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Latissimus dorsi flap in breast reconstruction following radical mastectomy and prophylactic subcutaneous mastectomy in the same patient: Case report

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Abstract. One of the most common surgical treatment options for breast cancer is radical mastectomy, which affects the quality of life of patients in remission and their psychological state. One of the solutions to this problem is the use of skin and muscle flaps from other anatomical areas, in particular the back, for plastic reconstruction of the breast after radical mastectomy. The study aimed to present the practical implementation of reconstruction of both breasts in the remote period of radical mastectomy in a patient in remission of breast cancer using a skin and muscle flap of the broadest back muscle in combination with an implant. The patient, who met the criteria for participation in the study, had previously undergone a radical mastectomy of the right breast for direct indications along with radiotherapy. Delayed breast reconstruction within the study was performed 6 years after the planned right-sided mastectomy. The first surgical intervention included marking the back and breast area, excision and harvesting of the flap, preparation of the implantation site and its placement with the implant. Three months after the operation, she underwent a prophylactic mastectomy of the left breast based on molecular genetic testing with immediate reconstruction using the second flap of the broadest back muscle. The surgery was performed using a perimammary approach. Due to the available dissection, various anatomical configurations of the flap, and low-variability vascular anatomy, the *latissimus dorsi* flap is an adequate choice of material for the reconstruction of radical postmastectomy interventions. The final result of bilateral use of the flap for breast reconstruction after mastectomy is in favour of restoration of the anatomical tissue defect and a satisfactory aesthetic option, without complications in the form of seromas, haematomas, or pain. The result has a positive impact on the quality of life of a patient in remission of breast cancer

Keywords: mammoplasty; surgical correction; implant; myofascial repair

INTRODUCTION

Breast cancer (BC) is the most common cancer among women and the second leading cause of cancer-related death in this group [1]. The high prevalence of BC is associated with modifiable risk factors, but mammography screening and surgical treatment can improve prognoses. Frequent invasive forms of breast cancer require radical methods, such as mastectomy. It is important to consider not only survival but also the quality of life of women after radical interventions. More than a third of patients do not receive a sufficient assessment of their symptoms during the remission period. Mammoplasty surgical interventions aimed at restoring anatomy and aesthetics after mastectomy can improve the quality of life and psychological state of patients. In particular, the use of skin and muscle flaps is the optimal method for aesthetic breast reconstruction after radical mastectomy.

Following D.L. Lovelace *et al.* [2] and O. Kaidar-Person *et al.* [3], patients with successful breast cancer treatment who are in remission in most cases face negative long-term consequences of treatment that affect the quality of life,

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namely the growth of scar tissue in the area of mastectomy and breast tissue deficiency. These consequences include physical, functional, emotional, and aesthetic changes. The goals of surgical treatment of different types of BC remain the same – the elimination of metaplastic tumours from the breast, but with the least degree of anatomical deformation of the topographic area, as noted by the authors of A.N. Giaquinto *et al*. [4]. Whether it is radical lumpectomy or mastectomy, the need for aesthetic improvement of the results and their significant impact on the psycho-emotional state have been studied and recognised by surgeons in both the United States (US) [5] and the European Union (EU) [6]. The use of muscle flaps from anatomical areas, in particular the back, for plastic reconstruction of the breast after radical surgical excision of the latter in the focus of breast cancer is a safe method for women in remission, as evidenced by the results of their use by H.G. Cha *et al.* [7]. A musculocutaneous flap of the *latissimus dorsi* (LD) is widely used as a method of reconstruction of postmastectomy consequences using an autologous tissue complex with or without implants. Their availability in the surgical protocol of surgery and limited contraindications have been demonstrated by Slovak scientists Z. Danková *et al.* [8] and L. Krasničanová *et al.* [9]. Flaps from the abdominal area are also used along with LD flaps, but women of reproductive age often have direct contraindications to their excision, as follows from the results of A.G. Waks & E.P. Winer [10]. Among the topical issues of the methodology for performing plastic breast reconstruction using muscle flaps is the need for lipofilling, as noted by P. Koczkodaj *et al.* [11], the parallel use of implants, assessment of autograft volume, assessment of blood supply variability and innervation of the implanted tissue complex [12].

