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Breast Reconstruction, An Actual Review

Hernandez Garcia Alondra Ana Karen[1], Gonzalez Vazquez Juan Carlos[2]

[1,2] Hospital General Regional 72 "Lic. Vicente Santos Guajardo"

ABSTRACT

Breast cancer treatment involves a multidisciplinary approach, including oncologic surgery, adjuvant therapy, and psychosocial therapies. Breast reconstruction has evolved over time, with early beliefs preventing its use. Early techniques included autologous breast reconstruction, local myocutaneous flaps, tubed pedicle flaps, prosthetic implant-based reconstructions, and silicone implants. Modern procedures began with the free flap in 1973, which allowed for more precise matching of normal breast tissue. Advancements in abdominal-based free flaps, transverse rectus abdominis myocutaneous (TRAM) flaps, and the DIEP flap have contributed to its popularity.

Advancements in breast reconstructive surgery have been significantly influenced by advancements in microsurgery, including the discovery of the free flap and the development of perforator-based flaps. The introduction of preoperative imaging methods, such as computed tomography angiography (CT), has made breast reconstruction more efficient. The use of operating microscopes and microvascular anastomotic coupler devices has also improved surgical procedures. However, flap perfusion remains a challenge, and new approaches like fluorescence imaging and laser Doppler imaging can help diagnose flap impairment. Despite the early stages of breast surgery research, advances in pre-operative planning and imaging remain significant. The combination of virtual reality and robotic surgery could further enhance the capabilities of doctors in breast reconstruction.

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INTRODUCTION

The care of breast cancer involves a multidisciplinary approach, and although oncologic surgery, adjuvant therapy, and psychosocial therapies are at the core of this approach, breast reconstruction is also an essential component of the management process. Following surgical excision of the breast, women who are battling breast cancer have a wide variety of choices open to them in order to restore the breast's attractive attributes. The fantastic results that patients are supplied in the present day are the consequence of several technical improvements that have occurred over the course of history. These developments have made it possible for the technique of breast reconstruction to be transformed into its current form. Additionally, the accomplishments that are now being made by researchers will be the ones that set the way for the future of breast reconstruction.

REVIEW OF THE RELEVANT LITERATURE

Early beliefs discouraged the use of breast reconstruction, such as those proposed by the well-known surgeon Halsted, who suggested that it would increase the probability of cancer recurrence or spread. This led to the practice of breast reconstruction being underutilized for a number of decades. However, as progress has been made in the knowledge of breast cancer and breast surgery, an increasing role for breast reconstruction has evolved in order to restore the cosmetic look of the breast for patients. Vincenz Czerny was the first person to conduct an autologous breast reconstruction in 1895. He did this by transplanting a lipoma from a patient's side. Local myocutaneous flaps served as the foundation for the development of novel surgical procedures in the years that followed. In 1896, for example, Ignio Tanzini was the first person to develop the latissimus dorsi myocutaneous flap for the purpose of closing a mastectomy defect. In 1906, Louis Ombrédanne was the first person to undertake a breast reconstruction employing the pectoralis minor muscle as a mound throughout the procedure. In the years that followed these early treatments, tubed pedicle flap techniques were developed. One example of these techniques is the one that Sir Harold Gillies performed in 1942. However, these early treatments often resulted in the patient being left with ugly scars and sometimes needed many surgeries and transfers to be performed together. Consequently, this resulted in the development of prosthetic implant-based reconstructions in

the decades that followed, which ultimately led to the creation of the first silicone implant by Cronin and Gerow in the year 1963. The contemporary procedures for breast reconstruction did not start to develop until a decade later, in 1973, when Daniel and Taylor presented the world with the free flap. This was the beginning of the modern breast reconstruction techniques. Autologous tissue from a distant place that more precisely matched normal breast tissue was made available to patients for the very first time. This treatment option was made available to patients. After doing extensive study in this area, Holmstrom executed the first abdominal-based free flap in 1979. Three years later, Hartrampf developed the transverse rectus abdominis myocutaneous (TRAM) flap. Both of these advancements were made possible by the research that was conducted. After a few years had passed, in 1994, Robert Allen brought the deep inferior epigastric artery perforator (DIEP) flap to the area of breast surgery. This was a continuation of the work that Koshima and Soeda had begun. Currently, the DIEP flap has become one of the free flaps that is done the most commonly for autologous breast reconstruction. Its popularity has contributed to its rise in popularity.

An improvement in both the knowledge of and the ability to perform microsurgery was a significant contributor to the technical advancements that were made in breast reconstructive surgery. In 1897, Murphy was the first person to record occurrences of end-to-end vascular anastomosis. In 1902, Alexis Carrel was the first person to present the triangulation technique. Super-microsurgery, which involves the anastomosis of vessels with a diameter of less than 0.8 millimeters, has been included into the field after the aforementioned development. A significant amount of advancements in microsurgery were made throughout the 1970s. The free flap was discovered by Daniel and Taylor, as was indicated before, and this led to a growth in the study of vascular anatomy, which in turn led to the invention of several procedures for free-tissue transfer. Through the preservation of muscle tissue, the development of perforator-based flaps, such as the DIEP flap, enabled a reduction in the morbidity that occurred at the donor site. On the other hand, this resulted in a proportional rise in the difficulty and complexity of carrying out the technique, which ultimately led to difficult dissections. Because of this, new technical breakthroughs were necessary in order to provide assistance to surgeons while they were undertaking breast reconstructions. In the years that followed, one of the advancements that came about was the introduction of preoperative imaging methods. Doppler ultrasound was the primary method of imaging used in the beginning stages of this field; however, the development of computed tomography angiography (CTA) for preoperative planning was finally made possible. Surgeons were able to generate reconstructions of the vascular architecture for the purpose of identifying perforators, mapping their path, and planning flap design prior to the day of surgery thanks to the development of computed tomography (CTA). In a short amount of time, computed tomography (CT) emerged as the pre-operative imaging method of choice, notably for DIEP flaps and breast reconstruction.

