



Post-Mastectomy Breast Reconstruction – a review on current trends

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Abstract

Introduction and objective. Mastectomy of the breast gland is a surgical procedure. It is one of the basic methods of treating breast cancer with stage I to III. Only in the case of stage IV cancer, it is not the basic method of treatment. Amputation of the breast gland is being used when the ongoing cancer process has affected more than one of the quarters of the breast. During this procedure, the wart and its areola are also removed, with the surrounding tissues (muscle fascia, lymph nodes, pectoral muscle). The aim of this study is to show different types of post-mastectomy breast reconstruction with their advantages and disadvantages.

Review methods. All relevant publications were retrieved from PubMed databases with the keywords including: “breast cancer”, “mastectomy”, “breast reconstruction”, “Post-mastectomy breast reconstruction”, “implant-based reconstruction”, “Fat Grafting reconstruction”, “Flaps based reconstruction”. The literature which was reviewed came from the last 10 years on methods of breast reconstruction after the mastectomy procedure.

Abbreviated description of the state of knowledge. Statistics regarding breast cancer surgery procedures can vary based on factors such as geographic location, access to healthcare, advancements in medical technology, and individual patient preferences. However, some general trends and statistics regarding breast cancer surgery procedures include: BCS vs. Mastectomy: In recent years, lumpectomy (breast-conserving surgery) has become increasingly common, particularly for early-stage breast cancer. However, mastectomy rates vary depending on factors such as tumor size, tumor location, patient preference, and medical recommendations.

Summary. Nowadays there are many methods including: implant-based reconstruction, fat grafting reconstruction, flaps-based reconstruction.

Keywords

breast reconstruction, mastectomy, female patients

INTRODUCTION

Mastectomy or amputation of the breast gland is a procedure, in which we surgically treat the patient's breast by removing it. It is one of the basic methods of treating breast cancer with stage I to III and only in the case of stage IV cancer, it is not the basic method of treatment. This method is being used when the ongoing cancer process has affected more than one of the quarters of the breast. Usually, during this procedure, the wart and its areola are also removed, as well as the surrounding tissues – lymph nodes, muscle fascia or the pectoral muscle itself. Due to the scope of the procedure, mastectomy can be divided into simple, radical and modified.

The radical form is the most crippling variant of mastectomy, because in addition to the mammary gland itself, we remove the underlying pectoral muscles (minor and major) as well as axillary lymph nodes on the side of the amputated breast. Currently, this method is used the least often due to the increasing desire to minimize the invasiveness of this procedure. Currently, the methods of subcutaneous mastectomy, i.e. a mastectomy that allows you to save the skin and/or the nipple are increasingly used.

Preservation of the skin of the mammary gland combined with the reconstruction of the shape of the breast (by implantation) allows to achieve beneficial visual effects of the procedure for the patient.

The decision to perform breast reconstruction involves two very important decisions: determining the optimal time to perform it and selecting the appropriate reconstruction technique, taking into account the complications and risks resulting from the decisions made [1].

One of the most commonly used breast reconstruction methods is implant-supported breast reconstruction. The development of breast implants and the advent of acellular dermal matrices have reduced post-operative complications and post-treatment examination outcomes.

Advances in fat-assisted breast reconstruction have also become a routine procedure in breast surgery. Its use allows to support and increase the volume of soft tissue between the implant and the mastectomy flap.

The above-mentioned methods and others such as flap-based reconstruction and radiotherapy will be discussed in more detail in this review of the current literature. Our goal is to isolate the advantages and disadvantages of each of them.

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METHODS

We reviewed the literature from the last 10 years on methods of breast reconstruction after mastectomy by searching the “PubMed” database by entering such terms as: “breast cancer”, “mastectomy”, “breast reconstruction”, “Post-mastectomy breast reconstruction”, “implant-based reconstruction”, “Fat Grafting reconstruction”, “Flaps based reconstruction”. We focused on analyzing the currently most used and most effective methods of breast reconstruction. We have analyzed each of them by selecting and describing in more detail the most commonly used ones. In addition, we discussed the need for radiotherapy after mastectomy, the impact of radiotherapy on implants, as well as the impact of changing the sequence of stages in breast cancer treatment on the therapeutic effect.

