Abstract. Background: After a review of clinical cases of the Unit of Plastic Surgery of the University of Siena, Italy, we found that 22 patients undergoing lipofilling for breast reconstruction needed less pain drugs compared to 18 patients which did not undergo lipofilling. In this work, the postoperative pain was analyzed in two groups of patients: a cohort treated with prosthesis and a cohort treated with prosthesis implant together with a lipofilling procedure. Patients and Methods: During the immediate postoperative period, a visual analog scale for pain was submitted to every patient every eight hours until they were discharged, then every day for a week, every two days during the second week and once a week in the first three months. The administration of analgesics was also registered. Results: Pain intensity was lower in the group treated with prosthesis and lipofilling. Conclusion: Fat transplant is a procedure well-tolerated by patients, resulting in a lower rate of pain.

Mammary reconstruction is the final step of breast cancer therapy. Many different techniques are used to achieve breast reconstruction and each of them is linked to the type of demolitive surgery.

The procedure mostly used is tissue expander and breast implant. In addition, there are other techniques exploited together with the implant of prosthesis to obtain better results; one of these is lipofilling. Over the past decade, lipofilling has been used to improve the results of breast reconstruction. Through such fat transplant, a surgeon can increase the dimension of the breast with small volumes of purified fat. One of most important advantages is that lipofilling is an autologous transplant. For larger volumes, or post-corrections, more fat transplants can be performed in time.

Lipofilling is a manageable technique with good results, it does not require general anesthesia and can also be performed as an outpatient procedure; it obtains greater volume, and better projection, symmetry and contour of the prosthesis, with greater tissue softness.

Breast reconstruction is burdened with a high incidence of postsurgical pain (1). Postsurgical pain can be caused by complications, restriction of movement and other factors that surgeons must consider. If the pain persists for more than two months, it is considered persistent postsurgical pain. An additional risk factor for the development of persistent postsurgical pain is the memory of the intensity of pain in the immediate postoperative period (2).

After a review of clinical cases of the Unit of Plastic Surgery of the University of Siena, Italy, we noted that patients undergoing lipofilling required less pain drugs. Therefore, we decided to thoroughly investigate this aspect.

In this work, we analyzed postoperative pain in two groups of patients: a cohort treated with prosthesis, and a cohort treated with prosthesis implant together with a lipofilling procedure. The level of pain felt by patients in the three months after surgery was studied.

Patients and Methods

Between 2010 and 2011, 55 patients were recruited for this study. Their age was between 33 and 63 years, the mean age was 45 years. All patients were subject to radical mastectomy without axillary dissection in order to treat breast cancer. After mastectomy, they received tissue expansion and breast implant. The possibility of undergoing fat transplantation to better modulate the results of surgery was explained. Twenty-five patients underwent lipofilling together with prosthesis and thirty patients were underwent to breast reconstruction only with prosthesis. All patients gave their informed consent for all procedures.

The day before every surgery, a briefing was organized and preoperative drawings were made. For the lipofilling, the donor site was selected from hips, thighs and abdomen. On the reconstructed breast, the surgical access was made on the mastectomy scar, under general anesthesia.

General anesthesia was induced in all patients with 2 mg/kg of propofol, maintained with sevoflurane and fentanyl. Pancuronium was the muscle relaxant used.

After removing the expander, the prosthesis was inserted. All prostheses were implanted under the pectoralis major muscle.
Sutures were made using Vicryl 3-0 for subcutis and Monocryl 3-0 for intradermic. Dermabond® glue was applied.

During the lipofilling procedure, infiltration was performed with angled movements. Subsequently, a variable amount of fat was aspirated and purified by centrifugation (3000 rotations per minute for 3 minutes). After centrifugation, the vital and purified fat were injected into the receiving sites in the upper pole and behind the mammary gland, respectively. The amount of purified fat was between 70 cm³ and 140 cm³ (average 90 cm³). The skin was sutured with 4-0 Monocryl.

At the end of surgery, a pressure dressing was placed on the reconstructed breast. On the day after the surgery, patients wore a containment band to reduce the risk of displacement of the prosthesis. The patients that underwent fat transplant also wore a compression sleeve at the donor site. For all patients, analgesic therapy was performed with 1000 mg paracetamol every 12 hours and ketorolac if the score by visual analog scale (VAS) was greater than 3 (see below).

During the immediate postoperative period, a VAS for pain was submitted to every patient. The VAS designed for this study was made with a 10 cm horizontal line with end points marked as “No pain” and “Unbearable pain” (Figure 1). The back was composed of graph paper. The patients had to indicate on this scale the pain they felt in the breast during the days of hospitalization after surgery as follows: every 8 hours until discharge; every day for a week; every two days during the second week; and once a week in the first three months. After the patient had marked a point on the VAS, we have identified the corresponding value on the back of the sheet graph paper.