The study aimed to present the practical implementation and results of breast reconstruction in the long term (namely, 6 years after radical mastectomy) using LD in a patient in remission of BC and prophylactic reconstruction with a muscle flap with an implant.

MATERIALS AND METHODS

A patient in remission from BC was selected for breast reconstruction using the LD muscle flap. The patient, 49 years old, had a history of BC, for which a radical right-sided mastectomy was performed with a subsequent course of radiotherapy. At the time of the preliminary examination, the right breast was absent, and the condition of the postoperative scar on the chest was satisfactory. The left breast was intact and not involved in the metastatic process of breast cancer. At the time of the study, this patient was undergoing outpatient care after radiotherapy and radical mastectomy. The surgical intervention for plastic reconstruction was performed at the Department of Plastic, Reconstructive and Aesthetic Surgery of the Pasteur University Hospital and the Faculty of Medicine of the Pavol Josef Safaryk University in Košice in 2023. The total duration of the study was 10 months.

The selection criteria for participation in the study were: remission of BC, radical mastectomy, satisfactory condition of the skin of the thoracic region (turgor, elasticity) after radiotherapy; absence of an active infectious or viral process, absence of defects in the back area (fistulas, connective tissue scars, injuries) of the back area, especially in the LD area; documented consent of the patient to excision of the skin and muscle flap for plastic reconstruction. Contraindications to the use of the LD flap were muscle damage due to damage to the neurovascular bundle; myopathy in history; congenital anomalies and defects in the development of the LD. The general contraindications for plastic reconstruction and exclusion from the study were the presence of an active inflammatory process of any localisation; diabetes mellitus and immunopathologies (especially immunodeficiencies); and anaemia.

For the surgical intervention, the patient underwent a routine clinical examination before hospitalisation, including a general and biochemical blood test, general urine test, chest X-ray, allergy tests to the implant material, blood glycaemic and coagulation profile. No additional magnetic resonance imaging was prescribed, but the conclusions of the last examination were considered. Surgical intervention, risks of complications, and previous medical history were agreed upon with the patient's attending oncologist. There were no contraindications to participation in the study.

The surgical tactics were aimed at delaying plastic surgery on both breasts. Considering the previous medical history, the left breast was remodelled using an autograft, namely an LD skin-muscle flap. An additional implant was used to restore the volume of the right breast. The selection of the specific anatomical area and the type of tissue flap was based on the objective of this research, which aimed to assess the efficacy of the LD material. For a planned prophylactic mastectomy of the right breast, an LD flap without an implant with immediate reconstruction was also used. The patient had no contraindications to excision and the use of two autografts. The surgical interventions were performed following the clinical guidelines and protocols of the Department of Plastic, Reconstructive and Aesthetic Surgery of the Pasteur University Hospital and the Faculty of Medicine of the Pavol Josef Šafárik University in Košice. The effectiveness of the surgical treatment was assessed three months after the intervention with constant monitoring of the patient's somatic condition. The experiment was conducted with the patient's voluntary consent, as indicated in the written informed consent to participate, and in compliance with the ethical principles of the Helsinki Declaration for clinical research involving human subjects [13]. The design and methodology of the study were approved by the Research Ethics Committee of Pavol Jozef Šafárik University.

RESULTS

Delayed breast reconstruction, which was performed as part of the study as the first surgical intervention, was performed 6 years after a planned right-sided mastectomy, the results of which are shown in Figure 1. For the reconstruction of the breast in this patient, a skin-muscle flap of LD with a combination of alloplastic material, namely a silicone breast implant, was used. The patient was preliminarily diagnosed with a BRCA1 gene mutation, which indicated a high risk of developing second BC. Therefore, 6 months later, she underwent a subcutaneous prophylactic mastectomy of the left breast with subsequent immediate reconstruction. Thus, the left-sided mastectomy with plastic surgery had a prophylactic purpose, which was substantiated by the results of molecular genetic testing. The

