Chirurgia (2012) 107: 199-205
Nr. 2, Martie - Aprilie

Breast reconstruction with autologous tissue - our clinical experience

M. Nemes[1], D. Grujic[1], Z. Crainiceanu[1], L. Jiga[2], G. Prilipceanu[1], D. Olariu[1], F. Bodog[3] , T. Bratu[1]

[1]Clinic of Plastic and Reconstructive Microsurgery, Casa Austria, Emergency County Hospital Timisoara, Romania
[2]Department of Vascular Microsurgery, Clinic of Vascular Surgery, Emergency County Hospital Timisoara, Romania
[3]Faculty of Medicine and Farmacy Oradea, Romania

Rezumat

Reconstrucția de sân cu țesuturi autologe - experiența noastră clinică

Introducere: Reconstrucția sânului postmastectomie a câştigat amploare de la introducerea utilizării țesutului autolog şi a tehnicilor chirurgicale oncoplastice. În prezent, defectele majore postoperatorii ale sânului pot fi tratate cu țesuturi de foarte bună calitate obținute cu ajutorul lambourilor autologe, cu scopul atingerii celor mai bune rezultate de ordin funcțional şi fizic.
Obiective: Scopul acestui studiu este să analizeze rezultatele noastre în reconstrucția sânului folosind țesut autolog şi să sublinieze importanța echipei multidisciplinare în chirurgia reconstructivă.
Material şi metode: În decursul unei perioade de 5 ani (2005 - 2009) am efectuat 28 de reconstrucții ale sânului după operații de cancer, 15 reconstucții secundare şi 13 primare, cu ajutorul a trei tipuri de lambouri: lambou musculocutan de dorsal mare, lambou musculocutan transvers de muşchi drept abdominal şi lambou abdominal bazat pe perforante din artera epigastrică inferioară profundă.
Rezultate: Rezultatele funcționale şi cosmetice au fost extrem de satisfăcătoare, înregistrându-se doar complicații postoperatorii minore, cum ar fi seromul şi hematomul zonei donatoare şi necroza parțială/marginală a lamboului. Nu s-au înregistrat complicații majore de tipul pierderii totale a lamboului.
Concluzii: Reconstrucția sânului folosind țesut autolog este o procedură sigură şi valoroasă, chiar dacă nu una dintre cele mai uşoare, care conferă cele mai bune rezultate funcționale şi cosmetice şi care este în acelaşi timp sigură din punct de vedere oncologic.

Cuvinte cheie: cancer de sân, mastectomie, reconstrucție, țesut autolog, chirurgia oncoplastică a sânului

Abstract

Introduction: Breast reconstruction after mastectomy gained new grounds since the introduction of autologous tissue and oncoplastic surgery techniques. Nowadays large postoperative breast defects can be treated with high quality tissues obtained by autogenous flap surgery, to achieve the best functional and physical results.
Objectives: The purpose of this study is to analyze our results in breast reconstruction using autologous tissue and to emphasize the importance of a multidisciplinary team.
Material and methods: During a five year period (2005-2009) we performed 28 breast reconstructions after cancer surgery, 15 in delayed and 13 in primary reconstruction, using three types of flaps: latissiumus dorsi flap, transverse rectus abdominis myocutaneous flap and deep inferior epigastric artery perforator flap.
Results: Functional and cosmetic results were very good, only minor complications such as seroma and hematoma of the donor site and partial/marginal flap necrosis occurred after

Corresponding author: Nemes Mircea
Clinic of Plastic and Reconstructive Microsurgery, Casa Austria
Emergency County Hospital
10 I. Bulbuca Blvd, 300736 Timisoara
Romania
E-mail: nemesmircea@yahoo.com

the surgical procedure. There were no major complications like total flap loss. Conclusions: Breast reconstruction with autologous tissue is a safe, well proved, although not easy procedure that confers best functional and cosmetic results and is at the same time oncologically safe.