During hospitalization, the administration of analgesics was registered for each patient together with the results of the VAS. A questionnaire was submitted to every patient after their discharge to record the type and dosage of any analgesics intake. All the material collected was analyzed.

**Results**

In both groups, there were no complications and the registered pain was a result of the surgical procedures used. The level of pain was lower in the lipofilling group.

*Analysis of VAS.* Pain intensity is reasonably higher in the early postoperative period. In the group treated with prosthesis, the mean value of VAS was 3.17, with a range of 1 to 6. In the group treated with prosthesis and lipofilling, the average VAS was 2.86, with a range of 1.2 to 4.7.

During the first week after discharge, the average level of pain in the group treated with prosthesis only was 3.18 (range=1-5), while in the other group the average was 2.91 (range=1-4.5).

*Analysis of VAS* in the second week gave an average of 2.62 (range=1-3.5) for patients treated with prosthesis and of 2.38 (range=1-3.5) for patients treated with lipofilling and prosthesis.

After three months, the average was 0.86 for the group of prosthesis and 0.69 for the group of prosthesis and lipofilling.

Statistical analysis was performed with Student’s T distribution and the results were all significant (*p*<0.05). Questionnaires. During hospitalization in the group treated with prosthesis only, seven administrations of FANS (ketorolac) and two of opioid (oxycode) were necessary; and in the subsequent three months, sixteen patients took one FANS.

In the other group, five FANS and no opioids were administered during the hospitalization, and thirteen FANS in the three months after surgery.

**Discussion**

After a review of clinical cases of breast reconstructions performed between 2008 and 2010 in the Unit of Plastic Surgery of University of Siena, it was noted that the patients submitted to lipofilling procedures required a lower rate of analgesic therapy. There are many techniques to achieve breast reconstruction, such as local flaps, but the procedure mostly used is to implant an expander then a prosthesis. The presence of postsurgical pain after breast reconstruction with tissue expander and breast implant has been examined in different studies (3, 4). Adequate management of postoperative pain is necessary for patients’ wellbeing and for their long-term management; moreover a high intensity of pain in the early postoperative period is linked to a high risk of chronic pain (2, 5). Breast reconstruction is burdened with postoperative complications such as pain and restriction of movement (5).

Postoperative pain can be immediate (disappearing within two months) or persistent. Persistent pain is defined as pain which develops after a surgical procedure and does not disappear after two months. In order to discuss persistent postsurgical pain, it is necessary to exclude malignancy and pre-existing problems (6). In breast reconstruction, persistent pain is an important problem whose prevalence in the past has been estimated to be around 49% (7).

Patients with a high body weight, young age, undergoing chemoradiotherapy or hormone therapy have an increased risk of postoperative pain (1, 10-12). Other factors identified as increasing risk are the cut of intercostobrachial nerve (8, 9), axillary dissection and preoperative anxiety (15-17).

Postoperative pain deserves important attention because it can significantly reduce quality of life (10).

Until recently, it was thought that breast reconstruction with tissue expander and submuscular prosthesis may
increase the risk of persistent pain. On the contrary, it would appear that an immediate reconstruction reduces this risk. Recent work has shown that breast reconstruction with an expander prosthesis does not cause additional persistent pain (11). Pain in the prosthetic implant seems to be due to stretching of the muscle and to release of substance P and other algogenic molecules. Over the years, numerous studies have been carried out to reduce pain associated with subpectoral implants using e.g. local anesthetics (20-22) and botulinum toxin (12). It is clear that great attention to pain management is crucial.

The capacity of fat transplantation to reduce pain is not understood. A possible explanation may be that it is the result of the action of growth factors present in significant quantities in the liposiprate (13). The growth factors produced by transplanted adipose tissue may promote engraftment tissue, with simpler and more rapid nerve growth. In this regard, interactions between adipose-derived stem cells and nerve tissue has been shown (25). Adipose tissue-derived stem cells might positively influence the regeneration of injured nerves by secreting growth factors and cytokines (14). Moreover, these cells can differentiate into a Schwann cell phenotype (15). It is known that adipose tissue-derived stem cells are able to improve peripheral nerve regeneration in vivo (25). Finally, such cells also have the ability to modulate the immune and inflammatory response, in some cases positively, in others negatively (16). Therefore the modulation of inflammation, and the release of factors promoting engraftment tissue and nerve growth probably reduce the production of algogenic cytokines, thus reducing the pain felt by the patient.

Conclusion

The present study shows that fat transplant is a procedure well tolerated by patients, leading to a lower rate of pain if used together with breast implants. The mechanisms of this effect are not yet completely understood but interactions in repair between stem cells (and their cytokines) and nerve bundles may partly explain these results.

Conflicts of Interest

The Authors declare that they have no conflicts of interest in regard to this study.

References


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