proposed approach to surgical treatment included, first of all, planning before plastic reconstruction. The preliminary planning and marking of the breast reconstruction trajectory was performed in the form of drawing a pattern on the patient's skin in a standing position (Fig. 1, 2). Preoperative markings were applied on the inframammary fold on the healthy and reconstructed side, medial and lateral borders; at the points of attachment of the pectoralis major muscle, and areas of abduction; the dorsal side included markings along the edges of the LD. The markings were made along the midline of the anterior chest and on each gland along the midline regarding the middle third of the clavicle and the location of the nipple. The contours of the implant placement for the right breast after radical mastectomy were determined according to the location of the pectoral muscles and the intact right breast.

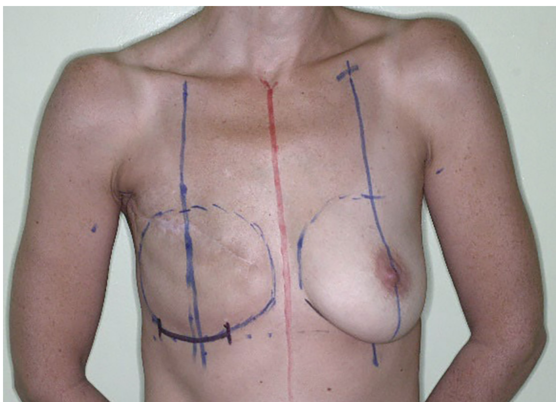

Figure 1. A 49-year-old patient with breast cancer underwent radical mastectomy of the right breast. Preoperative marking before plastic surgery
Source: photographed by the author

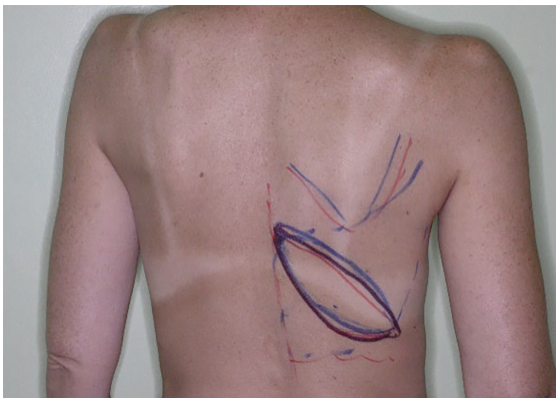

Figure 2. Preoperative marking: the boundaries of the back muscles, in particular, the *latissimus dorsi* and its blood supply
Source: photographed by the author

After a patient has undergone a modified radical mastectomy with a transverse scar, an oval-shaped skin flap is placed below and obliquely above the midline of the pectoralis major muscle. The preparation of the LD flap is accompanied by its elevation. To do this, an incision is made in the elliptical (oval) skin area, its dissection, and the actual isolation of the pectoralis major muscle, followed by dissection of the muscle by cutting off additional tissues, mainly the dense connective tissue of the fascial layers. After careful preparation of the flap, the skin-muscle complex was transferred to the patient's anterior chest wall (Fig. 3).

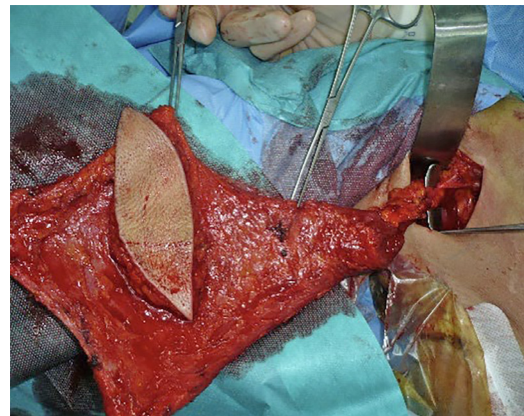

Figure 3. Muscle and skin flap from the broadest muscle of the back
Source: photographed by the author