Key words: breast cancer, mastectomy, reconstruction, autologous tissue, oncoplastic breast surgery (OBS)

Introduction

Due to the progress achieved in previous years and increase of life expectancy among patients who undergo radical breast cancer surgery, there is a growing number of patients for which breast reconstruction is the main means in improving both their physical and mental state. There are many different types of breast cancer, with different stages (spread), aggressiveness, and genetic signature; survival varies greatly depending on these factors. In our country, breast cancer is the most frequently diagnosed type of cancer and the main cause of mortality among women. Annually there are 4400 new registered cases, representing 22.41% of all the new cases and 17.50% of all deaths among women. (1)

The first therapeutic option in breast cancer treatment securing universally uniform results was the radical mastectomy performed by Halsted (1882), a disfiguring surgical procedure aiming at the excision of the breast and its cutaneous cover monoblock with the pectoral muscles and aponevrosis and the axillary nodal content. This technique remained practically unchanged until the 70's, when the perception about this disease gained new approaches. The modified radical mastectomy with preservation of the pectoralis muscles was found a more appropriate option, only to be followed by yet less invasive and equally safe procedures: breast-conserving surgery and skin-sparing mastectomy, when the volume and the location of the tumor allow it.

Both these techniques aim at minimizing the aggressiveness of the surgical procedure and the resultant deformity, while not impairing the final results and reaching equivalent therapeutic benefits. (2,3)

One of the most elaborated methods of breast reconstruction is the use of autologous tissue. This surgical approach gained more ground since the introduction of the oncoplastic breast surgery (OBS) techniques in the late 80's. Because breast reconstruction became so popular, we decided to analyze the results in our department concerning breast reconstruction using autologous tissue over a 5 year period.

Material and Methods

Between January 2005 and December 2009, in the Department of Plastic and Reconstructive Surgery of the Clinical Emergency County Hospital Timisoara a total of 28 patients received breast reconstruction using pedicled or free flaps.

The average patient age was 38 years (range 33-67 years), the average size of the clinically determined tumor was 32 mm (range 10–50 mm).

At the time of hospitalization, 15 patients (53.57%) have already had the ablative procedure (delayed reconstruction) and in 13 cases (46.42%) we performed primary reconstruction in the same operative procedure as the breast cancer surgery. In these last cases the axillary procedure was decided by the multidisciplinary team (MDT) - general/oncologic surgeon and plastic surgeon.

Primary reconstruction was done following Madden modified radical mastectomy in 11 cases (84.61%), and Patey modified radical mastectomy in 2 (15.38%) cases. Axillary lymph node dissection (ALND) was performed in all cases. Lymph node removal of the first and second station was performed in 11 cases and of the first, second and third station in the other two. In all cases, resection margins were checked intraoperatively.

All the patients who received delayed reconstruction had been treated by adjuvant chemotherapy and 12 of them had undergone radiotherapy after mastectomy.

In 14 cases controlateral mammaplasty, with or without implant, had been performed to achieve optimal symmetrical breasts.

Patients were examined after 3-6 months for local or systemic recurrence of cancer, postoperative complications of the donor and recipient site, cosmetic results and patient satisfaction.

When performing the data analysis, we encountered a variety of clinical situations. There were several histological tumor characteristics, which determined the radical modified mastectomy performed in our clinic. Invasive breast cancer with ductal carcinoma in situ component was found in 11 cases (84.61%), and multiple centre breast cancer (MBC) in 2 cases (15.38%).

Considering the complexity of each case (age, associated pathology, excision volume, tumor size/type, situation, presence of modified lymphatic nodes, breast modifications), every patient received a different medical and surgical plan for breast reconstruction.

In our clinic we performed three types of flaps for breast defects *(Fig. 1)*:

- Latissiumus Dorsi (LD) Flap - 22 (78.57%) patients;
- Transverse Rectus Abdominis Myocutaneous (TRAM); Flap - 4 (14.28%) patients
- Deep Inferior Epigastric Artery Perforator (DIEP) Flap - 2 (7.14%) patients.

Operative techniques

Preoperative markings were done with the patient in the upright position. Controlateral breast simmetrizing mammaplasty (if required) was done using the superior pedicle with inverted T-scar technique. All surgical procedures were performed under general anesthesia, with the patient in dorsal decubitus;

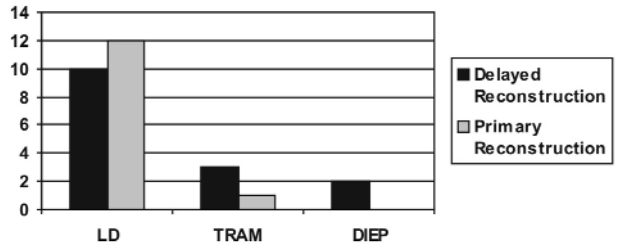

Figure 1. *Correlation between flap type and reconstruction stage*

exception was the semilateral decubitus for LD harvest. Average operative time was 3.5 hours (range 3-8 hours). As we mentioned before, in 13 (46.2%) cases the surgery was performed by the multidisciplinary team (MDT).