BREAST CANCER – EPIDEMIOLOGY AND MASTECTOMY

[In 2020, according to data presented by WHO, oncologists around the world diagnose approximately 2,300,000 new cases of breast cancer.][2]. It is a malignant tumor originating from the epithelial cells that line the inside of the lobules and milk ducts. It is the most common malignancy in women according to the World Health Organization, contributing to over 25% of new cancer cases diagnosed in 2012 (excluding non-melanoma skin cancer). Due to the upward trend in the incidence of breast cancer in women, the development of its diagnosis and treatment is very important [3].

[There are many histological characteristics of breast cancer. For the purposes of this article, for simplicity, we will divide it into invasive ductal breast cancer, called NST (derived from the leading ducts) and lobular breast cancer (derived from the cells that make up this gland).]

In recent years, risk factors for breast cancer in women have been established. The most reliable and worth looking into are: age, estrogen exposure and genetic predisposition. The density of the mammary gland is also important, it is a measure of the proportion of fibrous and glandular tissue. A woman with dense breasts has an increased risk of breast cancer compared to women who are of similar age but have less dense breasts. The reason for this include that higher breast density reduces the sensitivity of mammography [4]. Between 5–10% of breast cancer cases are caused by a genetic predisposition. The most commonly tested genes are BRCA1 and BRCA2 mutations. Some mutations are unique to one family, while others are recurring. The BRCA1/BRCA2 mutation spectrum varies depending on geographical origin, population or ethnic group [5].

In the past, women diagnosed with metastatic breast cancer were not treated with surgery. They underwent systemic therapy. Surgical resection of the primary tumor was considered palliative and was performed solely to improve quality of life and relieve symptoms. At the time, it was believed that local treatments for metastatic breast cancer did not work. However, controlled studies have shown that the combination of systemic therapy and surgical treatment improves the overall survival of patients [6].

Mastectomy, which is, to put it simply, amputation of the breast gland. In the past, it was mainly carried out in a radical form with the removal of the skin covering the gland and the nipple. The main indication for its performance is the

involvement of more than one breast quadrant by the ongoing neoplastic process. [Currently, breast conserving surgery (BCS) is the most popular technique used in the treatment of breast cancer. In addition, skin-sparing mastectomy (SSM) and nipple-sparing mastectomy (NSM) are also widely used.] During it, the entire breast tissue is removed, while preserving the skin areola and the inframammary ridge or the nipple-areola complex (NAC) [7]. These methods owe their popularity to improving cosmetic results and enabling immediate breast reconstruction.

IMPLANT-BASED RECONSTRUCTION

The most common method of breast reconstruction is implant-based reconstruction. In 2018, 83 217 breast reconstructions using implants were performed in the United States, and only 18 441 reconstructions using autologous tissues of patients [8]. In the past, silicone or salt implants were inserted directly under the skin, above the pectoralis major muscle. Back then, it was thought to be the best place and the procedure itself was easy and allowed the muscles to be preserved. Unfortunately, over time it turned out that this method has many disadvantages. Among other things, the most common complications include: capsular contracture or implant infections by exposing them through depleted subcutaneous tissue.

Conclusions were drawn that the most effective method of implantation is submuscular implantation, especially in terms of capsular contracture, because it shows the lowest percentage of its occurrence. The technique of full muscular coverage of the implant also has its disadvantages. It causes the inability to expand the lower pole and prevents the natural gravitational descent of the breast. Due to the problems that arose, the technique of partial muscle coverage and the double plane technique were introduced. This, in turn, meant that the pectoralis major muscle was not attached to the chest wall, and this caused it to move upwards, which caused the so-called window shading.

