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Evaluation of Sensation and Necrotic Complications after Nipple-Sparing Mastectomy

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Abstract

Background: Nipple-sparing mastectomy (NSM) is considered to be one of the most commonly used method of surgery in breast cancer. Oncologic and surgical complications are the major concerns associated with the NSM as a treatment or prophylactic approach for patients. The effective local control is the main goal in breast cancer treatment although aesthetic outcome and nipple-areola complex sensation are also important.

Method: This retrospective, descriptive, and cross-sectional study was performed on 35 hospitalized patients who underwent the NSM with axillary incision at the Department of Breast and Reconstructive Surgery at Sine Hospital, Tehran, Iran from April 2015 to April 2016. The patients were followed up in the first and second weeks and the first and third months following the surgery.

Results: 20 women who underwent the NSM were studied. The mean results in the flap sensation and in the nipple-areola complex sensation were 5.2 ± 2.4 and 5 ± 2.29, respectively. Major necrosis was reported in one patient in each follow-up session.

Conclusion: Although acceptable necrosis rate and significant sensation recovery after this method of mastectomy makes it more accentuated, certain complications and necessary revision surgeries after the NSM may diminish the favorable results, including sensation.

Keywords: Mastectomy, Nipple-areola complex sensation, Necrosis, Breast neoplasms

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Introduction

Breast cancer, as the most frequently diagnosed cancer globally is considered to be the leading cause of cancer-related deaths among women.[1] Management of the cancer involves careful evaluation of the evidence-based therapeutic approaches, such as surgery, radiotherapy, and systemic therapy. In the patients with early-stage breast cancer and high-risk individuals, requiring a risk-reducing mastectomy, nipple-sparing mastectomy (NSM) is a practical method of treatment.[2] NSM is an alternative to the conventional mastectomy, which may give the patients the prospect of better cosmetic outcomes along with therapeutic advantage, less surgical operations, and lower morbidity.[3-7]

Oncologic and surgical complications are the major concerns associated with the NSM as a treatment or prophylactic approach for the patients. The potential for recurrence of cancer or development of a new primary cancer in the retained nipple-areola complex[8] along with postoperative wound complications, such as seromas, hematomas, or ischemic necrosis are among the common concerns regarding the application of this treatment method.[3]

Mastectomy flap necrosis is one of the most prominent potential complications of the NSM, which occurs when the overlying breast skin does not have sufficient blood supply to survive.[9] The rate of mastectomy flap necrosis is reported to be approximately 15.8%; this number increases by 30% if the partial-thickness skin necrosis is also included.[9]

The risk factors developing the necrosis include smoking, obesity, advanced age, history of radiation, and greater breast volumes.[11]

Mastectomy flap necrosis leads to a significant economic burden to the healthcare system and has physical and psychological effects on the patients.[12]

In both nipple and skin-sparing mastectomy settings, the goal of the surgeon is removing the breast glandular tissue, while maintaining a viable skin envelope.[13] Therefore, this study was conducted to investigate the characteristics of the major ischemic complications after the NSM in 20 patients undergoing this procedure in Sina Hospital, Tehran, Iran.

Material and Methods

This retrospective, descriptive, and cross-sectional study was performed on 35 hospitalized patients who underwent the NSM with axillary incision (prophylactic mastectomy and therapeutic mastectomy for the breast cancer) at the Department of Breast and Reconstructive Surgery at Sina Hospital, Tehran, Iran from April 20, 2015 to April 20, 2016.

Written consent for publication and consent for participation was obtained from all the patients. the Ethics Committee and research department of the Tehran University of Medical Sciences (ethics code: 17210) approved the current study. The patients' records were anonymized and de-identified for analysis. The confidentiality of the details of the subjects was assured.

Sampling was performed through the census method. The inclusion criteria for this study were the patients with no nipple and/or areola involvement and an informed written consent obtained from all the patients after being informed about the surgery and publishing the results.

We followed up the patients in the first and second weeks and the first and third months after the surgery. In each follow-up visit, the dimension of the epidermal necrosis was measured via clinical examination and the nipple and skin sensation were also examined.