At the time of the primary intervention, tumor excision was performed with the aim of incorporating the tumor with at least a 1-cm macroscopic margin of normal tissue, the skin overlying the tumor (if there was skin involvement or tethering by the tumor), and the tissue excised for the remodeling procedure as an en-bloc specimen. (4) The breast tissue, including tumor, complementary tissue excised for the remodeling procedure and axillary lymph node dissection, and the controlateral breast resection specimen, if present, were sent for the histopathology exam.

Within the primary reconstruction group, the assessment of the excision margins showed complete excision of the tumor in 12 (92.30%) cases; in one case the margins were involved after tumor excision, so that a Patey modified radical mastectomy was performed. Among the patients which suffered mastectomy previously, we encountered 3 (20%) cases of cancer recurrence in the postoperative scars.

The creation of the breast mound was performed before flap harvest in all cases. Some difficulties in scar excision management were encountered when instead of oblique post radical /modified mastectomy scars, there were vertical or horizontal ones (performed in other clinics).

Postoperatively, antibiotics were given for 7 days, and analgesics for 3 to 5 days, while thrombosis prophylaxis was done during the entire time of hospitalization. Drainage tubes and compressive bandages were used at the donor site. The flap condition and the drainage fluids from the donor/recipient site have been monitored. Hospitalization time was on average 7 days (range 6-14 days).

We are presenting the surgical technique for each type of flap performed.

a. Breast reconstruction with LD flap

In 22 cases (78.57%) a pedicled LD tunneled flap with cutaneous island (in most cases the skin paddle was situated in the middle part of the muscle, with transverse orientation) has been used to cover post excisional defects situated in the outer-upper and lower quadrants of the breast *(Fig. 2)*. There were 10 delayed and 12 primary reconstructions.

We used two types of LD:

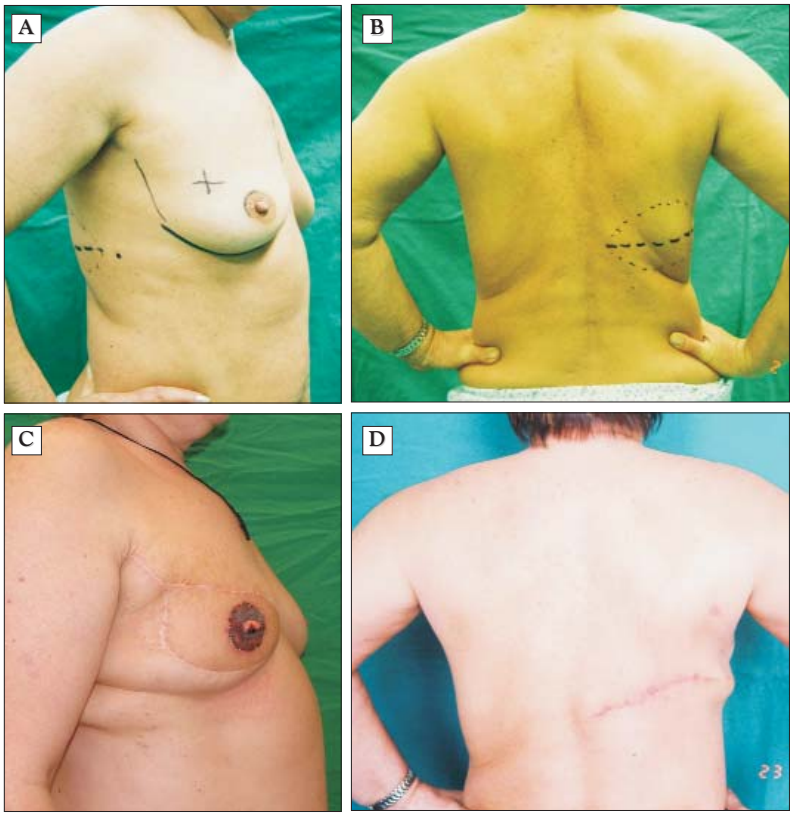

Figure 2. *48 y, stage II (T2N0M0) right breast carcinoma - immediate LD reconstruction:* ***(A,B)*** *preoperative planning,* ***(C, D)*** *six months and 1 year postoperative aspect*

- In 18 cases (81.81%) muscle flap with cutaneous island;
- In 4 cases (18.18%) extended LD flap with cutaneous island.

