ORIGINAL PAPER

Results in Breast Reconstruction – Retrospective Study

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Abstract

Introduction: The more and more frequent use of radiotherapy has hindered the approach manner of breast reconstruction. Applied before, during or after breast reconstruction, the radiotherapy compromises the esthetical results. **Material and Method:** The team's study included a number of 68 patients admitted to the Clinical Emergency Hospital "Prof. Dr. Agrippa Ionescu" Plastic and Reconstructive Surgery, within the period May 2013 – June 2017 for breast reconstruction after radical modified mastectomy with adjuvant treatment, chemotherapy / radiotherapy, or for subcutaneous mastectomy and immediate reconstruction with oncological indication. Among the followed objectives, we can list: the comparative assessment of the various reconstructive techniques with the premises of the presence of an adjuvant treatment of the curative mastectomy; the influence exercised by the medical history of the patient on the final result of the reconstruction and the susceptibility to complications or the need for a surgical re-intervention based on the used reconstructive procedure. **Results:** A careful and detailed pre-operatory assessment of the expectations of the patient and the selection of the adequate reconstructive procedure represent a necessity for a satisfying result. The breast reconstruction with implant during the associated therapy leads to the possibility of development of capsular contracture. Also, the additional use of a flap does not always offer protection against this complication. **Conclusion:** The radiotherapy improves the survival rate in the case of the patients with breast cancer in advanced stages, but makes difficult the selection of a reconstructive procedure.

Rezumat

Introducere: Utilizarea tot mai frecventă a radioterapiei a îngreunat modul de abordare a reconstrucției mamare. Aplicată înaintea, în timpul sau după reconstrucția sânului, radioterapia compromite rezultatele estetice. Material si metoda Studiul echipei a inclus un număr de 68 de paciente internate în Clinica de Chirurgie plastică și Microchirurgie Reconstructivă a Spitalului Clinic de Urgență "Prof. Dr. Agrippa Ionescu" din perioada mai 2013 – iunie 2017 pentru reconstrucția sânului după mastectomie radicală modificată cu tratament adjuvant chimio/radioterapie sau pentru mastectomie subcutană și reconstrucție imediată cu indicație oncologică. Printre obiectivele urmărite s-au numarat: evaluarea comparativă a diverselor tehnici reconstructive cu premisele prezenței unui tratament adjuvant mastectomiei curative; influența pe care o exercită antecedentele personale ale pacientei asupra rezultatului final al reconstrucției si susceptibilitatea la complicații sau necesitatea unei reintervenții chirurgicale în funcție de procedeul reconstructiv abordat. **Rezultate:** O evaluare preoperatorie atentă și detaliată a așteptărilor pacientei și alegerea procedeului reconstructiv adecvat acesteia este un necesar pentru obținerea unui rezultat satisfăcător. Reconstrucția sânului cu implant în prezența terapiei asociate ridică posibilitatea dezvoltării contracturii capsula-

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re. De asemenea, utilizarea adițională a unui lambou nu oferă întotdeauna protecție împotriva acestei complicații. **Concluzii:** Radioterapia îmbunătățește rata de supraviețuire la pacientele cu cancer mamar în stadiu avansat dar îngreunează alegerea unui procedeul reconstructiv.

INTRODUCTION

In the last century, the breast reconstruction after mastectomy has become an important element of the multicentric treatment of the patients suffering from breast cancer. Breast reconstruction was initially developed to reduce the complications of mastectomy and the deformations of the thoracic wall. Currently, it is known the fact that reconstruction can improve the psycho-social state and the quality of life of the patients with breast cancer[1].

The main objective of reconstruction is the re-creation of the form and symmetry by correcting the anatomical defect, at the same time, preserving the safety and health of the patient[1]. The main options in the reconstructive process involve the use of an implant, own tissue of the patient or both. The reconstruction process can begin immediately after mastectomy (immediate reconstruction) or after it (postponed reconstruction).