Since the previous modified radical mastectomy involved the total excision of the breast, breast skin and subordinate pectoralis major fascia with axillary lymph nodes, an autograft with an implant was used for the right breast (Fig. 4). The separated musculocutaneous flap of the LD contains elements of blood supply and innervation, as well as a continuous skin flap with hypodermis. However, the flap does not contain fascial sheets or additional tissue complexes of adjacent topographic zones. After that, the actual reconstruction site was prepared. For this purpose, the mastectomy scar was excised, and a subcutaneous tunnel was created for the dorsal passage of the skin and muscle flap. Only after the reconstruction site was prepared, the implant was fixed and placed with the appropriate prepared material. A prophylactic subcutaneous mastectomy was performed on the left breast through a perimammary incision that preserved the nipple tissue and intact breast. The subcutaneous mastectomy was performed with immediate reconstruction using a flap of LD.

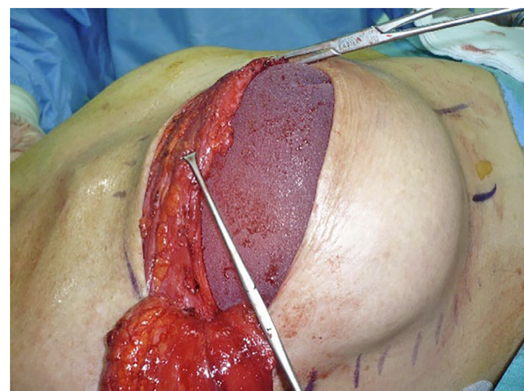

Figure 4. Reconstruction of the latissimus dorsi flap and augmentation of the implant covered by the pectoralis major and *latissimus dorsi* muscle
Source: photographed by the author

The use of the LD skin-muscle flap together with the implant allowed to restoration of the anatomical defect of the breast tissue after radical mastectomy and radiotherapy (Fig. 5). The skin flap is sufficiently elastic for plastic reconstruction and implant placement.

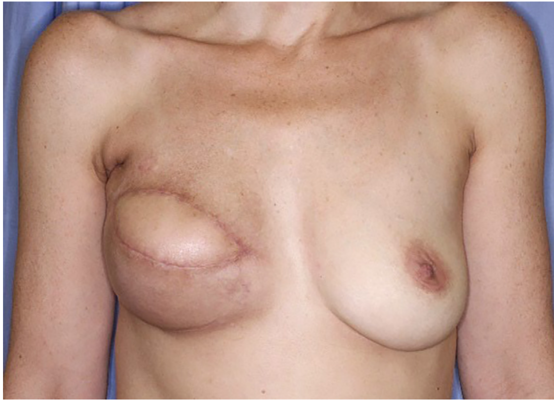

Figure 5. The result of the reconstruction of the *latissimus dorsi* muscle flap after radical mastectomy 3 months after plastic surgery
Source: photographed by the author

Thus, the patient's left breast was reconstructed using autogenous tissue in the form of a LD flap. This was a delayed reconstruction that showed satisfactory effectiveness in terms of restoring anatomical volume and the absence of immunological reactions to the implanted tissues and implant, which was assessed 3 months after the intervention (Fig. 5). The right breast underwent prophylactic mastectomy with immediate reconstruction along with mastectomy. Late reconstruction in this patient was possible given the satisfactory state of skin turgor and elasticity after radiotherapy (Fig. 6).

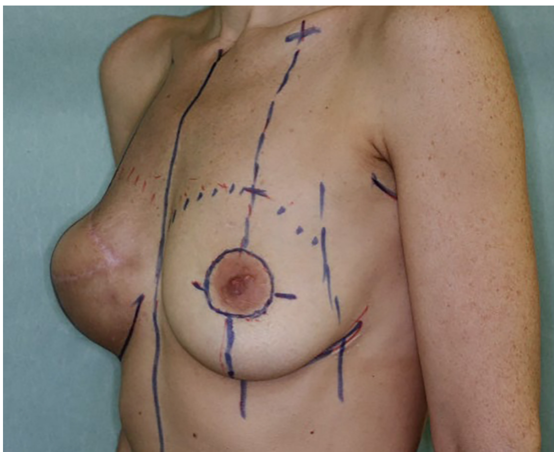

Figure 6. Preoperative markings on the left breast before prophylactic subcutaneous mastectomy
Source: photographed by the author

The perimammary approach for prophylactic mastectomy of the left breast was sufficient to place the LD flap and adequately reconstruct the volume after the removal of breast tissue (Fig. 7). The operation was performed according to the preliminary markings (Fig. 8).