Figure 1. Pre-tissue expanders

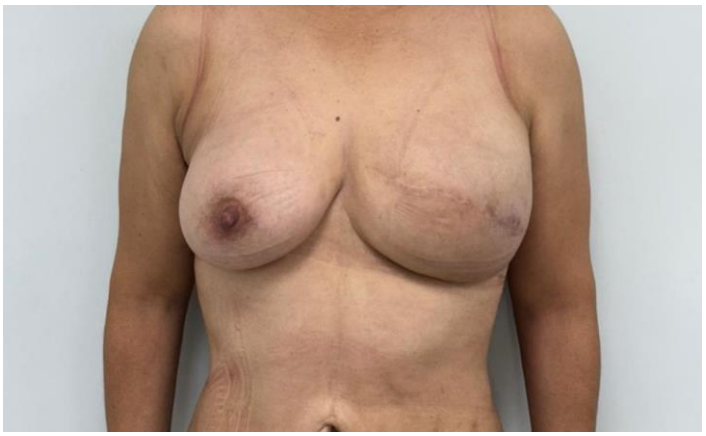
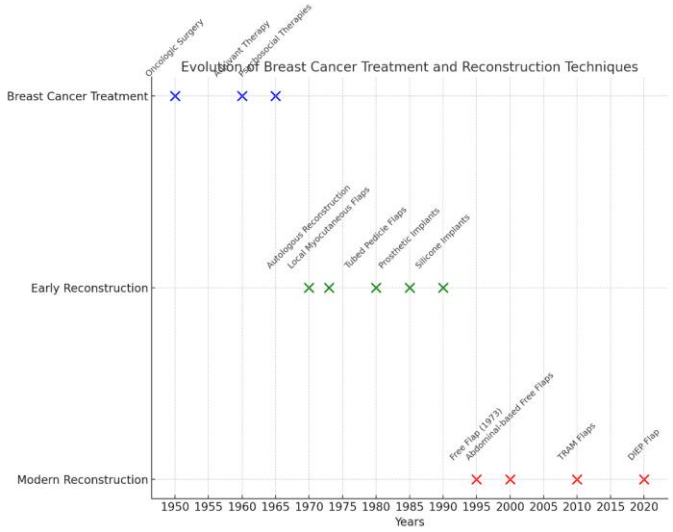


Figure 2. Post-tissue expanders

The preoperative imaging phase of breast reconstruction and microsurgery was not the only area in which advancements were made due to innovation. Since Carl-Olof Nylén brought the operating microscope into the operating room in 1921, it has enabled surgeons to undertake anastomoses that are progressively more difficult to accomplish with arteries that are continually smaller. Additionally, the development of microvascular anastomotic coupler devices has resulted in an increase in the efficiency of the operating theater. These devices have decreased the amount of time required for surgical procedures and have made it possible to conduct a higher number of cases simultaneously. One of the most serious challenges that plastic surgeons encounter is inadequate perfusion of the flap, which may result in the failure of the flap in part or even in its whole. A clinical examination carried out by the surgeon is the foundation of the conventional approach to determining whether or not the flap is receiving enough blood flow. On the other hand, there are a number of potential approaches for monitoring flap perfusion, such as fluorescence imaging and laser Doppler

imaging, which may be performed both intraoperatively and postoperatively. These methods may provide surgeons with a more sensitive way to diagnose flap impairment.



Despite the fact that breast surgery research is still in its early stages, advances in pre-operative planning and imaging continue to be a subject of significant interest. Despite the fact that thermographic imaging is a rather ancient idea, it has only lately been adopted for use in breast reconstructive surgery. When it comes to the localization of perforators, it has been proposed that infrared thermographic cameras might be used as an alternative or in conjunction with CTA. Not only that, but the newly researched technology of augmented reality (AR) or three-dimensional printing has the potential to generate reconstructions that can be superimposed onto patients in order to portray the vascular architecture in real time on the day of operation. In addition, the possibility of using robotic-assisted plastic surgery in the area of breast reconstruction has been suggested as a means of possibly enhancing the capacities and capabilities of what doctors are now able to accomplish. It's possible that the combination of virtual reality and robotic surgery might give even more benefits than first thought.

CONCLUSION

There have been several advancements in the area of breast reconstruction over the course of the last few decades. These advancements have come in the form of new information and technology, which has resulted in the creation of contemporary procedures. Just a small portion of the advancements that have altered the landscape of breast reconstruction not just for surgeons but also, and more crucially, for patients who have breast cancer are discussed in this editorial. These advancements have transformed the face of breast reconstruction. We have high hopes that this Special Issue of the Journal of Clinical Medicine will bring together a wide range of significant data that has the potential to make a contribution to the extensive history of innovation in the area of breast reconstruction and, as a consequence, further improve the results that patients have experienced.

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