The more and more frequent use of radiotherapy has hindered the approach manner of breast reconstruction. Applied before, during or after breast reconstruction, the radiotherapy compromises the esthetical results[2]. Its results are represented by hypertrophic scars, loss of the cutaneous flaps and complications in any of the immediate reconstruction procedures (implant or analogue tissue). The reconstruction with implants followed by radiotherapy presents a higher frequency of implant-related complications – capsular contracture and infection, compared to non-irradiated reconstructions. The exposure to radiotherapy of the reconstruction with analogue tissue compromises this procedure, in most of the cases, and necessitates a re-intervention – including the use of a second flap, in certain cases[2]. There is a series of approved protocol[3] in order to reduce to a minimum the effects of radiotherapy on breast reconstruction, as the postponed - immediate reconstruction of the breast with the temporary use of an expander-implant in order to preserve the dimensions and contour of the breast. The results of these techniques are still in observation in various prospective studies.

Also, we must not consider only the effects of radiotherapy on reconstruction but also the manner in which the reconstructive procedure can influence the radiotherapy administration[4].

MATERIAL AND METHOD

The team's study included a number of 68 patients admitted to the Clinical Emergency Hospital „Prof. Dr. Agrippa Ionescu" Plastic and Reconstructive Surgery, within the period May 2013 – June 2017 for breast reconstruction after radical modified mastectomy with adjuvant treatment, chemotherapy / radiotherapy, or for subcutaneous mastectomy and immediate reconstruction with oncological indication.

Among the followed objectives, we can list: the comparative assessment of the various reconstructive techniques with the premises of the presence of an adjuvant treatment of the curative mastectomy; the influence exercised by the medical history of the patient on the final result of the reconstruction and the susceptibility to complications or the need for a surgical re-intervention based on the used reconstructive procedure.

The inclusion criteria were represented by: Patients admitted for breast reconstruction after radical modified mastectomy and finalized adjuvant therapy (chemotherapy / radiotherapy). The patients diagnosed based on puncture biopsy with Tis or the initial breast cancer stage who suffered a subcutaneous mastectomy and immediate reconstruction.

The exclusion criteria, there were not included:

- the patients having less than 30 days from the finalization of the chemotherapy or less than 6 months from radiotherapy.
- the patients with local, post-radiotherapy trophic disorders.
- the patients with important co-morbidities (presence of metastases or other neoplastic processes, decompensated consumptive disorders).

Collection and statistical analysis of data

The collected data included qualitative and quantitative variables.

The qualitative variables were nominal variables (localization, therapy, reconstructive procedure, the existence of complications, type of complications, pre-

sentation for revision, existence of a personal medical history, type of medical history, symmetrization, CAM reconstruction).

The quantitative variables were of continuous type (age)

The collected data were analyzed as follows: the quantitative variables were analyzed based on distribution (Kolmogorov Smirnov test), central tendency indicators (medium, medial) and of dispersion (standard deviation, minimum and maximum value), the qualitative variables were analyzed as absolute and relative frequencies.

There were performed comparisons based on the existence of the personal medical history, the presence of complications and based on the treatment administered for the qualitative variables using the chi square or Fisher test, based on the situation.

For the presentation of the results, the adequate diagrams were used.

The threshold of the statistical significance was established at the value of 0.05. The data were collected with the help of the program Microsoft Office Excel and, subsequently, these data were re-coded in SPSS format. The statistical analysis of the data was performed with the help of the program SPSS 21.0.

RESULTS

In this study there were included 68 cases with immediate breast reconstructions or reconstructions performed at a distance from the curative mastectomy. All patients were subjected to an adjuvant treatment, chemotherapy or chemotherapy/radiotherapy, for the diagnosis of breast cancer.

The average age of the assessed patients was of 50.25 ±5.47 years, with a minimum of 37 and a maximum age of 62 years.

The unilateral reconstruction of the breast was performed in more than 75% of the cases with a dominance on the left breast 60%.

The chemotherapy was present in 53% of the cases and the association chemotherapy / radiotherapy in 47% of the cases.

The surgical techniques based on which the reconstructions were performed are as follows - 25% latissimus dorsi and implant, 25% expander and implant, 20% expander Backer, 11.7% TRAM free transfer, 11.7% subcutaneous mastectomy and implant and about 6% reconstruction with pediculate TRAM (Figure 1).

The presence of the pathological personal medical history could be found in 16% of the studied cases.