The invention of acellular dermal matrices (ADM), played a very important role. It is a biotechnologically designed human tissue of bovine or porcine origin, devoid of tissue antigens, so that the body’s immune response is not triggered, at the same time, it has a preserved structural matrix that promotes angiogenesis and tissue regeneration. By suturing the ADM to the lower margin of the pectoralis major muscle, the incidence of window shadowing was reduced. The ADM defines the lateral inframammary fold and supports the inferolateral part, which minimizes implant migration caused by muscle contraction [8].

However, despite the high rate of complications, tissue expansion is commonly used in breast reconstruction. The textured surface was designed in the late 1980s to promote tissue growth to prevent aberrations and disrupt the linear fibrosis associated with capsular contracture [9]. Two-stage breast reconstruction involves the placement of a textured surface tissue expander (TTE) and has been proposed as an alternative to smooth tissue expanders. Smooth tissue expanders show a much higher number of complications (skin necrosis, bacterial infections, hematomas, skin necrosis) compared to expanders with a textured surface.

Summarizing the advantages and disadvantages of breast reconstruction techniques using an implant, we can conclude

that the technique of reconstruction in the prethoracic plane, despite the disadvantages such as: capsular contracture, necrosis of the skin flap after mastectomy or implant infections, also has its advantages. Recent literature has shown that pre-pectoral implant placement for immediate breast reconstruction after mastectomy has many advantages. These include faster tissue expansion, the possibility of introducing a larger-volume implant, shortening the time to achieve the final expansion or, most importantly, reducing postoperative pain, which is a very important aspect for every doctor during each performed procedure. Shortening the time to achieve the final expansion and a faster rate of expansion enables better preservation of the skin flap after mastectomy, which translates into a better cosmetic effect of the procedure and the appearance of the reconstructed breast. [The pre-pectoral reconstruction also offers better opportunities for modeling the shape of the breast than the sub-pectoral variant, but also the reconstruction of the skin becomes easier and faster] [10].

FAT GRAFTING RECONSTRUCTION

Recently, autologous fat grafting (AFG) has become an increasingly popular method used in breast reconstruction. In AFG for breast reconstruction, the adipose tissue is taken mainly from the abdomen or thighs by lipoaspiration, the adipose tissue is then purified to remove blood, free lipids and other cellular debris and implanted in the breasts [11]. Autologous fat grafting can be used to improve breast symmetry, remove breast deformities, aesthetic breast augmentation, as a way to reconstruct the breast and to cover the soft tissues of the breast. Fat grafting is a technique that is particularly suitable for small to medium-sized breasts and for tumors located in the upper part of the breast. However, fat grafting correction is commonly used to correct secondary deformities or the effects of radiation therapy, which raises oncology questions about the cancer risk associated with fat grafting near the tumor bed [12]. Despite the fact that many specialists use fat grafting in total breast reconstruction, most consider only local application of AFG to be effective in order to improve symmetry and eliminate deformities [13].

Opinions on fat grafting are divided. The 2022 Goncalves study on the oncological safety of AFG, conducted under PRISMA guidelines, reviewed the histories of over 2,000 patients, concluding that “The evidence found in this review is highly suggestive that AFG in breast cancer patients is a safe procedure. Studies by Delay et al. and Rigotti et al. also confirm the safety of fat grafting. They also found no increased risk of breast cancer in the group treated with AFG compared to the group of patients not treated with AFG. More and more reports from the world of medicine regarding the success of fat transplantation motivate surgeons to determine the techniques that will ensure the best results of fat transplantation. Rigotti et al. also hypothesized that stem cells derived from adipose tissue can restore ischemic tissue vascularization and organ function by recruiting endothelial progenitor cells [14]. However, it should be remembered that according to current knowledge, 30–50% of fat may not be accepted, which forces the procedure to be repeated several times in order to obtain a satisfactory cosmetic effect of the procedure. In order to minimize this effect and eliminate the need to repeat the procedure to a minimum, tests were

carried out using a vacuum expander of external tissues – the Brava device [15]. The developed method is that before the operation, we first use the Brava device and then autologous fat grafting. The results of the study show that after a few weeks of using Brava, the breast volume increased from 100 to even 300 percent, and the authors of the study implanted 100 to 400 ml of lipoaspirate into the breast. By adding Brava, we can transplant more fat into the breast as well as increase the survival rate of such a graft and minimize its necrosis. The device in the study was well tolerated by patients, however, the possibility of skin complications should be taken into account – patients after radiotherapy are particularly at risk.