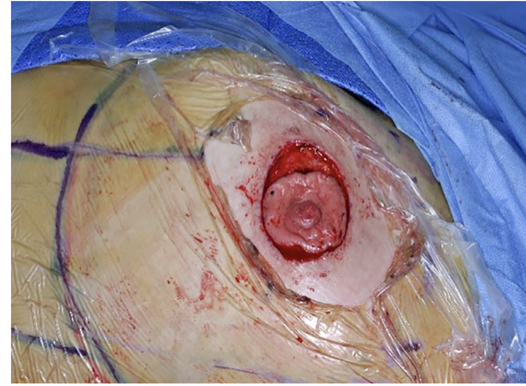

Figure 7. Prophylactic subcutaneous mastectomy through a perimammary incision that preserves the nipple and the breast itself
Source: photographed by the author

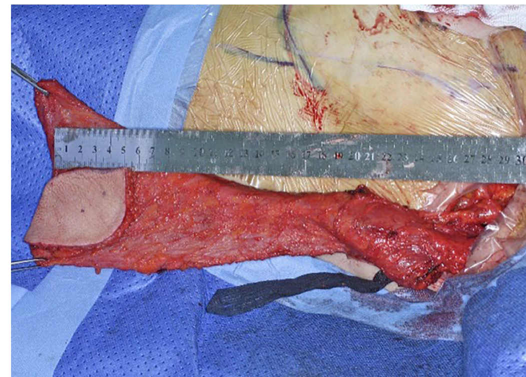

Figure 8. Preparation of a flap from the *latissimus dorsi* muscle
Source: photographed by the author

For the plastic reconstruction of the left breast immediately after prophylactic mastectomy, a flap of the LD with preserved elements of innervation and blood supply – the thoracodorsal artery and thoracodorsal nerve – was also used (Fig. 9, 10).

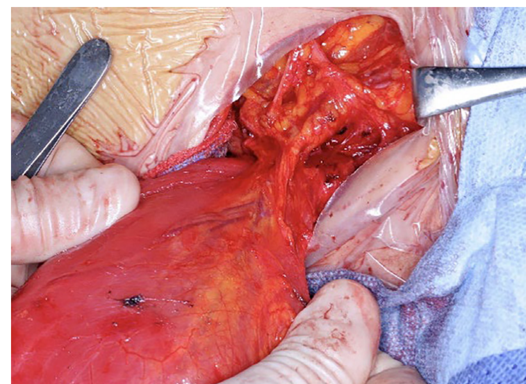

Figure 9. Muscle flap from the broadest muscle of the back together with the elements of blood supply and innervation – thoracodorsal artery and thoracodorsal nerve
Source: photographed by the author

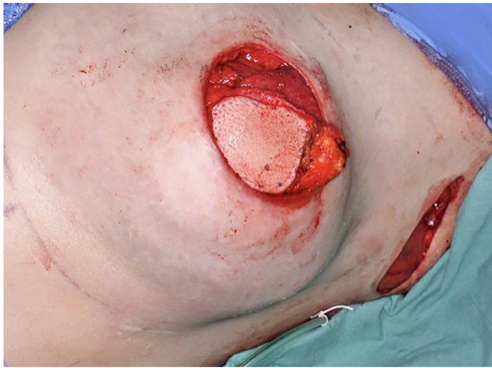

Figure 10. The musculocutaneous flap transferred to the anterior chest wall of the left breast
Source: photographed by the author

Breast reconstruction with an LD flap using an implant is effective, especially when a patient has contraindications to abdominal tissue harvesting. In contrast to local skin flaps used in most plastic surgery protocols after mammoplasty, the LD flap provides a larger and more adequate skin flap volume together with subcutaneous tissue (Fig. 5). These properties make it suitable for patients after breast radiotherapy when the skin after aggressive radiation treatment has low turgor and elasticity and is not an option for covering the artificial implant material.

