International Journal of Medical Science and Clinical Research Studies

ISSN(print): 2767-8326, ISSN(online): 2767-8342

Volume 03 Issue 01 January 2023

Page No: 147-154

DOI: https://doi.org/10.47191/ijmscrs/v3-i1-30, Impact Factor: 5.365

A Reviewing Early Vs Later Reconstruction for Post-Mastectomy Cases

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ABSTRACT

Objective: The objective of this study was to compare the advantages and disadvantages of patients undergoing either immediate or delayed breast reconstruction after mastectomy.

Methods: This review was compiled using information from numerous web databases. Scientific articles were selected based on the inclusion criteria. Data were collected, organized, and summarized.

Results: Mastectomy or breast removal is frequently performed as part of breast cancer treatment. Psychological issues following a mastectomy may get better for some patients after breast reconstruction. The most common type is immediate reconstruction, which preferably uses a nipple-sparing or skin-sparing mastectomy and implant-based reconstruction (but can also be autologous reconstruction). Delayed reconstruction is often performed using autologous tissue flaps or implant-based using either the definitive implant or temporary expanders.

Conclusion: Immediate reconstruction creates better cosmetic outcomes, shorter overall costs, quicker recovery, higher quality of life, and increases the psychological well-being of patients. Besides, delayed reconstruction is a beneficial option for post-mastectomy radiation therapy (PMRT) cases and reduced the incidence of postoperative complications than immediate reconstruction.

ARTICLE DETAILS

Published On:
31 January 2023

KEYWORDS: Breast Reconstruction, Classification of Breast Reconstruction, Immediate Reconstruction, Delayed Reconstruction

Available on:
https://ijmscr.org/

INTRODUCTION

The most frequent type of malignancy in women is breast cancer. One new incidence of breast cancer was predicted to be diagnosed in 2.3 million women in 2020 or 24.5% of all malignancies in women are caused by breast cancer[1]. In Indonesia, breast cancer is the most prevalent cancer, which is 19.2% of all cancer cases[2].

Breast cancer patients may experience treatment-related side effects, such as side effects from anticancer, also lymphedema, and mastectomy scars. These consequences can result in problems with sexual dysfunction, low self-esteem, and changed body image[3]. One of the treatments for breast cancer is breast removal or mastectomy which affects the social, psychological, and sexual well-being of patients[4]. Breast reconstruction, also known as a "reverse mastectomy", is assumed to aid in restoring physical and mental recovery following a breast cancer treatment crisis. Breast reconstruction can be done with autologous tissues based, implant-based, or a combination of both. Also, breast reconstruction can be classified into immediate breast reconstruction or early reconstruction refers to reconstruction done right after a mastectomy, and delayed breast reconstruction or later reconstruction refers to reconstruction done several months or even years later from mastectomy[5]. This study compared early breast reconstruction and later breast reconstruction regarding the outcomes and complications.

METHOD

This literature review was compiled using information from numerous web databases, including NCBI, Google Scholar, Science Direct, and Pubmed. "Mastectomy", "Breast Reconstruction", "Implant-based Reconstruction", "Autologous Reconstruction", "Immediate Breast Reconstruction", and "Delayed Breast Reconstruction" were the keywords used in the literature search. Scientific papers were chosen by the following inclusion criteria: the journal's publication year from 2012 to 2022, the journal is open access, and the articles are matched to the subject matter

covered in this literature review. Data were collected, organized, and summarized.

RESULT AND DISCUSSION

Mastectomy

Definition and Epidemiology

The term mastectomy is derived from the Greek word 'mastos', which means "woman's breast", and the Latin word 'Ectomia', which means "excision of". Mastectomy is a medical surgery in which all or portion of the breast is removed[6]. Mastectomy is recommended for approximately 50 percent of breast cancer patients in the United States[7]. In Indonesia, 57.9% of breast cancer patients had breast surgery, with the two most common procedures being breast-conserving surgery (54.7%) and mastectomy (45.3%). Surgery was the main treatment for early-stage breast cancer and late-stage (stage III and IV) mastectomy was chosen as intervention[8].