The incidence of complications after AFG is quite low. The most common are fat necrosis, oil cysts and postoperative infections. We can detect them with mammography and ultrasound – this is how we distinguish, for example oil cysts from tumors and eventual recurrence of the disease. Changes associated with complications after AFG have a characteristic picture in the previously mentioned examinations – thick calcifications that rarely require biopsy, changes usually do not capture contrast, sometimes only to a small extent [16]. The incidence of complications increases when patients undergo prior radiotherapy, modified radical mastectomy and skin-sparing mastectomy. Due to the increased fibrosis and reduced compliance of the recipient sites in irradiated breasts, these patients require an increased number of fat grafting sessions.

One should also be aware of the limitations in the use of this method in breast reconstruction. The main problem that stands in the way is matching this procedure to the patient's treatment schedule. Many attempts are made to optimize the oncological, cosmetic and reconstructive aspects, however, a large part of them is limited by the specific treatment process of the patient [16].

FLAPS-BASED RECONSTRUCTION

Flap-based autologous breast reconstruction is usually performed after a total or simple mastectomy and can be performed already during the mastectomy or with some delay – even several years after the procedure. Despite the high rate of breast reconstruction with an implant, autologous free tissue transfer offers several advantages in the appropriately selected patient. Among other things, autologous reconstruction has been shown to provide a more natural, drooping breast appearance with more durable results and greater patient satisfaction compared to implant-based reconstruction [17]. In addition, delayed autologous reconstruction helps replace fibrotic skin after surgery and PMRT – postmastectomy radiation therapy and is considered the preferred method of reconstruction for severe late complications. Flaps taken from the posterior part of the trunk and the gluteal area are not very good due to the poor aesthetic aspect of the collection site, the need to change the position many times, the small size of the flap and the adipose tissue that is quite difficult to shape [18].

[It is performed using free flaps that require microsurgical anastomosis.] The skin for this type of reconstruction can be taken from various places – most often these are the abdominal walls and the upper part of the thigh [19]. and/or perforator (SGAP – superior gluteal artery perforator and IGAP – inferior gluteal artery perforator) and thigh-based

“flaps”, such as the transverse upper gracilis flap (TUG) and the profund artery perforator (PAP) “flaps”. Autologous flap reconstruction is both a more advanced and more delicate procedure than implant reconstruction. Failure of flap reconstruction may leave the patient with no other reconstructive options [19].

Thigh-based flaps – transverse upper gracilis (TUG) flap. The ideal patients for this type of reconstruction are patients whose breast volume is between 250–400 cm³ per flap and excess fat tissue in the medial region [17]. There are several methods for determining the flap on the lateral part of the thigh. The boundaries of individual flaps are determined on the basis of perforators. Here, we distinguish TFL – tensor fascia lata flap and overlying soft tissue perforators that originate from the ascending branch of the lateral femoral peripheral artery, septocutaneous perforators occur in 97% of patients (1.8 perforators/thigh), musculocutaneous perforators occur in 64% (0.9 perforators/thigh). The main source of perfusion to the LTP – lateral thigh perforator flap lobe is the permanent septocutaneous perforator, which travels within the posterior septum between the TFL and the medial gluteus muscle [18]. In addition, some patients also have a large perforator of the anterior septocutaneous septum that travels in the septum between the TFL muscle and the rectus femoris or vastus lateralis muscle. This is unfavorable due to its eccentric location and smaller size [18]. The flap is dissected with the patient in the supine position. In the initial stages, dissection is limited to the medial 50% of the flap and this prevents unintended displacement of the lateral flap and potential damage to the pedicle during dissection. In the case of breast reconstruction, we select the LTP flap on the side of the breast that we are reconstructing. As recipient vessels, we choose mammary vessels, and the LTP pedicle fits well in terms of caliber. When we have stacked LTP lobes, the contralateral lobe is in most cases anastomosed with the retrograde internal mammary vessels.