After dissecting and mobilizing the LD flap, a subcutaneous tunnel has been created to transfer the flap in the desired position, without compromising the vascular pedicle. Rigorous haemostasis has been performed, suction drains were placed at the donor and recipient site and both were closed with two layers sutures.

In immediate reconstruction, the thoracodorsal vessels are kept intact during axillary dissection, whereas in delayed reconstruction the integrity of the thoracodorsal vascular system should be checked after past surgical procedures. The thoracodorsal nerve has been preserved in 6 cases (27.27%).

b. Breast reconstruction with TRAM flap

In 4 cases (14.28%) unipedicled controlateral TRAM flaps rotated 90° were used (three in delayed and one in primary reconstruction) *(Fig. 3)*. This type of flap was used, provided that the controlateral breast had the required volume and the flap sampling conditions allowed the procedure. The blood supply of the skin paddle came from periumbilical vascular perforators (from deep superior epigastric vessels). After identifying the perforators from the superior epigastric artery (by using the intraoperative Doppler investigation), the abdominal skin and fat tissue were dissected and raised together with the transverse rectus abdominis muscle, and tunneled to the recipient area. There the reshaping of the flap had been performed, by removing the fourth zone and half of the second zone, thus creating the desired volume and shape of the reconstructed breast.

By rotating the flap at 90°, the inferior part of the skin paddle became the superior part, which covered the post mastectomy defect.

After flap positioning, two drainage tubes (at the medial and lateral side of the inframammary fold) were positioned into the breast mound. The wound was closed with two layers suture.

The donor site defect was closed in two stages. The first stage involved the careful reconstruction of the anterior abdominal wall muscles after rectus abdominis harvest, followed by drainage tubes positioning; the second stage involved the two layers suture of subcutaneous tissue and skin.

c. Breast reconstruction with DIEP flap

In 2 cases (7.14%) of delayed reconstruction, DIEP free flaps were used to cover the defects situated in the central and most of the upper and lower quadrants of the breast *(Fig. 4)*. Preoperative mapping of the deep inferior epigastric artery using computed tomograph angiography was performed in both cases and it showed the dominant perforators from the medial row, with a diameter of 0.7 millimeters. The perforator vessels were estimated big enough to nourish the entire flap.

The Doppler flowmetry of the epigastric artery on the lower abdominal wall was done in both patients before and after the breast reconstruction, in order to determine the

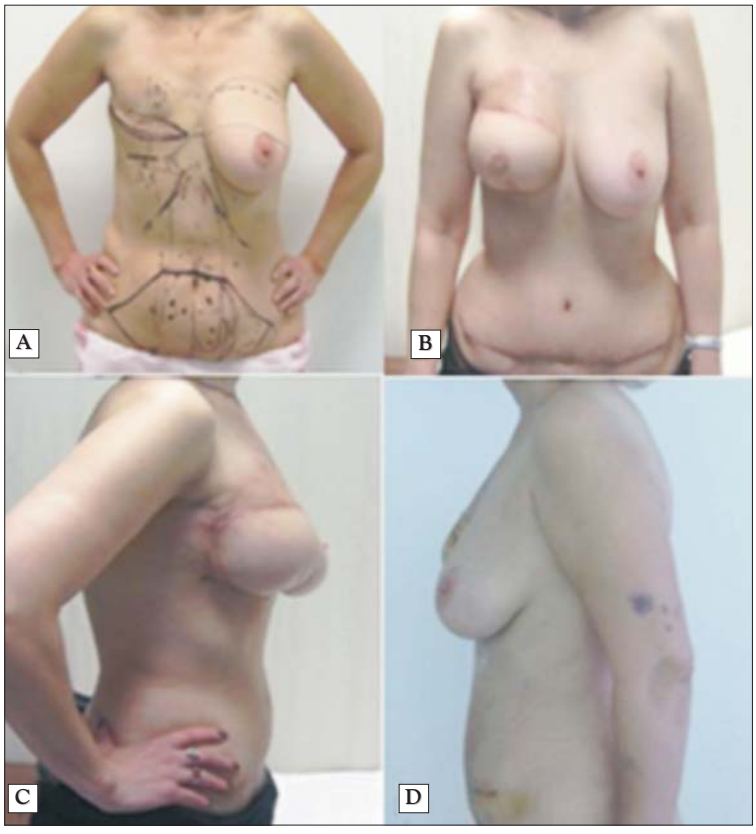

Figure 3. *46 y, radical mastectomy after DCIS, delayed reconstruction with TRAM flap:* ***(A)*** *preoperative planning,* ***(B, C, D)*** *four months after reconstruction*