Types and Techniques

There are several types of mastectomies, due to the patient's preference, the tumor's size, or a recurrence after conservative surgery. Types and techniques of mastectomy, such as[9]:

1. Skin-sparring mastectomy

Type of mastectomy where skin envelope is preserved but the breast tissue is removed. This technique is becoming more popular. This is only performed on breast cancer patients with small tumors that are far from the nipple and for preventive mastectomy.

2. Simple or total mastectomy

Mastectomy where involved skin and breast tissue are removed with or without axillary surgery. The axillary tail is normally always removed and the pectoralis fascia is usually retained. Simple or total mastectomy is the most common procedure and is usually used in breast cancer patients who cannot be handled with breast-conserving therapies, such as those who have larger tumors than their breast, or patients who have previously received radiotherapy to the chest wall.

3. Radical (Halsted) mastectomy

Type of mastectomy where the breast tissue, Pectoralis minor and major muscle, and all axillary tissue are removed. This technique is currently only in cases, where the malignancy has spread to the muscles of the chest wall or recurrent disease involving the Pectoralis muscles.

4. Patey mastectomy

Type of mastectomy where breast tissue, axillary nodes, and the Pectoralis minor muscle are removed. This technique is for quick and completeness of axillary clearance.

Table 1. Complications of Mastectomy Techniques[9]

Technique	Complication
Halsted	Extensive scars, lymphedema, limitation of shoulder mobility
Patey	Seromas, lymphedema, hematomas
Total / Simple	Seromas, haematomas, flap necrosis
Skin-sparring	Recurrence, nipple malposition, or ischemia

Complications

Mastectomy complications can be psychological, physical, or others. Psychologically, mastectomy can cause changes in self-concept, emotions, body image, behavior, roles of patient and family, and family dynamic. Depression and other depressive disorders are other psychosocial side effects of mastectomy[10]. Breast cancer patients post-mastectomy believe that losing a breast means losing "feminity". Some patients may experience a reduction in libido, which is related to the patients may not feel beautiful after having their breasts removed. It's interesting that after a successful breast reconstruction, patients began to feel more feminine again[11].

Physically, mastectomy can cause lymphedema, post-mastectomy pain, limitation of mobility, change of body posture, brachial plexus injury, and fatigue. Lymphedema is the swelling of the arm brought on by inadequate lymphatic outflow into the lymph nodes. Functional ability loss, cosmetic deformity, physical discomfort, recurrent erysipelas episodes, and psychological illness are possible outcomes from lymphedema[10]. Pain post-mastectomy is described as a constricting, burning, or lacing type and paresthesia at the medial aspect of the arm[12,13]. Changing in body posture post-mastectomy as a result of movement restriction, back pain, muscle weakness, and pain associated with severe postoperative wounds, and compensating for the removal of the breast[10]. Complications from a mastectomy can also occur depending on the mastectomy types and technique used, which can be seen in Table 1.

Breast Reconstruction

Definition and Epidemiology

Breast reconstruction is the process of creating a new breast following a mastectomy procedure for the treatment or prevention of breast cancer. Between 2010-2016, out of 6.002 patients who had breast cancer and were treated with mastectomy, 7,6% of patients had breast reconstruction after mastectomy. Breast reconstruction is more frequently performed in married patients, with stage III and IV breast cancer, and the tumor size is 2cm larger than in patients without breast reconstruction after mastectomy[14].