Trunk flaps – lumbar artery perforator flap (LAP), which was initially described as a pedunculated flap to cover defects in the dorsal midline or in the lumbosacral region due to its volume, its use in the above-mentioned cases was limited, but its use in breast reconstruction was discovered due to several important advantages of the LAP flap. These advantages include: consistent peduncle location and ease of erection, attractive donor site for most women due to easy concealment in clothing, large volume with reported softer adipose tissue for better cosmetic and breast-like effect, and better neural anastomosis sensory. The structure of the flap is based on perforating vessels from the lumbar arteries. On each side of the lumbar vertebrae, the lumbar artery originates directly from the aorta and then crosses directly behind the psoas major muscle [17]. The flap is designed to capture the soft tissues supplied by these vessels, which are commonly referred to as the “love handle” region. Flap determination is performed based on the patient’s side-lying and sitting position. This allows better access to the iliac crest and posterior midline. The best perforators are selected on the basis of CTA- computer tomography angiography or MRA- magnetic resonance angiography and then confirmed by Doppler ultrasonography [17].

Stacked flaps – One of the quite often used methods for unilateral or bilateral breast reconstruction is the use of stacked flaps, which allows to obtain the largest possible volume of the breast after surgery. This method is the best

solution for patients who have large breasts but do not have enough fatty tissue in the potential sites of flap removal. The vessels are often anastomosed with the anterior and retrograde internal mammary vessels [18]. The process of combining multiple flaps in one reconstructive procedure is technically challenging but can be performed within an acceptable time frame and complication profile. Every effort should be made for operational efficiency with this method to make these procedures available for routine breast reconstruction [17]. With this type of reconstruction, the method of supplementing the asymmetry with autologous fat grafting is always used secondarily. It turned out to be a very good complement to the method of stacked flaps. In addition to eliminating asymmetry, autologous fat grafting can also prevent breast contour deformities and volume deficiencies in patients after autologous breast flap reconstruction. However, it should be remembered that according to the latest research, between 30 and 50% of fat may not be accepted, which means that even several rounds of fat transplantation may be required to achieve the desired breast size.

[When discussing flaps, we cannot forget about a method such as deep inferior epigastric artery (DIEP). It is most often used for large-volume breast reconstruction. In this type of surgery, flaps are taken from one or more donor sites and then stacked. When we perform bilateral four-lobe reconstructions, we usually need a large amount of skin. Using asymmetric reconstruction, which involves using a combined deep inferior epigastric perforator (DIEP) flap with a unitary skin paddle to reconstruct the side requiring more skin and using two independently perfused, stacked flaps to reconstruct the side requiring less skin can provide improved aesthetic results compared to the usual four-lobe configuration using hemi-DIEP and a deep artery perforator (PAP) [26]. DIEP flap surgery requires the specialist to form a little cut within the layer covering the stomach muscle to permit examining of blood vessels traveling inside the muscle. DIEP flap surgery is considered a muscle-sparing procedure since specialists don’t evacuate any muscle, which suggests a speedy recuperation and less of muscle dystrophy.

Transverse rectus abdominis muscle (TRAM) flaps are one option for autologous breast reconstruction. We can use them as pedicled or free flaps. Each patient is individually assessed for the possibility of using this reconstruction method. The patient should be informed of the risks associated with free tissue transfer, including flap problems and donor site complications. Patients who have had previous abdominal procedures may receive a computed tomography angiogram to evaluate the anatomy of the perforator. Patients with a history or family history of blood clots may be referred to a hematologist for evaluation of hypercoagulability. Before the procedure, each patient should receive appropriate anticoagulant therapy and antibiotics. The preferred recipient vessels for autologous breast reconstruction are the internal mammary artery and vein. The most common point of vascular access is between the third and fourth ribs, which can be spared or partially removed to expose the vessels [27].

