



Breast Reconstruction after a Bilateral Mastectomy Using the BRAVA Expansion System and Fat Grafting

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Summary: Fat graft breast reconstruction following a mastectomy is always limited by the size of the skin envelope, which affects the amount of graft that can be injected in 1 session. Because the fat graft naturally resorbs in all patients, several sessions of fat grafting are necessary. BRAVA's negative pressure causes a "reverse" expansion of the skin envelope, thus permitting more space for the fat graft. This allows decreasing number of required procedures for an adequate breast reconstruction. We operated on a 38-year-old patient 4 years after bilateral mastectomy without irradiation for breast cancer. Before the procedure, the patient was instructed to wear the BRAVA system for 12 hours daily for 2 months before the first session, at all times between the sessions and for 1 month following the last fat grafting session. We performed 3 fat grafting sessions, as planned. Altogether, we injected 840 cm³ of fat on the right side and 790 cm³ of fat on the left side. Four months after the last operation, the patient was very satisfied with her new breasts. The breasts were soft, with good sensation and a natural feel. Using the BRAVA external expansion system for the enhancement of fat grafting is a suitable technique for breast reconstruction after a mastectomy. This technique produces soft and natural feeling breasts in fewer operative sessions, with a minimal risk of complications. Patient compliance, however, is greatly needed to achieve the desired results. (*Plast Reconstr Surg Glob Open* 2013;1:71; doi: 10.1097/GOX.0000000000000022; Published online 18 November 2013.)

For many years, we have known that a mastectomy significantly influences the quality of life.¹ In recent years, an increasing number of patients are seeking reconstructive procedures following a mastectomy. Depending on the local findings in the breast area after a mastectomy, we can offer these patients a variety of procedures. All of these procedures attempt to make the breasts appear as natural as possible when the patient is

unclothed and normal while wearing clothes. The most common approaches to breast reconstruction are the expander/implant, the latissimus/implant, the free transverse rectus abdominis muscle, and the deep inferior epigastric artery perforator reconstruction.² However, these procedures are associated with either a risk of a reaction to a foreign biomaterial or a risk of nonnegligible donor-site morbidity.

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Fat grafting (autologous fat transfer) has experienced a tremendous boom in recent years. Similar techniques have been used for more than 100 years. In 1908, Eugen Holander published his findings on the use of autologous fat mixed with ram fat.³ There has been a negative attitude toward this method, which includes suspicions that it causes necrosis, colliquation, and mainly that the whole graft may be quickly absorbed.⁴ Since 1990, however, together with the improvement of techniques and extensive experimental and clinical studies, an increasing number of plastic surgeons have begun to add this method to their armamentarium. The fat represents a filler with ideal properties because it naturally integrates into tissues and because it is autologous; therefore, the fat is 100% biocompatible. Additionally, the operations are noninvasive because there is no incision or suturing, and the scars are quite small.

The popularity of fat graft breast reconstruction has increased in recent years. Fat grafting is the best approach for breast reconstruction following a lumpectomy because of its regenerative properties in irradiated tissue and the desirability of filling only part of the breast. Fewer plastic surgeons, however, have used fat grafting for breast reconstruction following a total mastectomy.

Some authors advocate enriching fat grafts with stem cells to decrease graft absorption during the postoperative period.⁵ We have attempted this method on several patients who elected for a breast reconstruction procedure after a mastectomy, and we have achieved nice outcomes. The downside of this technique is the high price of the equipment, the length of time required for stem cell separation, and the fact that the amount of injected fat is always limited by the skin envelope.

Khoury and Del Vecchio⁶ started to promote the use of BRAVA (Brava Breast Enhancement and Shaping System, BRAVA) in conjunction with fat graft breast reconstruction and breast augmentation several years ago. BRAVA is a special bra consisting of plastic domes with silicon rims that is worn by a patient for several weeks before a fat grafting session. This technique has several benefits. Negative pressure from the BRAVA system causes a “reverse” expansion of the skin envelope, thus preparing more

space for the fat graft. It has been proven that this negative pressure induces increased vascularization in the breast tissue. In addition, some studies suggest that local mediators and stem cells are increased in the breast tissue after an external expansion.⁷

The most important issue for patients who have had a mastectomy and are being considered for a fat graft breast reconstruction is the availability of a sufficient amount of skin envelope to apply the fat graft to. By using a BRAVA expansion bra, this problem may be partially resolved.

To our knowledge, there are not much data in the literature describing a fat graft breast reconstruction after a mastectomy that was potentiated by an external expansion. The only clinical study was reported by Khouri et al.⁸

In this article, we describe a case of a breast reconstruction after a mastectomy using an autologous fat transfer combined with the BRAVA external tissue expansion system.

METHODS

The principles outlined in the Declaration of Helsinki have been followed. We operated on a 38-year-old patient 4 years after bilateral modified radical mastectomy without irradiation for breast cancer. She was generally healthy without any active disease. Before the procedure, the patient was instructed to wear the BRAVA system for 12 hours daily (during night) for 2 months before first session, at all times between the sessions and for 1 month after the last fat grafting session. During the preoperative counseling, the plan for 3 consecutive operations in 3-month increments was explained to the patient.

