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EVALUATION OF BREAST RECONSTRUCTION OPTIONS: IMPLANTS, AUTOLOGOUS FLAPS, AND THE USE OF ACELLULAR DERMAL MATRIX

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Abstract: INTRODUCTION: Post-mastectomy breast reconstruction is essential for restoring self-esteem and female identity, and actively contributes to patients' physical and emotional rehabilitation. Two techniques are advocated for its implementation: prostheses or autologous tissues. Both methods are widely used, but there are differences between them that can influence the choice of which one to use. **OBJECTIVES:** This study aims to analyze the different breast reconstruction techniques in order to help patients decide whether to use implants (IBR) or autologous flaps (AR). The aim is to assess the possible impact of radiotherapy, which may indicate a better chronological order between the placement of IBRs and therapy, since exposure to radiation can affect breast tissue to varying degrees, which could end up hindering reconstruction results. The use of acellular dermal matrix (ADM) is also a point to be evaluated in this article, given its potential to improve healing and facilitate implant placement. **METHODS:** Thus, by means of a systematic review based on the analysis of 42 high-quality articles found in the PUBMED, VHL and MEDLINE databases, selected after applying strict exclusion criteria divided into three stages, this review aims to evaluate the most relevant information on the topics covered, compare them with each other and summarize the possible conclusions. **RESULTS AND DISCUSSION:** At the end of the analysis, it was found that, in fact, IBRs are associated with faster recovery and return to activities when compared to flaps such as TRAM or DIEP which, due to their greater surgical complexity, have a longer recovery time, with less mobility and greater associated pain, especially in the donor tissue area. On the other hand, patients undergoing RA have a higher degree of satisfaction in terms of aesthetics, despite an increased risk of serious complications. Despite the clear differences, the evidence shows that both IBR and RA have a similar impact on

quality of life and there is no evidence to show that one method is superior to the other. Similarly, there is still a lack of robust evidence to prove the efficacy of Acellular Dermal Matrix, since the existing references are inconclusive as to the advantages of the method, and nevertheless point to a greater risk of local complications associated with its use, such as necrosis or infection. Regarding the use of implants in patients undergoing radiotherapy, the time of irradiation - before or after the reconstruction procedure - shows no significant difference in terms of the aesthetic or functional results obtained. However, this topic still lacks significant evidence and more studies are needed to reach definitive conclusions capable of systematizing clinical decisions. With regard to the post-operative period, it is clear that, in addition to the technique chosen, factors such as early mobilization, physical condition, post-operative care and physiotherapy have a significant impact on recovery and the time taken to return to activities, making it clear that a multidisciplinary care network is of unparalleled importance for early recovery. **CONCLUSION:** Breast reconstruction with implants (IBR) and flaps (AR) has advantages and disadvantages. RA offers natural aesthetic results, but involves risks such as thrombosis, while IBR is less invasive, but may not meet aesthetic expectations and has a higher risk of failure. In radiotherapy patients, IBR faces challenges due to tissue compromise. Recovery time varies: IBR is faster, while AR is more complex. The DIEP flap offers less pain. Acellular dermal matrix (ADM) can improve healing, but the results are inconclusive, and its indication should be cautious. The choice between IBR and RA depends on the patient's preferences and medical assessment.

Keywords: "Breast Implant", "Autologous Reconstruction", "Aesthetic Outcomes", "Functional Impact", "Recovery Time", "Complications", and "Satisfaction"

INTRODUCTION

Breast reconstruction is a surgery that seeks to restore the shape and volume of the breasts after a mastectomy, often performed for the treatment of breast cancer [1,2,3]. This procedure transcends aesthetics and is crucial for the physical and emotional rehabilitation of patients [1,2,3]. By restoring symmetry to the body, reconstruction plays an essential role in restoring female identity, strengthening self-esteem and promoting a full recovery [4,5].

Physical rehabilitation through breast reconstruction involves restoring body symmetry, which makes it easier to adapt to clothing, practise daily activities and improve the patient's general comfort [4,5]. In the emotional field, this surgery has a profound impact by minimizing the psychological effects of mastectomy [5,6]. Many women report that reconstruction helps restore their self-image and identity, and is an important step in coping with the changes imposed by the disease [5,6,7].