The latissimus dorsi flap (LDF) is used to reconstruct a large number of surgical defects associated with breast cancer. These defects include, among others, quadrantectomy, tumor resection, modified radical mastectomy and others. This type of reconstruction can be used both in immediate and delayed reconstruction, as well as in combination with tissue expanders or alone as an autogenous flap. LDF is a

reliable method of soft tissue reconstruction, guaranteeing the preservation of form and function during breast reconstruction with acceptable perioperative and long-term conditions. In situations where there is a tissue deficit, LDF is able to provide the required amount of tissue during the autologous reconstruction procedure. Additionally, it provides a reliable vascular pedicle in the context of implant-based reconstruction, which is particularly important when considering areas of irradiated tissue. In the context of autogenous breast cancer reconstruction, LDF is the preferred treatment for patients who do not meet the criteria for TRAM flap implantation. These conditions include prior tummy tuck procedures, prior TRAM procedures, not having enough skin or fat tissue in the abdominal area, and a high risk of comorbidities such as diabetes, obesity, or smoking. For patients whose breasts have been irradiated, LDF can be used to deliver well-perfused tissue to ischemic areas on the chest wall. Additionally, LDF can be used to correct partial defects resulting from mastectomy or lumpectomy, to increase the volume of thin or delicate skin flaps on implants, and to maximize the aesthetic result in prophylactic mastectomy. Relative contraindications to the use of the latissimus muscle include posterior lateral thoracotomy, during which the muscle and its blood supply were previously divided, and the division of the thoracic pharyngeal nerve during axillary node dissection, which led to muscle atrophy [28].]

RADIOTHERAPY AND IMMEDIATE BREAST RECONSTRUCTION

Currently, we can observe new trends in the treatment and reconstruction of breast cancer. These include bilateral mastectomy, prophylactic mastectomy, and skin and nipple-preserving mastectomy. These methods are used more and more often for immediate breast reconstruction. Due to the expansion of indications for radiotherapy among patients with early-stage breast cancer, the number of immediate breast reconstructions has decreased, but it has contributed to the improvement of the treatment planning technique that complements radiotherapy and the improvement of breast reconstruction based on autologous implants [1].

[After mastectomy, it is advisable to start radiotherapy for the patient. However, it should be remembered that there are many more indications for radiotherapy, and each decision is made individually based on the patient's clinical picture and her medical history.] This combination reduces the risk of local tumor recurrence. Radiation therapy has many side effects. We can divide them into immediate effects (occurring immediately after its implementation in a fairly short time interval) and delayed effects. Immediate effects include, for example: exfoliation, erythema, discoloration, edema and ulceration, in almost 85% of patients acute radiation dermatitis is observed. Delayed effects, however, are: skin dryness, discoloration leading to skin fibrosis, which ultimately led to more complications, such as more frequent capsular contractures, implant failures and poor cosmetics, as well as telangiectasias [20]. Based on research from the UK, we can see a trend there that between 30 and 40% of women do not undergo immediate breast reconstruction after mastectomy due to the fact that radiotherapy after reconstruction is ambiguous in terms of its safety. A survey conducted by the Association of Breast Surgery in Great Britain (March to

June 2014) showed that the majority of surgeons (as much as 77%) believe that the current information base we have regarding breast reconstruction is insufficient to be able to make decisions regarding reconstruction before radiotherapy [20]. Nearly 90% of physicians choose delayed breast reconstruction in the face of radiotherapy, even though there was no qualitative or cosmetic difference between immediate and delayed breast reconstruction. One study compared two groups of patients: irradiated and non-irradiated, and showed that capsular contracture rates are similar in both irradiated and non-irradiated groups. Some authors have reported adverse effects of breast prosthesis radiation due to fibrosis of the pectoral muscles. This leads, among other things, to implant migration. This is more evident in submammary reconstructions than in prepectoral reconstructions. Post-mastectomy radiotherapy (PMRT) has a lower reconstruction rate compared to non-irradiated patients, but PMRT appears to reduce the relative contraindications to IBR (53–55), (56–58). A population study from the SEER database of 5,481 radiotherapy patients showed that IBR rates nearly doubled during the 2000 decade – from 14% to 25% [3].