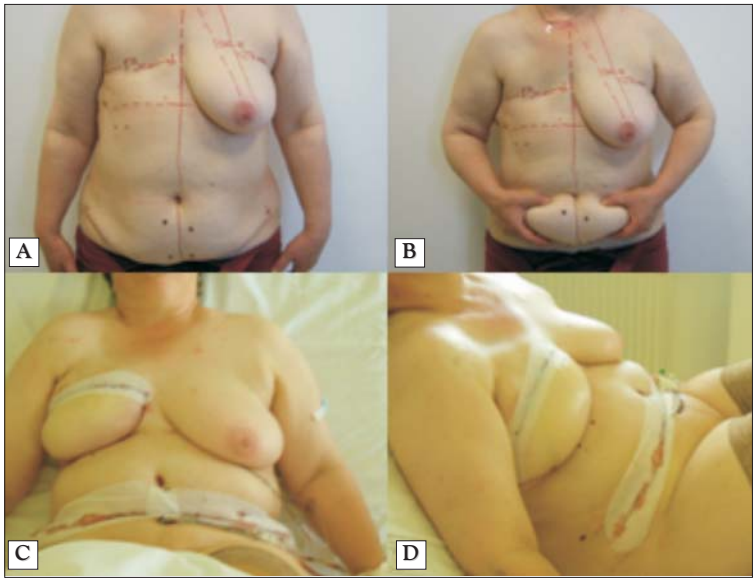

Figure 4. *57 y, radical mastectomy after invasive breast cancer, delayed reconstruction with DIEP flap:* ***(A, B)*** *preoperative planning,* ***(C, D)*** *two days after reconstruction*

location, caliber, and flow in the perforating vessels. (5) Each flap was based on two perforators from the deep inferior epigastric artery.

The skin and subcutaneous tissue island were lifted off the external oblique fascia until the lateral row of perforators was identified. After choosing the perforators, the anterior rectus abdominis fascia was incised around them and then laterally and distally towards the groin, to facilitate the dissection of the trunk of the inferior epigastric vessels. Then the rectus abdominis muscle was split longitudinally and inferiorly to expose the required pedicle length. Branches of the intercostal nerves situated anterior to the deep inferior epigastric vessels were preserved. (6)

Then the flap was transferred to the previously created breast mound and we performed microvascular anastomosis. The recipient vessels were the internal mammary vessels of the third intercostal space and branches from the thoracodorsal artery. Nerve repair wasn't performed.

The deep fat of the flap tissue was sutured to the pectoralis major to prevent flap movement and microanastomosis thrombosis. A drainage tube was inserted in the lateral side of the reconstructed breast, followed by two layers wound closure.

At the donor site the anterior rectus sheath was closed, and then abdominoplasty with umbilicoplasty was performed.

Results

We analyzed the postoperative results, both in terms of postoperative complications and patient satisfaction with the functional / cosmetic outcome. The clinical results were good; we encountered 7 minor complications (7/28 cases, 25%) and no major complication. The former were related both with the flap itself and with the donor area.

Flap level complications

There were 3 minor complications (10.71%), but no major complications like total flap loss *(Table 1)*. Hematoma underneath the translated LD flap was encountered in one case, and drainage was needed. There was partial necrosis in the second area of a pedicled TRAM flap (one case), and marginal necrosis in the upper and lower outer quadrants of a DIEP flap (one case); in both cases necrectomy was performed, followed by secondary suture. Postoperative evolution was favorable.

Donor site level complications

There were 4 minor complications of the donor site (14.28%), all in cases of LD flap. The most frequent were seroma and hematoma. Conservative management of the drains postoperatively is the best method to prevent it. These issues are even more significant in the patient who has undergone irradiation. (7)

In 2 cases we encountered hematoma followed by seroma (both patients underwent previous radiotherapy), requiring evacuation by puncture. In one case there was a wound dehiscence followed by secondary healing and subsequently hypertrophic scar, and in another case there was donor site infection due to suction drain deficiency, that solved with antibiotic treatment and wound care.