Type of Procedure

1. Implant-based Reconstruction

Implant-based reconstruction (IBR) is breast reconstruction using prosthetic devices meant to increase the size of the intact breast or to replace surgically excised breast tissue. In the United States, implants are used in the majority (81%) of breast reconstruction surgery[15]. Beginning in the early 1960s, when Cronin and Gerow develop the silicone prosthesis and used it therapeutically for augmentation mammoplasty, prosthetic implants were utilized for breast reconstruction[16]. There is a technological innovation in IBR, namely the use of an acellular dermal matrix (ADM). The commonly used implant materials are silicone, saline, or a combination of both/double lumen[16]. Implant-based reconstruction can occur in immediate breast reconstruction or delayed breast reconstruction and can occur in either one or two stages[15]. In planned single-stage implant placement or direct-to-implant placement, IBR is completed with a single implantation operation. And in planned two-stage implant placement, a tissue expander is first inserted and then a permanent implant is inserted after some time has passed[17]. There are three possible tissue planes for implant placement, such as:

A. Pre-pectoral

Prepectoral placement may lessen pain and spasm from muscle dissection and prevent the chance of a postoperative animation deformity[17]. Better control over implant position and mastectomy flap perfusion in pre-pectoral placement is provided by a two-stage approach[18].

B. Dual plane

Dual-plane placement or known as dual-plane direct-to-implant reconstruction (DP-DTI) may lessen implant rippling and palpability and provides improved soft tissue coverage of the device[17]. In the DP-DTI procedure, the implant is inserted into a combined subpectoral and sub-ADM pocket[19]. This method is possible to finish the reconstruction in a single-stage approach[20].

C. Subpectoral

This procedure is one of the earliest and most fundamental-based methods. Subpectoral placement is useful for patients who may have concerns about their ability to heal and their tissue's perfusion. Subpectoral placement enables entire muscle coverage of a tissue expander without the use of ADM. Acellular dermal matrix (ADM) is an additional foreign substance from the body whose use must be careful with patients with diabetes, or smokers. Subpectoral placement can reduce pressure on the flaps and is useful, especially for patients with tenuous mastectomy flaps. Also, this procedure is required in the majority of delayed breast reconstruction, where the preoperative chest wall contour is flat[21]. In this procedure, the implant is inserted into the submuscular by releasing the pectoralis major muscle from the ribs and the implant will be covered by an adequate skin sheath[16].

Although implant-based reconstruction is a good procedure and often used for breast reconstruction, there are some complications, including impaired wound healing, seroma, hematoma, capsular contraction, and infection[22]. Infection can be avoided by preparing the surgical field and pocket before inserting the tissue expander and implant[23]. Infection cases can be managed by determining the presence of infection, administering broad-spectrum antibiotics, and evaluation[24, 25]. Another rare complication of implant-based breast reconstruction (1 in 2.200-86.000) is breast-implant-associated anaplastic large cell lymphoma (BIA-ALCL). Although uncommon, it is a potentially lethal illness that is easily treated with the right diagnosis and treatment[26, 27].

2. Autologous Reconstruction

Autologous reconstruction (AR) is a breast reconstruction that uses the patient's tissue[16]. In the United States, AR is used in 19% of breast reconstruction surgery[15]. Both immediate breast reconstruction (IBR) and delayed breast reconstruction (DBR) are options for AR. Immediate breast reconstruction (IBR) offers the highest opportunity for an aesthetic outcome, resource-saving, and fewer operations. In DBR, mastectomy skin flaps are frequently damaged and less compliant and a bigger rate of free-flap thrombosis[16, 28].

The anatomical location to perform AR is from the region which the tissue flap is sourced[15]. The use of lower abdomen tissue is the preferred donor site and technique for AR, for example, deep inferior epigastric perforator (DIEP) and transverse rectus abdominis myocutaneous (TRAM)[16]. Deep inferior epigastric artery perforator (DIEP) is used in 52% of AR and has advantages, including aesthetic, well-tolerated, and long-lasting results even in high-risk populations[29]. Deep inferior epigastric artery perforator (DIEP) flaps use skin and fat from the patient's abdomen[30]. Transverse rectus abdominis myocutaneous (TRAM) is another abdominally-based microsurgical tissue method used in 21% of AR. Transverse rectus abdominis myocutaneous (TRAM) flaps include skin, fat, and muscle from the patient's abdomen[31].