Thus, a partially autologous reconstruction was performed, as the patient's biological material was used, but with the use of an implant for the right breast. The bilateral reconstruction was performed using both LD flaps, which showed no signs of rejection or complications in the postoperative period, excluding pain, impaired upper limb function, or limited range of motion (Fig. 11).

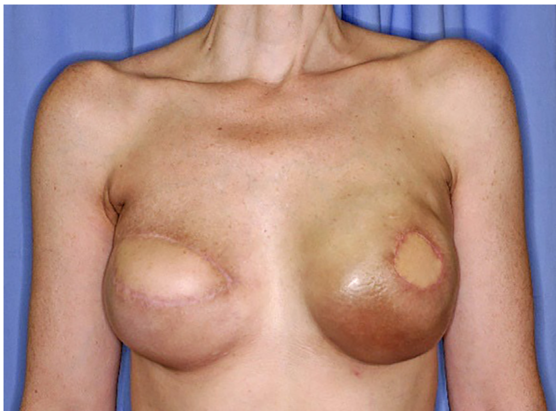

Figure 11. The final result after plastic surgery using the *latissimus dorsi* flap to reconstruct both breasts
Source: photographed by the author

Comparison of the patient's baseline data after unilateral radical mastectomy with the intermediate and final results indicates favour of restoration of the anatomical defect minus tissue and a satisfactory aesthetic option. The final result has a positive impact on the patient's quality of life in breast cancer remission. In addition, left-sided prophylactic mastectomy with plastic surgery is a preventive life-saving step in the management of this clinical case.

However, among the identified disadvantages of LD plastic surgery is the long duration of the surgery, which includes the harvesting and preparation of the skin and muscle flap, preparation of the site for implant and flap placement, and the actual plastic surgery of the breast area. Another disadvantage is the long scar on the back that remains after flap harvesting and the minor aesthetic effect on the operated breast: the transplanted skin from the back differs in colour from the surrounding thin and lighter skin on the breast.

DISCUSSION

Surgical treatment for breast cancer depends on the type of cancer, the stage of the disease, the patient's age, genetic factors, and general condition, as noted by L. Wilkinson & T. Gathani [14]. Modified radical mastectomy is the standard treatment for most patients with BC. Modern technologies allow mastectomy patients to restore the shape of the removed breast and improve their quality of life after radical and aggressive treatment. S. Char *et al.* [15] noted that mammary glands after mastectomy can be reconstructed using alloplastic materials (saline or silicone implants) or autologous tissues in the form of skin and muscle flaps. Sometimes, both implants and autologous tissue are used for breast reconstruction, as demonstrated in this study. Breast reconstruction can be performed at different times, but the patient in the study chose delayed breast reconstruction, which is a surgery performed several weeks, months or years after mastectomy according to clinical indications and informed consent.

According to S.B. Nam *et al.* [16], the advantage of using the LD flap for further breast reconstruction is that it provides for almost complete restoration of shoulder function in the long term. The thoracodorsal nerve division does not lead to volume loss or deformation of the topographic area of the shoulder and upper extremity at the site of autograft harvesting. Reliable anatomy (low variability of blood supply, innervation, and fibre course), easy dissection and relatively low complication rate, as indicated by J.B. Thomsen *et al.* [17], ensures the reliability of this technique, which is actively used by surgical schools. Long-term follow-up by G. Wattoo *et al.* [18] on a large cohort of patients who underwent reconstruction using LD showed a relatively low rate of side effects and unplanned revision surgery for inflammatory complications, as well as high patient satisfaction after breast reconstruction (namely, after radical mastectomies for BC in history), which indicates how reliable this technique is in the time aspect.