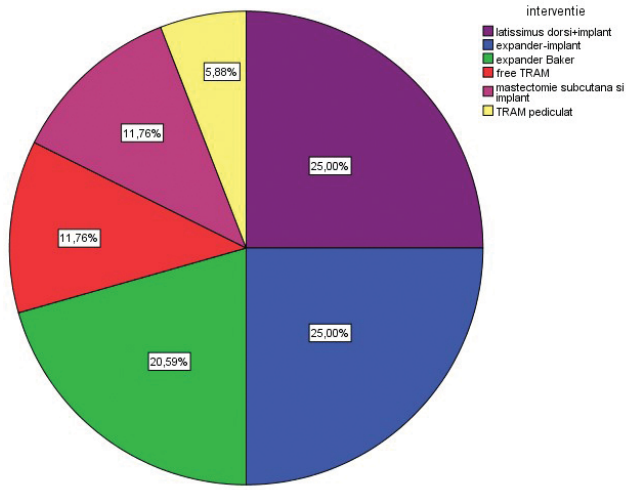

Figure 1. Structure of the study lot based on the reconstructive procedure.

With respect to the personal medical history of the patients which influenced the selection of the reconstructive surgical procedure, we mention – abdominal surgery in the inferior or superior area, presence of systemic diseases with treatment in progress – diabetes mellitus treated with insulin, coronary disease, BPOC respiratory pathology, obliterating arteriopathy, smoker patient.

The presence of the pathological personal medical history influenced the chosen reconstructive procedure; in most of the cases, 45%, it was performed the subcutaneous mastectomy and implant (the diagnosis of Tis or initial stage cancer), Backer expander or expander followed by implant in 36.36%, especially in the cases with a contraindication regarding the use of the analogue tissue.

The type of the used reconstructive procedure differs, in a significant manner, based on the existence of the pathological personal medical history. Therefore, the patients with pathological personal medical history benefited of a reconstruction of subcutaneous mastectomy and implant type (45.45%), Backer expander (36.36%) and expander/implant (18.18%). Only the patients without pathological personal medical history benefited of latissimus dorsi and implant (29.82%), free TRAM (14.04%) and pediculate TRAM (7.02%) (Figure 2).

The presence of the complications was registered in a percentage of 26%, this being almost similar between the cases with exposure at chemotherapy 27.8% and chemotherapy / radiotherapy 25% or the choice of the patient.

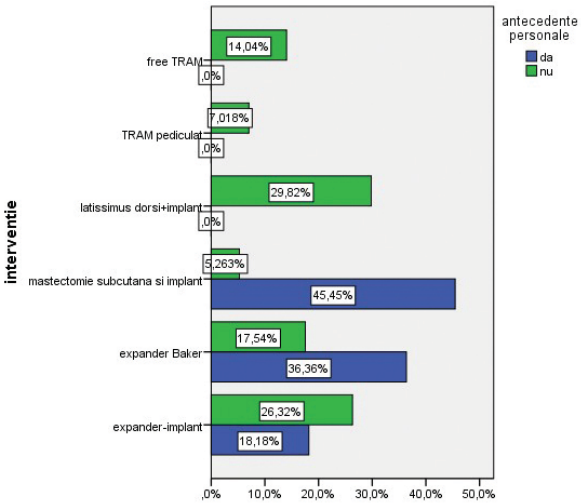

Figure 2. The type of the used reconstructive procedure based on the existence of the pathological personal medical history.

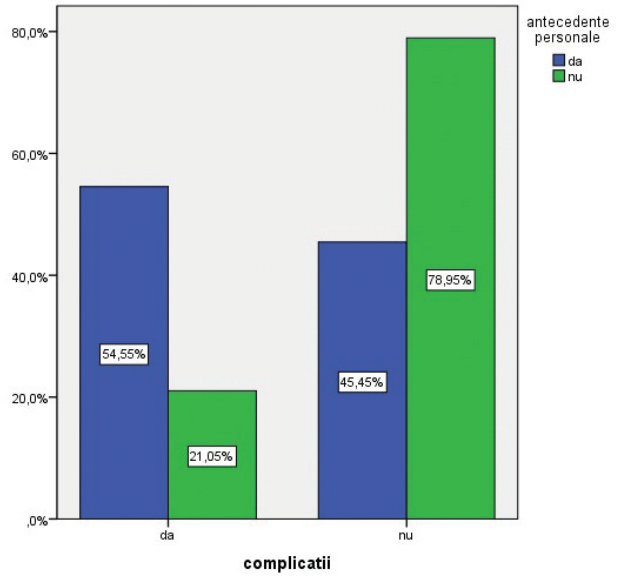

Figure 4. The presence of the complications and the pathological personal medical history.