Due to anatomical limitations or patient preference, AR can also be performed using tissue from another area, for example, latissimus dorsi (LD), profunda artery perforator (PAP), lateral thigh perforator (LTP), transverse upper gracilis (TUG), superior gluteal artery perforator (SGAP), or inferior gluteal artery perforator (IGAP)[15, 16, 32]. The factors that should be considered when evaluating donor sites for a given patient can be seen in Figure 1. In an ideal situation, donor sites would have the following characteristics, such as[32]:

A. Contain sufficient subcutaneous fat to produce an acceptable breast mound.
B. Create minimal donor site functional morbidity.
C. Provide an adequate size skin paddle to resurface a chest wall and have the sufficient surface area to mold into a convex shape.
D. Be easily approached in a two-team setting
E. Have reliable perforator and feeding vessel anatomy

F. Can conceal scar burden at donor sites.
G. Match color/quality skin to breast or chest skin.
H. Can create a sensate flap.
I. Have fat consistency that mimics normal breast tissue

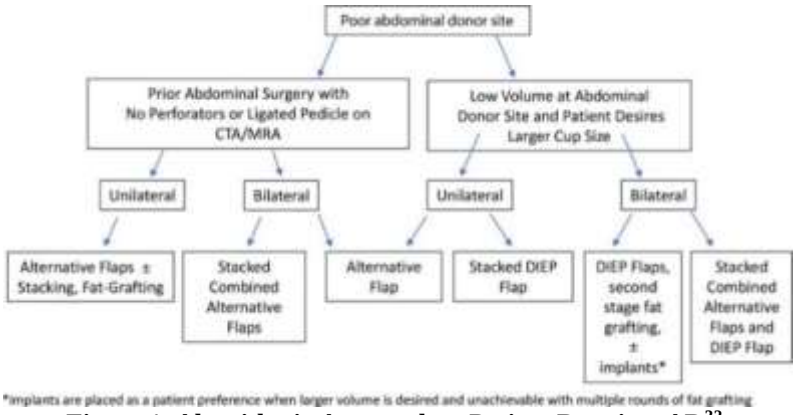

Figure 1. Algorithmic Approach to Patient Requires AR[32].

The advantage of using AR is can be completed in a single surgery, contrary to most IBR which need two-stage implant placement. Also, AR is meant to be permanent breast reconstruction, while IBR is recommended to be replaced every 10 years. On the other hand, AR is more extensive procedure than IBR and may come with more serious complications, like deep vein thrombosis, hernias, wound dehiscence, slow wound healing, and scaring[31].

Timing of Breast Reconstruction

1. Immediate reconstruction

Immediate reconstruction is a reconstruction performed at the same time as a mastectomy. The majority of breast cancer patients in the United States (75%) are given the option of immediate reconstruction[15]. This high demand is may be caused by a rise in curative and prophylactic nipple-sparing or skin-sparing mastectomy. Also, there are improvements in bioprosthetic technology with better aesthetic outcomes[33].

The recommended mastectomy technique for immediate reconstruction is simple skin-sparing mastectomy and nipple-sparing mastectomy[34]. Immediate reconstruction can be done for implant-based breast reconstruction (IBR), especially for breast cancer patients with small to moderately-sized breast and low degree of ptosis. Also, a tissular substitute such as a biological matrix or synthetic mesh can be utilized in place of the implant to provide support[35]. Synthetic mesh, ADM, or dermal autograft can be used to form the implant pocket in the partial submuscular, complete submuscular, or subcutaneous plane[36].

However, numerous studies have documented the increased morbidity linked to immediate implant-based reconstruction in the setting of post-mastectomy radiation therapy (PMRT)[37]. Post-mastectomy radiation therapy (PMRT) has been shown the improve overall survival and reduce locoregional reccurence[38]. Therefore, it seems safer to consider immediate autologous breast reconstruction in the context of PMRT. One of the anatomy sites that can be used for autologous breast reconstruction is DIEP[39].