Recent studies report significant improvements in health-based quality of life among irradiated patients who undergo immediate breast reconstruction compared to those with delayed breast reconstruction. Therefore, plastic surgeons should increasingly consider reconstruction plans in relation to anticipated adjuvant treatment needs. However, there is no well-defined algorithm for breast reconstruction in PMRT conditions [3]. Lymphatic mapping combined with a sentinel node biopsy performed before surgery remains the most accurate test to predict radiotherapy at this time. It can help determine whether we can perform immediate breast reconstruction [21]. In general, if the sentinel node is positive on a preoperative test, radiation therapy is expected and recommended. Despite these assessment methods, absolute indications for radiotherapy appear only after the final pathomorphological examination. Because another point to consider when deciding on the use of a radiotherapy protocol is tumor invasion into the breast parenchyma [21].

FUTURE PERSPECTIVES

Recently, new trends have emerged in the treatment of breast cancer. Surgeons currently try to leave as little breast tissue as possible in women at risk of breast cancer and avoid breast reconstruction. For women who are at risk for breast cancer and have currently healthy breasts, an option to reduce the risk of cancer is to completely remove both healthy breasts and consider reconstructive surgery after mastectomy. The results show that women are very satisfied with both the post-BPM (Bilateral prophylactic mastectomy) results and their decision to use BPM. We also found that women who opted for BPM and mastectomy reconstruction had slightly different performance expectations and were more difficult to meet than those who opted for BPM alone. Therefore, future research on the implications of patient expectations in this setting is needed. Two studies from the current review suggest that BPM dissatisfaction or regret is associated with physician-initiated BPM [22]. The quality of life of end-stage breast cancer patients can be threatened by the symptoms of malignant wounds. Reconstructive surgery after mastectomy is beneficial for end-stage breast cancer

patients. The appropriate local flap for breast reconstruction is still unknown. The study found that trapezoidal flaps were superior to pivot flaps in improving overall health and chest symptoms. Further studies with larger samples are needed to confirm superiority [23]. “Ultramicrosurgery” is a technique that safely performs microdissection and suturing using optical instruments and instruments. Much attention has been paid to tissue regeneration, which may promise better breast reconstruction techniques in the future. Injection of polymer-seeded chondrocytes into animal models has been reported to produce human nipple-shaped cartilage plaques. Immediate reconstruction of a large excision covering 20–40% of the breast can remove large areas of tumor and prevent secondary breast deformity. It can also reduce costs, provide delay-free reconstruction without secondary surgery, and require fewer contralateral procedures. The use of a preoperative 3D laser scanning system and the intraoperative technique of direct volumetric transfer of the mastectomy specimen have yielded satisfactory postoperative results. The principles and methods of oncoplastic surgery are adapted to meet the needs of defect reconstruction before and after lumpectomy, with satisfactory results before and after irradiation. There are many breast reconstruction options available to women in the 21st century, all with satisfying natural feel, comparable size, and breast elasticity. As breast reconstruction continues to evolve, plastic surgeons continue to look for innovative methods and techniques to optimize aesthetic results [24]. Work is underway to evaluate the use of decision aids to improve the preparation of women for breast reconstruction. Because her 3D version of the

technique used in this study did not provide her 360-degree view, a woman interested in assessing the aesthetic outcome of a reconstructive procedure such as a latissimus dorsi flap should be able to access the outer breast area. The wound could not be fully evaluated [25].

SUMMARY

Summarizing the collected information on breast reconstruction methods after mastectomy, we can draw different conclusions about each of them. Whichever method we choose, there will be advantages and disadvantages behind it.