From the patients with complications, 66% present capsular contracture and 11.11% seroma. 5.56% of the patients with complications present wound dehiscence, expander rupture, liponecrosis or partial flap necrosis (Figure 3).

An association, significant from a statistical point of view, ($p < 0.021$) is between the presence of the complications and the pathological personal medical history; therefore, about 55% from the patients with pathological personal medical history, respectively 21%, the ones without pathological personal medical history, presented post-operatory complications (Figure 4).

The term of surgical re-intervention for revision refers to the replacement of the implant or of the Backer expander, with another implant, the repositioning of the implant or its replacement with an analogue tissue flap, upon the request of the patient.

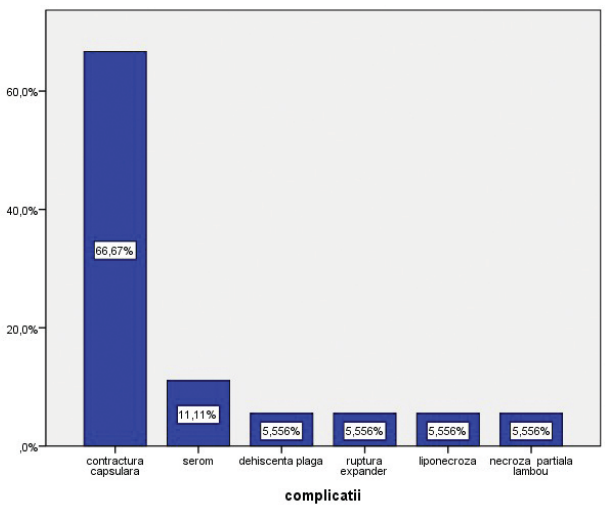

Figure 3. The presence of complications.

The necessity of the surgical re-intervention for revision was requested in 10% of the cases and it was not associated with the previously administered treatment type ($p=0.699$). 8.33% of the patients subjected to chemotherapy and 12.5% of the ones subjected to chemotherapy and radiotherapy, come for revision (Figure 5).

In about 25% of the cases, it was performed the symmetrization of the breasts and the reconstruction of the nipple-areolar complex was performed in the case of 19% of the patients. The performance of the symmetrization is associated, in a statistical significant point of view ($p=0.008$), with the existence of the personal medical history. In 54.55% of the patients with personal medical history, respectively 17.54% of the patients without personal medical history, it was performed the symmetrization of the both breasts.

The surgical technique chosen for reconstruction varied significantly ($p<0.001$) based on the adjuvant therapy.

- in case of chemotherapy – 30.56% of the reconstructions were performed with expander followed by implant, 22.22% subcutaneous mastectomy and implant, 22.22% free TRAM, 16.67% Backer expander and 8.33% latissimus dorsi and implant.

In the case of the chemotherapy associated to radiotherapy – the percentage is higher, 43.75% for the

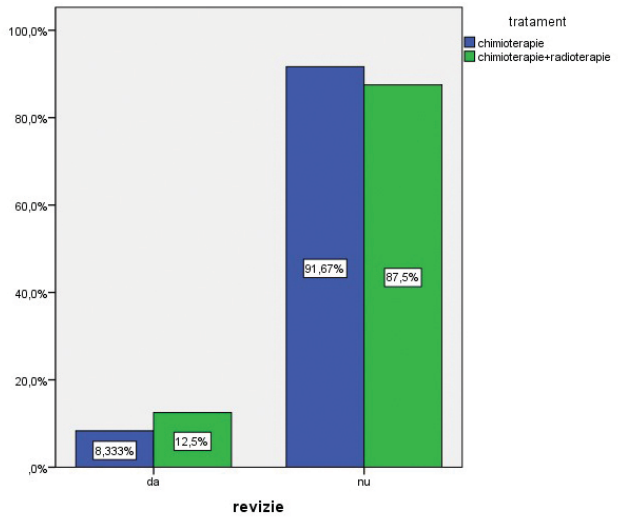

Figure 5. The necessity of the surgical re-intervention for revision associated with the previously administered treatment type.

reconstruction with latissimus dorsi and implant, 25% Backer expander, 18.75% expander followed by implant and 12.5% pediculate TRAM. It was performed no immediate reconstruction of subcutaneous mastectomy and implant type, or postponed reconstruction – free TRAM.