Together, the oncologic surgeon and the plastic surgeon should perform the preoperative evaluation before immediate reconstruction. To choose between a skin-sparing mastectomy and a nipple-sparing mastectomy, it is important to carefully consider the tumor's size, tumor location, and nipple-areola involvement of the breast cancer[40]. Also, it is always crucial to define the patient's expectations of contour, sensation, firmness, and consistency of the new breast as these factors can occasionally result in lower patient satisfaction in an immediate breast, especially for IBR[33]. Postoperatively, a nonconstricting surgical bra with soft compression dressings is utilized to apply very light pressure over the breast. These interventions have been shown to lower infection rates and seroma[40].

2. Delayed reconstruction

Delayed reconstruction is a breast reconstruction that is carried out several months to several years after a mastectomy. This procedure is especially pronounced when radiotherapy was a part of the treatment for the patient, and also can be considered when there is decreased skin flap perfusion caused by the mas mastectomy process or related comorbidities such as diabetes, obesity, cardiovascular disease, or smoking[33]. Delayed reconstruction is allowed at least six to twelve months after the last radiation therapy session, to evaluate the deformity and plan the best reconstruction modality[41].

Delayed reconstruction is most suited for the use of autologous tissue flaps[42]. Latissimus dorsi (LD) flap which is usually combined with a definitive implant is the most adequate flap for smokers or patients with diabetes since it has a low risk of complications. Additionally, it is a good flap for slim individuals who have a history of abdominal surgery or who plan to become pregnant in the future. Transverse rectus abdominis myocutaneous (TRAM) or deep inferior epigastric artery perforator (DIEP) are good options to consider for patients with large breast, evident ptosis, and sufficient abdominal tissue. However, TRAM and DIEP are

not suitable options for patients who are obese and present with a high risk of impaired wound healing and fat necrosis[33]. Profunda artery perforator (PAP) flaps can also be chosen for the patient who was thin and had an inadequate abdominal donor location[42].

The delayed reconstruction with autologous tissue flaps has a difficult technic of operating in a scared and radiated region. Occasionally insufficient recipient vessels and severe breast asymmetry may reduce aesthetic outcomes. However, optimal aesthetic outcomes can be attained by[42]:

A. Increasing breast volume by deepitheliazing the inferior mastectomy flap skin rather than removing it.
B. Restoration of breast skin envelope with tissue expansion when possible.
C. When adequate breast skin surface area is present, optimal positioning of small skin paddle to be later incorporated entirely into a nipple areola reconstruction.
D. When extensive skin resurfacing is necessary, limit the reconstruction of the breast mound to two skin tones.
E. When both an immediate and delayed bilateral breast reconstruction is carried out at the same time, eccentric division of abdominal flaps occurs.
F. Performing second-stage breast reconstruction revisions and fat grafting.

Delayed reconstruction can also be implant-based. The implant-based reconstruction (IBR) can use definitive implants or temporary expanders. The plastic surgeon should prepare a preoperative strategy that includes a thorough examination of the healthy breast's characteristics and the best technique for treating the breast. First, a clinical and radiologic preoperative evaluation is essential for accurately selecting the surgical method. Second, it is also important to do an oncologic evaluation. It is also necessary to evaluate the contralateral breast, which should involve mammographic and ultrasound examinations. After the operation, some surgeons apply a dressing with elastic straps for three days or advise the patient to wear a sports bra as a medium compression immediately on the first postoperative day[43].

Immediate Reconstruction and Delayed Reconstruction Comparison

In comparison to delayed reconstruction, immediate reconstruction is thought to produce superior aesthetic outcomes, lower overall cost, reduced recovery time, a better quality of life, and improved patient psychological well-being31. This is at least in part related to the fact that the mastectomy and breast reconstruction are performed together, minimizing the number of operations and anesthetic exposures[44]. In comparison to patients who underwent delayed breast reconstruction, those who underwent immediate reconstruction experienced less pain and suffering. The majority of breast cancer patients reported better mental stability, also cosmetic satisfaction with their bodies, and completion of surgical treatment[45]. Immediate reconstruction should be considered due to delaying breast reconstruction potentially significantly affecting patient expectations of surgical discomfort and recovery[46].