Patient satisfaction and functional/cosmetic outcome

By selecting the surgical procedure best suited to accommodate our patients' needs, we managed to obtain very good results in 26/28 cases (92.85%). In the other two, partial flap

Table 1. *Flap level complications*

Flap level complications	LD	TRAM	DIEP	Total
Partial necrosis	-	1	-	1
Hematoma	1	-	-	1
Marginal necrosis	-	-	1	1
Total complications	1	1	1	3

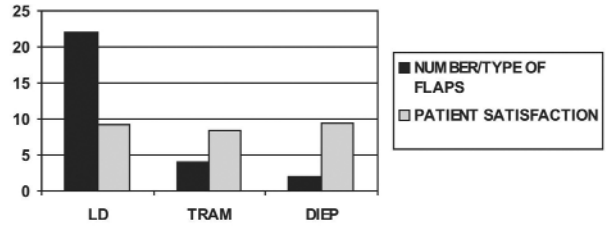

Figure 5. *Correlation between number/type of flaps and patient satisfaction*

necrosis determined minor deformities that impaired the final result. The patient satisfaction with the reconstructed breast was scored from 0 (minimal satisfaction) to 10 (maximal satisfaction). The high, moderate, and poor satisfaction was set at scores between 8 and 10, 6 and 7, and 5 or less, respectively *(Fig. 5)*.

Discussion

Breast reconstruction with autologous tissues is known to provide a much more natural, durable and long-lasting result for patients. (8) The two factors already recognized as major indications for oncoplastic breast surgery are excision volume and tumor location. (9) The first element, excision volume, is the single most predictive factor of surgical outcome and potential for breast deformity. Studies have suggested that, once 20% of the breast volume is excised, there is a clear risk of deformity. (10)

The relationship between body mass index, breast size and tumor size is pivotal. Audretsch states that no more than 12% of the glandular tissue should be resected in order to ensure a good aesthetic outcome without reconstruction. (11) In all the clinical cases of this series, tissue loss post breast mastectomy was greater than 50%. Considering the above mentioned, our decision to use autologous tissues was the best choice in breast reconstruction.

However, some considerations must be taken before performing this complicated surgical maneuver. The increasing worldwide tendency for conservative breast surgery places great emphasis on the need to assess precisely the full extent of cancer in the breast. Inadequate surgical management of breast cancer is common, as shown by the number of excision biopsies with positive resection margins. This is why radiation therapy and chemotherapy play important roles in managing undetected malignant foci, the fact that these foci are not surgically removed may lead to an increased local recurrence. (12)

Before performing surgery, several preoperative considerations were evaluated in all patients:

- Mastectomy defect;
- Neurovascular bundle pedicle integrity;
- Previous radiation/chemotherapy;
- Controlateral breast size and shape;
- Donor site scar location;
- Patient associated pathology.

Table 2. *Indications and contraindications correlated with flap type*

Flap type	Indications	Contraindication
LD	Thin habitus	Posterior thoracotomy
	Previous abdominal operations (including abdominoplasty)	Severe cardiac disease
	Preferred dorsal donor site	Severe pulmonary disease
	Failed implant or TRAM reconstruction	Implants not desired
	Patients desiring future pregnancy	
TRAM	Excess lower abdominal tissue and patient desires abdominoplasty	Cardiac disease
	Previous failure of implant reconstruction	Pulmonary disease
	History of radiation to the chest wall	Collagen-vascular disease
	Radical mastectomy defect with large tissue requirement	Obesity more or equal to stage II
		Cigarette smoker
		Previous abdominal surgery
		Older patient > 70 years
		Any small vessel disease
DIEP	Radical mastectomy	Previously abdominoplasty
	Skin-sparing mastectomy	Autoimune diseases
	Breast reconstruction at patients with congenital diseases-Poland Syndrome	Cardiovascular diseases

From our experience we think that one of the most important aspects in planning an autologous reconstruction is the integrity of the neurovascular bundle. Careful anamnesis and clinic/paraclinical investigations must be performed, in order to obtain the necessary information about any illness that could have caused small vessel disease or about surgical procedures that could have damaged the flap blood supply. (13,14)

For each type of flap some indications and contraindications are indicated in *Table 2*.