Considering all the advantages of the LD flap, the study aimed to use the flap for both reconstructions: after radical mastectomy of the right breast and for immediate reconstruction after prophylactic mastectomy of the left breast in the same patient. The patient received objectively satisfactory results of restoration of breast volume and anatomy without serious complications and with a satisfactory aesthetic effect. Randomised controlled trials conducted by M.B. Rindom *et al.* [19] show that after delayed breast reconstruction with a dorsalis pedis muscle flap or thoraco-dorsal artery graft, this group of patients is less likely to have postoperative symptoms of shoulder pain and show satisfactory shoulder function one year after surgical

reconstruction. However, the harvesting of a back muscle flap carries a potential risk of deterioration in shoulder joint function, chronic pain, and reduced quality of daily function. Contrary to the proposed opinion, the study did not show the presence of pain or impairment of both limbs at the control examination three months after the interventions on both breasts.

Some clinics prefer to use a flap from the posterior shoulder muscle. This material is advisable for patients who have scars after laparotomy, have undergone abdominoplasty, do not have access to microsurgery, or are smokers or obese. On the other hand, R. Tevlin *et al.* [20] demonstrated the use of deep inferior flap material. Important parameters of the clinical outcome after autologous breast reconstruction for BC are the fact of flap loss, fatty necrosis of the reconstruction site, abdominal protrusion, and abdominal hernia at the site of skin and muscle flap harvesting, as demonstrated by S.D. Archangelo *et al.* [21]. The first two conditions are related to flap perfusion, while the latter reflect pathological abnormalities in the patient unrelated to the breast. Retrospective clinical studies on numerous groups of patients after radical mastectomies conducted by J. Beugels *et al.* [22] show that the procedure of delayed breast reconstruction with abdominal skin and muscle flaps allows restoring the physiological volume of the mammary glands due to a sufficient amount of tissue. However, among the few complications, which did not exceed 4% in total, the authors highlight seroma (as the earliest complication) and flap loss. Such complications were not observed in the course of the study, and the volume of the LD flap also had satisfactory volumetric parameters.

Due to its simple surgical access, various anatomical flap configurations (shape and volume of harvested material), possible flap orientation and consistent vascular anatomy, the LD flap has been widely used in various fields of reconstructive surgery, as shown by the study, which focused on the effectiveness of its combination with implants when necessary. However, with the advent of abdominal flaps and free flaps, interest in the LD flap for breast reconstruction has partially declined. Abdominal flap harvesting has its advantages, but in most cases is challenging due to the different specific harvesting techniques used by different surgical schools and several somatic parameters used to assess donor site morbidity and suitability for autotransplantation, as described by H. Mortada *et al.* [23]. For example, according to the study by D. Boczar *et al.* [24], obesity is linked to increased postoperative complications during abdominal flap harvesting and is also considered a contraindication for subsequent procedures involving the extraction of skin and muscle flaps from the abdomen. A frequent possible complication in obese patients is abdominal protrusion and abdominal hernia after microsurgical breast reconstruction for BC.

J.S. Palve *et al.* [25] show that the structure of complications for different skin and muscle flaps for breast reconstruction after BC is significantly different. The patients studied by the authors with an implanted LD flap had the highest rate of minor complications, in most cases seroma, and the lowest rate of postoperative complications requiring reoperation. Patients with abdominal flaps in the study showed the highest rate of complications requiring reoperation. In breast reconstructions after radical mastectomies using implants, the same number of both minor complications and complications requiring surgical intervention were found. These differences may indicate individual characteristics of the postoperative process depending on the study population, differences in protocols and patient management tactics in different surgical centres. Part of the differences can also be explained by the peculiarities of the grading of complications and the time of their registration in the postoperative period. The patient in the present study did not have early or late postoperative complications in both breasts, which can be explained by the insufficient sample of subjects to assess the risks of complications.

The need to use an implant is usually explained by the potentially unsatisfactory flap volume in a particular clinical case and contraindications to harvesting a significant amount of tissue, as indicated by H. Sousa *et al.* [26]. In the case of the right breast, the use of a combination of a skin and muscle flap with an implant was due to the need to restore the anatomical volume of breast tissue after radical mastectomy. Such a surgical choice carries potential risks of seroma and haematoma in the early postoperative period, but they were not detected in this patient.