Although some studies have shown that immediate reconstruction has better psychological well-being than delayed reconstruction, the study of Yoon et al 2018 shows that there is no significant difference between the psychological well-being of immediate and delayed reconstruction. This can be a result of the lack of a mastectomy in patients who are planning immediate reconstruction. However, patients who opt for delayed reconstruction have had to deal with the mastectomy scar, also its psychological and emotional sequelae[47].

Besides the advantages of immediate reconstruction, there are several complications of immediate reconstruction. Early complications of immediate reconstruction include seroma, infection, hematoma, skin flap necrosis, delayed healing, failed expansion, displacement, or implant explantation. 57% of immediate breast reconstruction patients undergo revision surgeries, compared to 27% of delayed breast reconstruction patients. This is because the risk of developing capsular contracture after an immediate reconstruction is higher (40%) than after delayed reconstruction (17%)[33].

In comparison to immediate reconstruction, delayed reconstructions have reduced the incidence of postoperative complications, including delayed wound healing, infection, mastectomy flap necrosis, reconstruction failure, and tissue fibrosis[47,48]. Complication rates for immediate reconstruction, indicate the results of two operations. However, complications in delayed reconstruction are the result only of the reconstructive process. So the combination of two surgeries and longer operative times in immediate reconstruction may explain in part the increased risk of complications[49]. Patients with delayed reconstruction had a decreased rate of mastectomy skin flap necrosis. It happened because the time that passed between the mastectomy and the subsequent reconstruction most likely allowed the mastectomy flaps to revascularize and heal from the initial trauma of the mastectomy. In these situations, the mastectomy may function as a preliminary surgical delay of the skin flaps, making them more tolerant of being remobilized at the time of the delayed reconstruction[48,49]. The advantages and disadvantages of immediate autologous reconstruction, immediate implant-based reconstruction, delayed autologous reconstruction, and delayed implant reconstruction are shown in **Table 2**.

Table 2. Advantages and Disadvantages of Common Breast Reconstruction Methods [31,33,44,47,48,49,50].

Procedure	Advantages	Disadvantages
Immediate AR	More cost-effective in the short-term Placed a breast mound immediately In the context of PMRT, safer with fewer complications than immediate IBR Less morbidity compared to IBR Higher quality of life scores than delayed AR	Scarring across the donor site No definitive pathology report was available at the time of surgery Complications: PMRT can result volume loss, wound contracture, and fat necrosis (especially with chemotherapy)
Immediate IBR	Placed a breast mound immediately Most cost-effective in the short-term Best aesthetic outcome if radiotherapy is not involved	Relatively higher risk of complications compared to AR No definitive pathology report was available at the time of surgery Complications: PMRT is most frequently associated with capsular contracture Other complications: infection and implant exposure are further risks Increased risk of implant loss is connected with lymph node dissection.
Delayed AR	Allows more time for high-risk patients or uncomfortable patients who may be recommended to delay reconstruction Possibly better results if performed 12 months after the PMRT Less wound contracture, volume loss, fat necrosis, and revision operation than immediate AR	Delayed cosmetic results Two procedures Complications: PMRT may cause volume loss, fat necrosis, and wound contracture
Delayed IBR	When PMRT is needed, good to excellent esthetic results. Gives patients additional time to decide whether to get an AR or IBR Ability to revise any asymmetries or radiation effects at the time of tissue expander removal	Delayed cosmetic results. Two techniques Smokers more likely had tissue expander complications. Use of expanders for a long time leads to rupture. Increased risk of implant loss is connected with lymph node dissection.

CONCLUSION

Mastectomy is one of the treatments for breast cancer. Breast reconstruction or known as “reverse mastectomy” can be performed on an implant-based or autologous tissue. There are two types of breast reconstruction: immediate and delayed. Immediate reconstruction provides the benefits of creating better cosmetic outcomes, shorter overall costs, quicker recovery, higher quality of life, and increase psychological well-being of patients. Delayed reconstruction is a beneficial option for PMRT cases and reduced the incidence of postoperative complications.

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