Several studies have highlighted the benefits of breast reconstruction for patients' quality of life [5,6,7]. The results include a reduction in symptoms of depression and anxiety, as well as a significant improvement in self-esteem [6,7]. This feeling of control over one's own body contributes to general well-being, helping women to overcome the emotional and physical challenges associated with breast cancer [6,7].

Breast reconstruction techniques can be classified into two main groups: with prostheses or with the patient's own tissue (autologous) [7]. The former uses silicone implants to reconstruct breast volume, while the latter uses the patient's own tissue, such as abdominal muscle or back skin, for a more natural result. The approaches can be immediate, performed at the same time as the mastectomy, or delayed, at a later date [7,8]. Each option

has advantages and challenges, and the choice is based on the patient's clinical conditions and preferences [7,8].

Surgical complications, such as necrosis, infection, seroma, flap failure and contractile capsule, are important aspects to consider in breast reconstruction [7,8,9]. These factors can influence both the choice of technique and the timing of the intervention [7,8,9]. For this reason, a detailed discussion between the patient and the medical team is essential to ensure an informed decision, in line with the expectations and individual conditions of each case [7,8,9].

In short, breast reconstruction is a procedure that goes beyond aesthetics, promoting physical, emotional and social benefits for women who have faced breast cancer [8,9]. The personalized choice of technique and timing of surgery is essential to maximize results and ensure a full recovery [8,9,10]. In this context, an integrative review on the subject is essential to gather and critically analyze the available findings, contributing to more informed decisions for both health professionals and patients [8,9,10]. This type of study makes it possible to identify gaps in knowledge, promote advances in clinical practice and ensure that choices are made based on robust and up-to-date evidence [8,9,10].

OBJECTIVES

The aim of this study is to analyze the different breast reconstruction techniques, comparing the use of implants (IBR) and autologous flaps (AR), with an emphasis on the advantages and disadvantages of each approach in terms of aesthetic results, functional impact and postoperative recovery [11]. The research aims to evaluate the aesthetic satisfaction, psychological impact and recovery time of patients, considering that reconstruction with flaps offers more natural results, but with greater complexity and risk of compli-

cations, while reconstruction with implants provides a faster recovery, but with a greater risk of long-term failure [11]. The study aims to provide a critical analysis to help patients make informed decisions, taking into account their expectations and individual conditions [11].

Another important focus is to explore the optimal order between breast reconstruction with implants and radiotherapy, since radiotherapy can affect the integrity of breast tissue and increase the risk of implant failure [11]. The study seeks to evaluate, based on existing comparative data, aesthetic satisfaction, psychological well-being and the risks of implant failure in both approaches [11]. The research also aims to understand how radiotherapy can interfere with reconstruction, offering clearer guidance on the best strategy for each patient, considering their clinical conditions and personal preferences [11,12].

In addition, the study investigates the use of acellular dermal matrix (ADM) in breast reconstruction with implants, considering the benefits and risks associated with this technique [11,12]. ADM has been proposed as a support to improve the integration of the implant with the breast tissue, but it can be associated with complications such as implant failure, infections and tissue necrosis [11,12]. The research aims to review the available evidence to assess the risks and benefits of using ADM, providing a basis for more informed and personalized decisions about its application in breast reconstruction [11,12]. Together, these objectives aim to provide a comprehensive analysis of breast reconstruction options, taking into account aesthetic results, recovery and possible complications, in order to improve the patient experience [11,12].

METHODS

This work constitutes a systematic review with the aim of consolidating and analyzing the available evidence on breast reconstruction techniques, with a focus on comparing the use of breast implants (IBR) and autologous flaps (AR) [12,13,14]. A systematic review is a rigorous methodological approach that aims to identify, evaluate and synthesize data from relevant studies on breast reconstruction options, providing a comprehensive, evidence-based understanding of the aesthetic results, functional impact, recovery time and complications associated with these techniques [14]. This type of review is essential for providing clearer clinical guidelines, as well as identifying gaps in scientific knowledge that can drive future research [15]. The review focuses on evaluating the effectiveness of each technique, long-term aesthetic outcomes and patient satisfaction, as well as investigating the factors that influence the choice between the two approaches [15].