The type of administered adjuvant therapy was not associated, in a statistical significant manner, with the performance of the symmetrization. In the case of the patients with chemotherapy – in case of 62.5% of them, it was performed the symmetrization of both breasts, compared to 37.5%, representing the case of the patients subjected to combined therapy – chemotherapy and radiotherapy.

DISCUSSION

In the past, all reconstructions were postponed, so that this operatory moment would not influence the detection of a recurrent disease. The breast reconstruction was performed only in the case of the patients with a disease in initial stage, at a distance of at least 2 years, because most recurrences were detected within 2 years from the mastectomy[5]. Currently, this approach was abandoned, the patients being able to choose between a reconstruction performed simultaneously with the mastectomy (immediate reconstruction) or at a distance from it, after the finalization of the adjuvant therapy (postponed reconstruction)[5].

Even in the near past, the postponed reconstruction was preferred because it was considered that a reconstruction immediately after mastectomy could delay the adjuvant therapy through possible post-operatory complications and the exposure of the patient to an increased risk of recurrence. The studies performed for this purpose proved that the immediate reconstruction does not expose the patient to an additional recurrence risk and that this approach is an adequate choice[6]. However, we can mention some advantages and disadvantages of the immediate reconstruction versus the postponed reconstruction.

The immediate reconstruction has a clear benefit, through the avoidance of the psychological impact on the patient of exiting the operating room without a breast[7]. Also, it reduces the number of exposures to general anesthesia. By using, as much as possible, the breast native tegument, this approach improves the cosmetic results[8]. The immediate reconstruction can be an excellent option in the case of the patients with ductal carcinoma in situ (DCIS) or initial stage disease. The reconstruction with analogue tissue performed at the same time with the mastectomy tends to have better esthetic results compared to the postponed reconstruction procedures, because it enables the performance of a subcutaneous mastectomy[9]. Also, the recovery period is shorter and the total costs are smaller.

The postponed reconstruction has also its advantages. In the case of the patients who are not sure about the optimal reconstructive method, its postponement offers time to decide[9]. Many patients are not very much affected by the lack of a breast, as they expected to be, and they decide to perform the reconstruction. The recovery period after mastectomy is shorter. Usually, the patients cannot choose the operatory moment for the surgical curative treatment of the breast cancer but they can choose a recovery and healing period, enough for them, until the performance of the breast reconstruction[9].

It is also easier and faster to schedule a mastectomy surgery compared to the one of mastectomy and immediate reconstruction, where both the general surgeon and the plastic surgeon must work as a team during the surgery.

It is very important to mention that the nodal status is known during the postponed reconstruction and there is no risk for re-intervention at the level of the axillary lymph nodes or of irradiation of the reconstructed breast. The avoidance of the irradiation of the reconstructed breast is one of the strongest arguments of postponed reconstruction[7].

The most important aspect to be considered in the case of the multi-disciplinary protocol of the breast

cancer treatment is the interaction between radiotherapy and the reconstructive moment. In the last years, the indications and the use of radiotherapy, post-mastectomy, were increased. Its indications include the dimension of the tumor of more than 5 cm (some protocols even over 4 cm), narrow tumor edges, 4 or more positive lymph nodes[10].

The benefits of radiotherapy after mastectomy, in the case of the patients with one up to three positive lymph nodes, are still in discussion but its use is increasing. It is obvious that a certain percentage of the patients who shall undergo a mastectomy surgery shall be subjected to radiotherapy after the obtaining of the histopathological diagnosis[11].