For implant-supported breast reconstruction according to recent studies have presented that pre-breast reconstruction shows it can be done in a short period of time as well as it is easier to carry out by the surgeon. Moreover, prepectoral placement shows that there is a possibility of not only introducing the larger-volume implant, but also the postoperative pain can be reduced.

With fat grafting reconstruction the complications are quite low, however there can be the appearance of fat necrosis, postoperative infections or oil cysts. Also patients who undergo prior radiotherapy have increased appearance of fibrosis, therefore the checkups and increased number of fat grafting sessions (FGS) will be needed. While using the fat for the reconstruction we need to remember that 30 up to 50% may not be accepted by the patient. The same problem can be encountered in flaps based reconstruction.

Table 1. Summary of the therapeutic methods

Author/ year/ title	Study design	Type of method	Advantages	Disadvantages/ Possible complications
Sung- Eun- Kim, 2019, “Prepectoral breast reconstruction”	Discussion on the prepectoral breast reconstruction	Prepectoral breast reconstruction	Decreased rate of capsular contracture Reduced implant failure rate Significantly better aesthetic results To reduce high costs vicryl mesh, porcine mesh or titanium-coated polypropylene mesh are currently used. Muscle- sparing Reduced pain and recovery time after the surgery	Rippling and wrinkling of the skin Gap between the chest wall and the prepectoral implant The high cost of acellular dermal matrices, which are two or four times more required for this procedure than for subpectoral reconstruction
Li H, Wang Y, Yang D, Petit JY, Ren G, 2021, “Clinical study of the feasibility, complications, and cosmetic outcomes of immediate autologous fat grafting during breast-conserving surgery for early-stage breast cancer in China.”	Autologous fat transfer/grafting is a reliable technique for improving poor cosmetic results after breast tumor resection. The study involved 58 patients with early breast cancer treated surgically and divided into two groups - after breast conserving surgery (BCS) with lipofilling and BCS without lipofilling.	Fat transfer/ grafting reconstruction	Satisfactory aesthetic effect of the breast appearance Less need for secondary surgeries, especially in patients with small breasts or tumors located in the upper and inner part of the breast Increased satisfaction with the procedure for both patients and doctors Low risk of surgical complications	No confirmation of the oncological safety of immediate lipofilling in patients with early breast cancer Unexplored effectiveness for larger breast sizes Very low risk of the presence of serum requiring drainage and leading to complete fat resorption. Oncologically safe procedure, no recurrences or metastases at the site of fat transfer
Myers PL, Nelson JA, Allen RJ Jr. 2021, “Alternative flaps in autologous breast reconstruction.”	Summary of flap harvesting options, types of flaps, and surgical flap harvesting techniques and results of alternative flaps in autologous reconstruction.	Flap-based breast reconstruction.	More natural, ptotic appearance of the breast with longer lasting results and improved patient satisfaction for example compared to implants. Low incidence of complications at the flap donor site Dynamically developing reconstructive microsurgery may make this method a standard in breast reconstruction in the future	Impossibility of harvesting the flap due to anatomical conditions - lack of volume at the donor site or previous abdominal surgery Loss of sensation Additional scar at the flap donor site Possibility of lymphedema at the site where the flaps are taken (usually the back of the thigh) In the case of flaps taken below the gluteal fold - pain when sitting

One of the advantages in comparison to implant supported reconstruction is that the breasts are not only more durable, but they also look more natural. For patients who had the stacked flaps reconstruction and whose breasts are larger it can be the best option, hence the volume of breast which can be obtained can be greater. Another advantage is that it can be performed either during the mastectomy or even a few years later. Recent trends however show that surgeons try to avoid reconstruction surgery, therefore they leave little to no breast tissue.

CONCLUSIONS

In the light of modern knowledge, the post-mastectomy breast reconstruction is slowly developing. Hence mastectomy is an amputation of the breast gland, the vast majority of the patients who undergo this surgery decide to also undergo reconstruction. Nowadays there are many methods including: implant-based reconstruction, fat grafting reconstruction, flaps-based reconstruction. Each method can be carried out on different types of patients, due to the fact that each has advantages and disadvantages behind it.

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