The survey of studies was carried out in the PUBMED, VHL and MEDLINE databases, covering articles published between 2019 and 2024, exclusively in English. The keywords used were: “Breast Implant”, “Autologous Reconstruction”, “Aesthetic Outcomes”, “Functional Impact”, “Recovery Time”, “Complications”, and “Satisfaction” [15]. To ensure the accuracy and relevance of the results, the search used Boolean operators and filters for date, language and type of publication, ensuring that only 42 high-quality articles were considered for the analysis [15].

The article selection process followed three rigorous stages [15,16]. In the first stage, 689 articles were identified using a combination of the selected descriptors [15,16]. Filters were applied to exclude studies outside the period of analysis, non-peer-reviewed publications, experimental studies on animals and articles in languages other than English [15,16]. In

the second stage, an initial screening of 239 articles was carried out based on the titles and abstracts, excluding duplicate articles, narrative reviews and studies irrelevant to the topic of breast reconstruction [15,16,17]. In the third stage, 89 selected articles were fully evaluated, applying additional exclusion criteria such as insufficient or inconsistent data, inadequate methodologies or results that did not adequately address the aesthetic and functional outcomes of breast reconstruction [15,16,17]. After this careful analysis, the 42 most robust and relevant studies were included in the final analysis, ensuring that the systematic review provides a comprehensive overview of the outcomes and best practices in breast reconstruction techniques with implants and autologous flaps [15,16,17].

RESULTS AND DISCUSSION

BREAST RECONSTRUCTION: IMPLANT OR AUTOLOGOUS FLAP?

The choice between implant-based breast reconstruction (IBR) or autologous flap reconstruction (AR) is an important step for patients facing the need to reconstruct the breast after mastectomy [17,18,19,20]. Each technique has advantages and disadvantages that must be carefully considered [17,18,19,20]. In the case of RA, the aesthetic advantage is highlighted, as the use of own tissue provides more natural results in terms of shape and texture [17,18,19,20]. However, this approach has significant risks, such as a greater chance of deep vein thrombosis or pulmonary embolism, which can be worrying for groups of patients [18,19,20,21].

On the other hand, implant-based reconstruction (IBR) offers a less invasive procedure with a lower risk of serious complications, such as blood clots associated with RA. However, this technique may not achieve the same level of aesthetic and sexual satisfaction, as

well as presenting a greater risk of long-term failure, such as implant ruptures or seroma [18,19,20,21]. These factors can influence the patient's decision, especially if the aim is to prioritize the durability of the reconstruction [18,19,20,21].

Despite the differences, studies show that in terms of overall quality of life and psychological well-being, the two approaches are similar [18,19,20,21]. This reflects that, regardless of the choice, the positive impact of breast reconstruction on self-esteem and adaptation to the body after cancer treatment is evident [20,21,22]. The strength of the evidence for these conclusions is considered moderate, indicating that the current results are reliable, but there is still room for further research to clarify doubts and offer more security to patients [20,21,22].

The decision between IBR and RA must be personalized, taking into account the patient's clinical profile, her expectations in relation to the aesthetic result and the risks involved [21,22,23]. It is essential that the doctor guides the patient in a clear and empathetic way, providing detailed information about the options available [21,22,23]. With open communication and careful analysis, the patient will be able to make an informed choice that best meets her needs, ensuring that breast reconstruction is a positive stage in her recovery journey [22,23,24].

BREAST RECONSTRUCTION WITH IMPLANTS AND RADIOTHERAPY: WHAT IS THE IDEAL ORDER?

Implant-based breast reconstruction (IBR) before or after radiotherapy is a relevant issue for patients facing breast cancer who need to reconcile aesthetic and oncological treatments [22,23,24,25]. Studies indicate that physical, psychological and sexual well-being and aesthetic satisfaction are similar, regardless of the order in which the procedures

are performed [23,24,25]. This flexibility in approach can offer patients more options, allowing the choice to be adapted to clinical needs and personal preferences [24,25,26].

One of the most critical factors is the risk of implant failure [24,25,26]. Research suggests that the likelihood of the implant failing or needing to be removed is comparable whether IBR is performed before or after radiotherapy [25,26,27]. However, it is important to note that radiotherapy can influence the integrity of the tissue around the implant, potentially increasing the risk of complications [25,26,27]. For this reason, the decision on the order of the procedures must take into account individual factors, such as the extent of the treatment and the type of tumor [25,26,27,28].