Effects of the reconstruction with breast implant after radiotherapy

If radiotherapy is necessary after mastectomy, and if the patient chooses, with respect to reconstruction, the expander / implant, it is recommended the performance of the radiotherapy and, subsequently, the placement of the tissue expander for reconstruction[12]. However, the reconstruction of an irradiated tissue after mastectomy involves complications. The effects of radiotherapy limit the success of the tissue expansion[12]. This process is associated with pain, limitation of the expanded volume, deformations of the ribcage, a higher frequency of infections and the extrusion of the expander[11].

Compared to the placement of an expander / implant under a non-irradiated tissue, the reconstructed breast can be firmer at palpation, asymmetric and with a smaller projection. Certain studies showed a higher frequency of the complications (including unfavorable cosmetic results) of up to 60% and an increased incidence of the need for re-intervention for capsular contracture, additional tissue coverage or other additional procedures[11].

If, after radiotherapy, the exposed tissues have a low level of damages caused by irradiations, or the volume necessary for reconstruction is not excessive, the tissue expansion can be performed safely but with a reasonable risk for complications[11].

If the negative effects of radiotherapy over the tissues are obvious or a higher volume is necessary for reconstruction, it is preferred the association of the expander / implant with a transposition flap, for instance, latissimus dorsi[12]. This enables the use of a non-irradiated and well-vascularized tissue in reconstruction and the flap of latissimus dorsi covers the implant / expander and enables the tissue expansion. Also, the tissue area brought together with the flap can replace the tissue affected by radiotherapy[12].

Effects of reconstruction with autologous flap after radiotherapy

A good choice for breast reconstruction after radiotherapy is represented by the postponed reconstruction with autologous tissue. It must be mentioned that the pediculate TRAM flaps present a higher rate of tegument and adipose necrosis when the pedicle was exposed to radiotherapy before the surgery[13]. The TRAM free transferred flaps have a lower frequency of complications, compared to the pediculate ones[14]. There is a slightly increased frequency of complications in the healing process secondary to the decreased capacity of the irradiated tissue to integrate the new structures. In order to prevent this, it is recommended the use of larger volume of tissue for the creation of the flap and the excision of a corresponding area, from a dimensional point of view, from the irradiated and fibrotic tissue at the level of the thoracic wall[15].

The adjuvant radiotherapy administered post-mastectomy decreases the incidence of the local – regional recurrence of the breast cancer in the case of the patients diagnosed with an invasive stage of the disease and it was proved to be efficient for the improvement of the survival rate in the case of the patients with positive lymph nodes[16,17].

It is known the fact that the patients who were previously subjected to radiotherapy and who are candidates for breast reconstruction, present certain particularities. Also, the selection of the surgical technique and of the best moment for breast reconstruction are the key elements for a satisfying result[18]. This is determined by the high rate of the local complications, also well-known as being secondary to radiotherapy, which has a degenerative impact over the rest of the soft tissue at the thorax level[18].

The transfer of autologous tissue facilitates the reaching of the main objectives of breast reconstruction. Among them we can mention – the creation of an adequate volume for the pre-operatory dimensions, position and contour, a natural consistency and a longer period without the need for re-intervention.

The improvements brought to the reconstruction techniques with analogous tissue raise the current reconstructive option to a stage in which the final results are almost similar to the pre-surgical aspect, making this technique the golden standard for breast reconstruction[19].

The sampling techniques of the flaps and the maintenance of their viability, were improved to a level in which the attention was moved on the cosmetic aspect of the new breast and of the donor area, similar to the ones in the elective cosmetic surgery.

Currently, many studies from the specialty literature show that this type of reconstruction has no negative effects on the detection of the tumor recurrence[20-28].

The patients who request breast reconstruction after curative mastectomy often desire the keeping of the initial form – frequently noticed at the contra-lateral breast. Some of the patients desire a moderate improvement of the cosmetic aspect and the third group is represented by the patients who desire the complete review of the reconstructed breast[29].

The expectations of the patient have an important role for the post-operatory satisfaction level, and, therefore, the real results must be discussed from the beginning. The patients tend to have an inadequate information level regarding breast reconstruction and various studies present an increased frequency of the non-satisfaction regarding the final result[30,31]. Therefore, a careful and detailed post-operatory assessment of the expectations of the patient and the selection of the most adequate reconstructive procedure represent a necessity.