One mention is needed referring to thoracodorsal nerve preservation/resection. In our patients which had undergone LD flap reconstruction, innervation had been preserved in 6 cases (small size breast), when patients refused the application of the combined technique LD flap/implants and we desired the volume of the new breast to remain constant in time.

In reconstruction with autologous tissue, because of the magnitude of the procedure, complications can occur even in the best of hands. Anyway, microvascular surgery with muscle-sparing free DIEP flap allows the surgeon to preserve large muscular areas. (15) The DIEP flap dissection requires microsurgical expertise and has a long learning profile. Final results are long-lasting and abdominal sequelae are extremely reduced as demonstrated by a comparative study between TRAM and DIEP flaps. (16) Patients enjoyed all our medical attention in order to choose the most indicated surgical procedure fitted to their needs. All reconstruction methods that we used are considered oncologically safe.

Conclusions

Breast reconstruction with autologous tissue is one of the most reliable, although not the easiest alternative for breast defects and deformities, especially when more than 20% of breast tissue is removed. On long term, the cosmetic and functional outcome is superior to other present reconstructive techniques, especially the reconstruction with perforator based flaps, which nowadays gains more ground. Advanced training and experience is vital to understand the entire chain of goals that must be accomplished for achieving the best possible results.

References

1. Suteu O, Ghilezan N, Todor N, et al. Epidemiologia cancerului de sân în România. Bucuresti 1999; 27-32.
2. Losken A, Carlson GW, Bostwick J, et al. Trends in unilateral breast reconstruction and management of the contralateral breast: the Emory experience. Plast Reconstr Surg 2002; 110:89-97.
3. Nissen MJ, Swenson KK, Ritz LJ, et al. Quality of life after breast carcinoma surgery. A comparison of three surgical procedures. Cancer 2001;91:1238-46.
4. Clough KB, Jacqueline S, Couturaud B, et al. Oncoplastic Techniques Allow Extensive Resections for Breast-Conserving Therapy of Breast Carcinomas. Ann Surg 2003;237(1):26–34.
5. Blondeel PN, Beyens G, Verhaeghe R, et al. Doppler flowmetry in the planning of perforator flaps. Br J Plast Surg 1998; 51:202-9.
6. Yan XQ, Yang HY, Zhao YM, et al. Deep inferior epigastric perforator flap for breast reconstruction: experience with 43 flaps Chin Med J 2007;120 (5):380-4.
7. Kroll SS, Schusterman MA, Reece GP, et al. Breast reconstruction with myocutaneous flaps in previously irradiated patients. Plast Reconstr Surg 1994;93(3):460-9.
8. Trabulsy PP, Anthony JP, Mathes SJ. Changing trends in postmastectomy breast reconstruction: A 13-year experience. Plast Reconstr Surg 1994;93:1418-27.
9. Bulstrode NW, Shortri S. Prediction of cosmetic outcome following conservative breast surgery using breast volume measurements. Breast 2001;10:124–6.
10. Rainsbury R. Surgery insight: oncoplastic breast-conserving reconstruction - indications, benefits, choices and outcomes. Nat Clin Pract Oncol 2007;4(11):657–64.
11. Audretsch W. Oncoplastic surgery and the use of flaps in immediate reshaping. In: Proceedings of the 2nd European conference of plastic and reconstructive surgery of the breast. Milan, 6–10 November 2003 (Personal communication).
12. Tamiolakis D, Antoniou C. Axillary nodal metastasis of occult breast primary cancer. Chirurgia (Bucur). 2008;103(4):467-71.
13. Kroll SS, Baldwin B. A comparison of outcomes using three different methods of breast reconstruction. Plast Reconstr Surg 1992;90:455-62.
14. Roy MK, Shrotia S, Holcombe C, et al. Complications of latissimus dorsi myocutaneous flap in breast reconstruction. Eur J Surg Oncol 1998;24:162-5.
15. Blondeel N, Vanderstraeten GG, Matton G. The donor site morbidity of free DIEP flaps and free TRAM flaps for breast reconstruction. Br J Plast Surg 1997;50:322–30.
16. Garvey PB, Buchel EW, Pockaj BA, et al. DIEP and pedicled TRAM flaps: a comparison of outcomes. Plast Reconstr Surg 2006;117(6):1711–9.