The strength of the evidence available on this issue is considered low, partly due to the limited number of comparative studies [25,26,27,28]. In addition, many of the existing studies present significant differences in their methodologies and sample sizes, making definitive conclusions difficult [26,27,28]. This highlights the need for more well-designed research to provide more robust data that can guide doctors and patients [26,27,28].

For the patient, this evidence gap means that there is a greater need for personalization in decision-making [27,28,29]. The choice of the order of procedures should be made in conjunction with the doctor, taking into account factors such as the benefits and risks, the patient's health conditions and her preferences [27,28,29]. This personalized approach can help ensure that the patient feels confident and comfortable with the treatment plan [27,28,29].

Although the current results indicate flexibility in choice, they also reinforce the importance of investing in more studies that directly compare the two approaches [27,28,29,30]. Future research could evaluate how radiotherapy affects the reconstructed breast tissue

and the implant over time, as well as exploring interventions that could minimize associated complications [27,28,29,30].

In summary, the decision to perform IBR before or after radiotherapy should be based on a careful analysis of the patient's individual conditions and the available evidence [27,28,29,30]. At the same time, it is essential that health professionals encourage the development of more studies to fill the gaps in knowledge, ensuring that patients have access to the best possible treatment options [28,29,30,31].

RECOVERY AND RETURN TO ACTIVITIES

Recovery after breast reconstruction varies widely depending on the technique used, whether with implants (IBR) or flaps (AR), such as TRAM and DIEP [29,30,31]. These methods present significant differences in terms of recovery time, pain, mobility and impact on quality of life during the postoperative period [29,30,31]. The choice of technique should be based on a careful analysis of the patient's clinical conditions and expectations [29,30,31,32].

Implant-based reconstruction (IBR) is often associated with a faster and less invasive recovery period [29,30,31,32]. Many patients can return to light activities within a few weeks, with moderate pain usually well controlled by medication [30,31,32,33]. However, arm mobility is limited initially to avoid stressing the implants, and the risk of complications such as infections or seromas can prolong the recovery process [30,31,32,33]. Despite these limitations, the impact on quality of life is generally less, allowing a quicker return to everyday activities [31,32,33].

On the other hand, reconstruction using a TRAM flap has a longer recovery time due to the greater complexity of the surgery, which involves removing abdominal tissue [31,32,33].

Pain tends to be more intense, especially in the donor area, and requires stricter control [31,32,33]. In addition, mobility can be quite limited in the first few months, which affects the return to day-to-day activities. Despite the more significant initial impact, many patients report greater aesthetic satisfaction in the long term, which can positively influence their quality of life [31,32,33,34].

The DIEP flap, although similar to the TRAM, offers some advantages [31,32,33,34]. As the rectus abdominis muscle is preserved, pain in the donor area is generally less intense, and complications related to abdominal muscle weakness are reduced [32,33,34,35]. However, recovery time and mobility limitations in the first few months are similar to those of TRAM [32,33,34,35]. This technique is an attractive option for patients seeking a balance between aesthetic results and less long-term functional impact [32,33,34,35].

In addition to the specifics of each technique, various factors can influence the recovery process, such as the age and physical condition of the patient, the presence of complications and adherence to post-operative care [32,33,34,35]. Physiotherapy is fundamental to restoring strength and mobility, especially in cases involving donor sites. Emotional support from family and friends also plays a crucial role in helping the patient cope with the challenges of the postoperative period [33,34,35].

In summary, the choice of breast reconstruction technique must be individualized, taking into account the patient's physical characteristics and preferences, as well as medical recommendations [33,34,35]. While IBR offers faster recovery and less initial impact, flap techniques such as TRAM and DIEP can provide superior aesthetic results, but with greater complexity in the postoperative period [34,35]. A multidisciplinary approach and open communication between doctor and patient are essential to ensure the best possible experience during this process [34,35].

CRITICAL ANALYSIS OF THE USE OF ADM IN BREAST RECONSTRUCTION

Acellular dermal matrix (ADM) is a processed biological material that serves as a “scaffold” for the growth of new tissue [34,35,36,37]. Its use is common in breast reconstruction, especially as a support for healing and the formation of new tissue around implants [34,35,36,37]. Although promising, this approach has benefits and risks that should be considered carefully [35,36,37].