The 65 years old women and the women over that age represent only 3% from the patients with breast reconstruction with autologous tissue. This can be the result of the perception of the surgeons regarding the increased pre-operatory risk[32-33]. However, many studies showed that the age is not a predictor for weak results after micro-surgical reconstruction[34,35]. The patients being more than 65 years old, who are subjected to a reconstruction with abdominal tissue do not differ regarding the satisfaction degree, flap loss risk, flap necrosis, reconstructed breast morbidity, wound healing process or infection risk compared to the persons under this age[34].

The reconstruction with autologous tissue can be benefic especially to the old patients because of the presence of a ptosis breast and a higher degree of abdominal laxity. The current data support the safety of the use of the autologous tissue in breast reconstruction at this category of patients but the age can be associated to a higher risk of venous thromboembolism and herniation which need re-intervention[35,36].

Also, the co-existence of the disorders as arterial hypertension and the cardiac disorders can interact with the age and the increase of the perioperative risk.

Liponecrosis in the breast reconstruction with abdominal autologous tissue – is a frequently encountered complication[37] and it be represented by a nodule or mass which appears after reconstruction. It is caused by the ischemia of the subcutaneous adipose tissue, which leads to the necrosis of the adipose cells, scarring and, sometimes, calcification. Even if it presents no risks, it can simulate the presence of a tumor recurrence, both clinically and radiologically. From a clinical point of view, it can be palpated as nodular formation, with regular or irregular shape, or a tissue mass with tegument retraction[37]. During the mammography, it can appear as an irregular density, a mass with spicules or microcalcifications[38]. It presence leads to anxiety and the necessity for an additional biopsy[39]. Also it can negatively affect the cosmetic result of the reconstruction through the breast distortion effect.

Following the assessment of the specialty literature, the study performed by Ibrahim K. and his team[40] present a series of factors which may influence the risk for liponecrosis in the reconstruction with abdominal autologous tissue. So, among the important predictive factors we can enumerate: obesity, radiotherapy before reconstruction and also the one administered after reconstruction, smoking, presence of the medical history of abdominal surgery. The factors with protective role are represented by the bilateral reconstruction and the vascular overloading of the micro-surgical flap.

The reconstruction with autologous tissue is associated with an average of 1.06 additional interventions[41]. This is in contrast with the reconstruction with implant which, in general, needs several surgical interventions during the lifetime, because of the capsular contracture, the movement of the implant or modifications of the body-build of the patient. The cosmetic adjustments can be classified as follows: 1. Review of the tegument area with CAM reconstruction; 2. Modifications of the tegument sheath; 3 Volume modifications; 4. Symmetrization surgery.

It is possible for no other sub-specialty in the plastic surgery to have such an evolution and development as the one regarding the breast reconstruction, noticed in the last 3 decades. The obtaining of an immediate reconstruction with acceptable results, the possibility to keep a big tegument sheath, the micro-surgical evolution and the creativity of the surgeons involved in this field, led the breast reconstruction with autologous tissue to a superior level and with a continuing development.

CONCLUSION

A careful and detailed pre-operatory assessment of the expectations of the patient and the selection of the adequate reconstructive procedure represent a necessity for a satisfying result. A reconstructed breast is inferior, from an esthetic point of view, to a breast which suffered no surgical intervention, in almost any circumstance – even in the case of subcutaneous mastectomy with immediate reconstruction. Breast reconstruction through the association of an implant with autologous tissue enables an increase of the advantages and, at the same time, an integration of the disadvantages for each technique, individually considered. Many of the essential aspects of the final result in breast reconstruction are not related to the performance of the plastic surgeon (for instance, the dimension of the breast, quality of the skin and the vascular integrity of the mastectomy flaps). The association of the adjuvant therapies and of the pathological personal medical history limit the breast reconstruction options and expose the patient to a higher risk to develop post-operatory complications. The breast reconstruction with implant during the associated therapy leads to the possibility of development of capsular contracture. Also, the additional use of a flap does not always offer protection against this complication. The radiotherapy improves the survival rate in the case of the patients with breast cancer in advanced stages, but makes difficult the selection of a reconstructive procedure.

Compliance with ethics requirements:
The authors declare no conflict of interest regarding this article.

The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law. Informed consent was obtained from all the patients included in the study.

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