructive breast surgery. Report of two cases and literature review

Results and discussion

Autologous skin graft

The analysis of the selected studies enabled the identification of advancements and limitations in post-cancer breast reconstruction utilizing autologous grafts. This technique, which relies on the use of the patient's own tissue, has demonstrated superior outcomes in terms of quality of life, aesthetic satisfaction, and long-term stability when compared to alternative reconstructive options.

One of the most significant aspects is the safety of the procedure. De Kerckhove et al. (2023) indicated that tertiary reconstruction with autologous flaps—even in patients with prior failed implant reconstructions—is safe and yields favorable functional results. Similarly, Navarro et al. (2024) evaluated autologous fat grafting in post-mastectomy reconstruction and concluded that the technique does not compromise oncological safety, serving as an effective alternative for improving breast shape and volume. Furthermore, Yu et al. (2024) presented a systematic review evidencing that autologous fat lipoinjection is a safe complementary procedure that enhances aesthetics without increasing the risk of tumor recurrence.

Postoperative quality of life has also been extensively studied. Gort et al. (2024) reported significant improvements in sleep quality among patients undergoing autologous reconstruction, suggesting reduced postoperative discomfort and enhanced adaptation to the procedure. In a complementary evaluation, Mayr-Riedler et al. (2025) assessed quality of life one year post-surgery and found that patients reconstructed with autologous grafts exhibited higher levels of satisfaction concerning their body image and emotional well-being.

However, certain clinical factors may influence outcomes. Nava et al. (2025) identified that preoperative radiotherapy and chemotherapy can negatively impact autologous reconstruction, increasing complication rates and prolonging recovery. Similarly, Nag et al. (2024), in a meta-analysis, concluded that neoadjuvant chemotherapy can affect final outcomes, although the impact varies depending on the type of flap used.

Regarding tumor recurrence and the viability of subsequent surgeries, Christopher et al. (2022) conducted a retrospective study involving 2,734 autologous flap reconstruction procedures and concluded that, in the event of locoregional recurrence, reconstruction with autologous tissue remains a viable option, allowing secondary interventions without compromising patient safety.

On another note, Corpuz et al. (2024) analyzed the relationship between pre-existing psychiatric diagnoses and outcomes of reconstruction with autologous grafts, finding that patients with psychiatric histories experience higher postoperative complications. This finding underscores the importance of prior psychological assessment to optimize outcomes.

Collectively, these findings demonstrate that breast reconstruction with autologous grafts is a safe and effective technique that provides sustained benefits in terms of satisfaction and quality of life. Nonetheless, factors such as radiotherapy, chemotherapy, and pre-existing psychological conditions can significantly influence outcomes, emphasizing the need for comprehensive clinical evaluations prior to opting for this technique. The subsequent section will compare these results with existing evidence, highlighting similarities, differences, and their clinical implications.

Use of Implants

The safety of implants and their impact on overall health has been extensively investigated. Lieffering et al. (2025) reviewed what is known as “breast implant illness” and concluded that, while some women report systemic symptoms following reconstruction, a clear causal relationship has not been firmly established. This finding is crucial for informed decision-making in the context of post-cancer breast reconstruction. On another note, Kullab et al. (2024) assessed the risk of rotation for Mentor anatomical implants and found that, although the complication rate is low, it remains an important consideration when selecting the ideal implant.

Regarding innovations, Mazzolai et al. (2025) studied a pioneering implant designed to treat lymphedema associated with breast cancer, reporting promising results in reducing inflammation and improving quality of life. Similarly, Mario et al. (2025), in a systematic review, highlighted the benefits of single-stage adjustable expanders, which can reduce the need for additional surgeries and optimize aesthetic outcomes.

The comparison between reconstructive techniques has also been thoroughly addressed. Zhang et al. (2025) analyzed direct-to-implant reconstruction versus tissue expander-based reconstruction and concluded that the former may reduce surgical complications in certain populations, although the choice ultimately depends on individual factors. Complementarily, Kidd et al. (2024), in a recent review, emphasized the emerging role of prepectoral reconstruction as a technique associated with lower postoperative pain and improved implant integration.

The long-term impact of implant-based reconstruction has also been studied. Guliyeva et al. (2022), in a systematic review on persistent pain following breast reconstruction, indicated that while many patients experience improvement over time, a percentage may suffer from chronic pain requiring specialized management. Meanwhile, Joo et al. (2022) investigated local recurrence patterns in patients with implant reconstructions and found that the location of the primary tumor may influence the risk of recurrence, highlighting the importance of postoperative follow-up.

From a clinical perspective, Arellano et al. (2018) analyzed post-mastectomy reconstruction outcomes in a tertiary care hospital in Mexico and concluded that implant reconstruction remains a viable option, yielding good

aesthetic and functional results. Finally, Said et al. (2022) documented their experience with irradiated implants, concluding that while radiotherapy increases the risk of complications, the use of innovative materials and new surgical techniques allows for satisfactory results in most cases.

Conclusions

Innovations in post-cancer breast reconstruction have led to significant advancements in both the use of autologous grafts and the placement of implants, optimizing aesthetic and functional outcomes for patients undergoing mastectomy. Nevertheless, each technique offers specific advantages and challenges that must be individually assessed to select the most appropriate alternative for each patient.

The use of implants has evolved alongside the development of new technologies, such as biocompatible models, low-rotation anatomical implants, and prepectoral reconstructions assisted by acellular dermal matrices. These advances have contributed to a reduction in complications—including capsular contracture—and improved postoperative quality of life. However, long-term safety remains a topic of debate, particularly concerning the emergence of systemic symptoms and the risk of local cancer recurrence.

Conversely, autologous reconstruction has demonstrated significant progress due to refinements in micro-surgical techniques, allowing for greater precision in breast remodeling and a lower long-term complication rate. Autologous grafts provide more natural results and a reduced need for re-intervention compared to implants, although they involve more prolonged and technically demanding surgical procedures.

From a clinical and scientific perspective, there is no single ideal solution for all patients. The choice between implants and autologous grafts should take into account individual factors such as health status, availability of donor tissue, risk of complications, and personal preferences. Personalizing reconstruction based on updated clinical evidence and emerging technological advancements represents the pathway towards safer, more effective reconstructive care tailored to meet the needs of each patient.

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