The operation consisted of 3 phases: fat harvesting, fat processing, and fat graft injection. The procedure was performed under general anesthesia. Before the liposuction, we infiltrated the subcutaneous tissue with a tumescent solution containing 1 L of saline and 1 mL of adrenaline. Fat was harvested from the abdominal wall, the flanks, or the lateral thighs using handheld 60-mL Toomey syringe and a 3-mm Mercedes cannula (Mentor, Santa Barbara, Calif.). We processed the fat in 3 parts using 250 cm³ PureGraft bags (Cytori Therapeutics). Each part was rinsed 2 times with 150 mL of Ringer’s solution. We found that the use of the PureGraft bags was superior to centrifugation in a large-volume fat grafting procedure because it saved time. We find the most important consideration for a favorable fat graft outcome, that is, the utilization of a correct graft injection technique. The graft was injected into many spots around the reconstructed area using a 9-cm type III Coleman cannula (Mentor). The injection was performed very slowly with a fan-shaped tech-

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nique during the withdrawal of the cannula. We injected the graft into subcutaneous plane and partly into pectoral muscle. We attempted to prevent accumulation of the fat graft as much as possible and the overfilling of a tissue to prevent ischemia, necrosis, colliquation, or calcification. Therefore, we stopped filling when there was no resistance of tissue while injecting the cannula or when tissues started to be tight. The patient began wearing the BRAVA system 1 day after each fat grafting session.

RESULTS

We performed 3 fat grafting sessions, as planned, and the patient's cooperation was excellent. During the first fat grafting session, we injected 210 cm^3 on the left side and 260 cm^3 on the right side. After

3 months, during the second session, we injected 280 cm^3 on the left side and 280 cm^3 on the right side. Six months after the first session, during the third session, we injected 300 cm^3 on both sides. Altogether, we injected 840 cm^3 on the right side and 790 cm^3 on the left side. The patient began wearing the BRAVA system 2 months before the first operation and finished wearing the system 1 month after the last operation, as planned. Thanks to the external reverse expansion, excess pendulous skin was present before each fat grafting session. Four months after the last operation, the patient was very satisfied with her new breasts. The breasts were soft, with good sensation and a natural feel (Fig. 1). We did not experience any complication during these operations. In addition, there was no complication



Fig. 1. A, The patient before the first session of fat grafting, after 2 mo of wearing the BRAVA bra; B, The patient before the second session of fat grafting, 3 mo after the first session; C, The patient before the third session of fat grafting, 3 mo after the second session; D, The patient 4 mo after the last session of fat grafting.

in postoperative course, such as cysts, fat necrosis, palpable lumps, or ultrasonography abnormalities.

DISCUSSION

The first attempts of grafting fat into the breast, which occurred around 1990, elicited negative reactions from plastic surgeons who feared that the development of microcalcifications could hinder breast cancer detection. Subsequently, this technique was not utilized for several years, without substantial underlying scientific data to backup those concerns. Microcalcifications also occur following different breast operations, such as breast reduction. In addition, calcifications after fat grafting are localized in different areas and have a different radiological appearance than breast cancer calcifications.^{9,10} Therefore, expert radiologists should not have problems distinguishing between tumor and post-fat grafting calcifications.

The use of fat grafting in patients with a history of breast cancer had been, until recently, a controversial topic. This belief was caused by several studies that described an increasing tumor reactivation by mesenchymal stem cells.^{11–13} However, there are data suggesting that these in vitro studies were not conducted using normal tumor cells but with tumor lineage cells, and therefore, they did not have an in vivo correlate.¹⁴ On the other hand, there are clinical studies that do not show increased locoregional relapses of breast cancer.¹⁵ Petit et al¹⁶ described a series of 646 patients who underwent fat grafting after breast cancer therapy. They were followed up for a mean of 19.2 months, and the locoregional relapse rate was 2.4%. This number was not significantly different from the risk of a locoregional relapse in the group without lipofilling. However, as in other types of breast reconstructions, regular screening following breast reconstruction by fat grafting is necessary.

Considering its flexibility, excellent postoperative results, and low incidence of complications, fat grafting is well appreciated by patients after breast cancer therapy. However, fat graft breast reconstruction after a mastectomy is always limited by the size of the skin envelope, which affects the amount of graft that can be injected in 1 session. Because the fat naturally resorbs in all patients, several fat grafting sessions are required. External expansion before and after the operation increases the size of the skin envelope for fat grafting and allows for a decreased number of procedures necessary for an adequate breast reconstruction.

Wearing an external expansion system lasts for several months and is quite challenging. A very

important point in considering this technique for a patient is the thorough explanation of all of the demands. It is a consideration for motivated patients who are willing to endure the regular BRAVA bra use.

CONCLUSIONS

Using an external expansion for the enhancement of fat grafting is a suitable technique for breast reconstruction after a mastectomy. It produces soft and natural feeling breasts in fewer operative sessions, with a minimal risk of complications. This technique has many advantages compared with other reconstructive techniques; however, patient compliance is greatly needed to achieve the desired results.

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