Despite the above-mentioned controversies and potential complications, the LD flap remains particularly useful for breast reconstruction in patients who wish to avoid abdominal scars due to the use of abdominal flaps, in patients with contraindications to abdominal flap harvesting, as well as in those who have already used abdominal flaps in the past, as described by P.S. Soon *et al.* [27]. Thus, it is important to choose the optimal method of breast reconstruction, considering the individual characteristics of the patient and his or her medical history. Depending on the clinical case, it may be advisable to use a combination of different methods, such as an LD flap with an implant, to achieve optimal results.

CONCLUSIONS

Breast cancer is one of the most common malignancies in women, and its surgical treatment is an evidence-based therapy. The choice of modified radical mastectomy is the most common approach for most patients, performed according to a standard protocol. However, a significant disadvantage of radical mastectomy is the psychological trauma for the patient associated with the loss of the breast. Therefore, breast reconstruction is the best way to solve psychological problems after radical mastectomy.

This clinical case illustrates the use of a skin and fat flap to reconstruct both breasts in the same patient after radical mastectomy. The method of choice was delayed breast reconstruction, i.e., a surgical intervention performed a long time after mastectomy (from several weeks to years). The timing of delayed reconstruction is variable depending on the patient’s indications and depends on the objective state of health, the stage of progression or remission of BC, the presence of direct contraindications and the duration of additional treatments (chemotherapy, radiation, or hormonal therapy).

The LD musculocutaneous flap is a reliable skin and muscle flap for the reconstruction of anatomical defects. The advantages of the *latissimus dorsi* flap include providing

sufficient tissue volume for autologous remodelling, as well as complete vascular coverage for breast reconstruction with implants in case of prior radiotherapy. Thus, reconstruction of the right breast after radical mastectomy with implants and complete autogenous reconstruction of the left breast after prophylactic subcutaneous mastectomy using skin and fat flaps provided a satisfactory aesthetic and physiological result in a patient with delayed breast reconstruction. Further practical studies of this issue will focus on the effectiveness of the results of using the *latissimus dorsi* flap for delayed reconstruction of different periods after radical mastectomy.

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None.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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Клапоть найширшого м’яза спини при реконструкції молочної залози після радикальної мастектомії та профілактичної підшкірної мастектомії: клінічний випадок

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Анотація. Одним із найпоширеніших варіантів хірургічного лікування раку молочної залози є радикальна мастектомія, яка впливає на якість життя пацієнток у стадії ремісії та їх психологічний стан. Одним із варіантів вирішення цієї проблеми є використання шкірно-м’язових клаптів з інших анатомічних ділянок, зокрема спини, для пластичної реконструкції молочної залози після радикальної мастектомії. Метою роботи було представити практичне виконання реконструкції обох молочних залоз у віддаленому періоді радикальної мастектомії у пацієнтки в період ремісії раку молочної залози з використанням шкірно-м’язового клаптя найширшого м’яза спини в поєднанні з імплантатом. Пацієнтка, яка відповідала критеріям участі в дослідженні, раніше за прямими показаннями разом із променевою терапією перенесла радикальну мастектомію правої молочної залози. Відстрочену реконструкцію молочної залози в рамках дослідження проводили через 6 років після запланованої правобічної мастектомії. Перше оперативне втручання включало розмітку області спини та грудей, висічення та забір клаптя, підготовку місця імплантації та встановлення його з імплантатом. Через 3 місяці після операції їй виконано профілактичну мастектомію лівої молочної залози на основі молекулярно-генетичного дослідження з негайною реконструкцією другим клаптем найширшого м’яза спини. Операцію проводили перимаммарним доступом. Завдяки доступній дисекції, різноманітній анатомічній конфігурації клаптя та низькій варіабельності судинної анатомії клапоть найширшого м’яза спини є адекватним вибором матеріалу для реконструкції радикальних постмастектомічних втручань. Кінцевим результатом двостороннього використання клаптя для реконструкції молочної залози після мастектомії є відновлення анатомічного дефекту тканини та задовільний естетичний варіант, без ускладнень у вигляді сером, гематом або болю. Результат позитивно впливає на якість життя пацієнтки в період ремісії раку молочної залози

Ключові слова: мамопластика; хірургічна корекція; імплант; міофасціальна репарація