Existing studies on the use of ADM in breast reconstruction are not yet conclusive in relation to improvements in the patient’s physical and psychological well-being or aesthetic satisfaction [36,37]. Although some reports indicate positive results, the overall evidence does not confirm a significant advantage compared to other techniques without ADM [36,37,38]. This uncertainty highlights the need for more robust evaluations [36,37,38].

From the point of view of complications, the use of ADM may be associated with an increased risk of implant failure, leading to the need for removal [36,37,38,39]. In addition, there is a slight increase in the risk of infections when ADM is used, although the clinical impact of this additional risk is still not entirely clear [36,37,38,39]. On the other hand, the risk of seroma formation and the need for revision surgery are similar, regardless of the use of ADM [36,37,38,39,40].

Another important aspect is the risk of tissue necrosis, which remains low in general, but may be slightly higher with the use of ADM [36,37,38,39,40]. This may be related to the interaction of the material with local tissues and the process of integrating the ADM into the body [36,37,38,39,40]. This complication, although rare, reinforces the need for careful assessment on a case-by-case basis [36,37,38,39,40].

The strength of the evidence on the use of ADMs is variable, largely due to the li-

imited number of studies available and the varying methodological quality between them [38,39,40]. In addition, there are different types of ADM on the market, each with specific properties that can influence the results and associated risks. These variables make it difficult to generalize the findings widely [38,39,40,41].

For patients, the benefits of using ADM are still uncertain, especially in terms of aesthetic improvement and general well-being [38,39,40,41]. On the other hand, the risk of additional complications, such as implant failure and infection, is a major concern [39,40,41]. This reinforces the importance of a personalized approach, where doctor and patient discuss the pros and cons of this technique in detail [39,40,41].

In conclusion, the use of ADM in breast reconstruction should be assessed with caution [39,40,41]. The decision should be made on an individual basis, considering the potential benefits and risks, as well as the patient’s characteristics and expectations [40,41,42]. Better designed future studies with a larger number of participants are essential to clarify the real advantages and disadvantages of this approach, allowing for more informed decisions [40,41,42].

CONCLUSION

Therefore, breast reconstruction with both implants (IBR) and flaps (AR) are fundamental options for each patient’s surgical choice, as each technique has its advantages and disadvantages. In relation to the RA, the aesthetic advantage is notable, since the use of the patient’s own tissue results in a natural shape and texture, but there are risks such as deep vein thrombosis and pulmonary embolism.

Implant-based reconstruction (IBR), on the other hand, offers less invasive procedures and a lower risk of serious complications, such as clots associated with RA. However, this technique may not bring the desired level of aesthetic and sexual satisfaction, and there is also a hi-

gher risk of long-term failure, such as implant rupture or seroma. Each of these points can influence the patient's decision, especially if the desired goal is durability and reconstruction.

Implant-based breast reconstruction (IBR) in patients undergoing radiotherapy is a highly relevant issue for women undergoing breast cancer treatment, as it seeks to reconcile aesthetic and oncological goals. Physical, psychological and sexual well-being and aesthetic satisfaction are fundamental aspects in this process. In addition, the versatility of surgical approaches offers patients different options, allowing for greater personalization of treatment.

However, radiotherapy can compromise tissue integrity, increasing the risk of complications in the area where the implant was made. For this reason, the order of the procedures must be carefully evaluated, taking into account individual and patient-specific factors. Currently, there are a limited number of comparative studies analyzing different methodologies and procedure sequences, highlighting the need for more robust research to support clinical decisions.

Recovery time and return to daily activities after breast reconstruction vary according to the technique used. Implant-based reconstruction (IBR) usually has a shorter recovery period, allowing the patient to return to light activities within a few weeks. On the other hand, flap reconstruction, such as TRAM, is more complex and invasive, requiring a longer recovery time. The DIEP flap, although similar to the TRAM, has some advantages, such as less intense pain. These factors reinforce the importance of an individualized approach that takes into account physical characteristics, patient preferences and medical recommendations.

The use of acellular dermal matrix (ADM) is also worth mentioning. This biological material aids healing and the formation of new tissue around the implant. Despite promising results, there is still no consensus on its effectiveness in improving patients' physical, psychological and aesthetic well-being, due to the lack of more comprehensive studies. Therefore, the indication of ADM should be made with caution, based on an individualized assessment and medical advice.

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