Patients' data, including the age, gender, body mass index (BMI), smoking history and alcohol consumption, and a history of diabetes mellitus, were investigated. Moreover, surgical factors, such as tumor stage (based on the TNM classification) and tumor multifocality or multicentric quality along with the oncological factors, including the receptor type (Estrogen receptors (ER), progesterone receptors (PR), and human epidermal growth factor receptor 2 (HER2)), sentinel lymph node biopsy (SLNB) and fine-needle aspiration, usage of Technetium-99 and/or blue dye and the administration of neoadjuvant therapy, were also evaluated. The patients' satisfaction survey reviewed five essential

Table 1. Score definition of the flap and nipple-areola complex sensation

Score	Definition
0	The patient fails to identify the sensation
1	Decreased sensation in comparison with the pre- operation
2	No changes in the sensation in comparison with the pre-operation

sensations (pressure, temperature, pain, exteroceptive sensation, and projectile responsiveness to touch). We carried out a statistical analysis using the SPSS software version 19, logistic regression, t-test (the level of significance was set at 0.05), Chi-Square test, and descriptive statistics.

Results

After excluding the patients who did not meet the inclusion criteria, 20 women undergoing the NSM were studied. The mean age of the participants was 38.4 ± 8.22 years old and the mean BMI was recorded as 24.32 ± 2.42 and none of our patients had comorbid conditions, such as diabetes mellitus or high blood pressure.

In our investigation, two of the patients had a tumor with the size of 0.5 × 0.5 cm, eight of them had a tumor with the size of 1 × 1 cm, one had a tumor with the size of 1.5 × 1.5 cm, the tumor size of four of our patients was recorded to be 2 × 2 cm, the rest of the patients (five patients) underwent the prophylactic surgeries, and one patient received the neoadjuvant therapy.

In the axillary examination with the Technetium-99m, two of the patients had a positive SLNB who underwent the axillary dissection later. No evidence was recorded for metastasis in any of our patients.

Regarding the hormone receptors, 19 cases were reported to be positive for PR, ER, and HER2.

To assess the flap sensation, after three months of observation, five criteria, including the temperature sensation, crude touch sensation, pressure sensation, pain, and projectile responsiveness to touch were evaluated on a scale ranging between 0 - 2 points. We asked the patients to score each criterion based on the condition before the surgery (Table 1). Table 2 demonstrates the results for each variable.

We applied the same variables to evaluate the nipple-areola complex (NAC) sensation (Table 1) and table 3 represents the related results.

The patients were evaluated for the flap and NAC necrosis at four periods of time, including one week, two weeks, one month, and three months after the surgery, respectively. Table 4 presents the results.

The patients who had the necrosis in each follow-up were treated through dressing change and debridement, if indicated. During the three months of follow-up, as mentioned in table 4, one of our patients developed the necrosis and discoloration in the site of surgery, for which the debridement was performed, but the patient underwent the reconstructive surgery with pectoral flap due to not responding to the treatment. During this time, another patient developed the flap discoloration after receiving the radiotherapy, eventually treated with the skin graft accordingly.

Table 2. The Flap sensation results

Sensation	Mean results
Temperature	1.05 × 0.3
Crude touch	1.05 × 0.5
Pressure	1.05 × 0.5
Pain	1.05 × 0.5
Projectile responsiveness to touch	1 × 0.45
Summation	5.2 × 2.4

Table 3. The nipple-areola complex sensation

Sensation	Mean results
Temperature	1 × 0.45
Crude touch	1 × 0.45
Pressure	1 × 0.45
Pain	1 × 0.45
Projectile responsiveness to touch	1 × 0.45
Summation	5 × 2.29

Table 4. The flap and NAC necrosis evaluation

Time of evaluation	Total number of patients who had flap and/or NAC necrosis	Size of necrosis	Number of patients
The first week after surgery	6	1 × 1 cm	2
		2 × 2 cm	2
		3 × 3 cm	1
		5 × 5 cm^2	1
The second week after surgery	2	1.5 × 1.5 cm	1
		5 × 5 cm	1
The first month after surgery	1	5 × 5 cm	1
The third month after surgery	2	3 × 3 cm	1
		5 × 5 cm	1

NAC: Nipple-areola complex

Discussion

In recent years, breast reconstruction surgeries have become one of the main aspects of the approach to cancer; moreover, the attitude towards reconstruction has expanded. Nowadays, not only a normal-looking breast is expected, but also the preservation of sensation in breast specially in nipple-areola complex is anticipated. This study was designed to investigate the patients' satisfaction regarding the aesthetic outcomes, NAC and flap sensation, along with the necrosis incidence in the follow-up visits. The sensation after the NSM was evaluated with a questionnaire designed to measure five parameters, including the temperature sensation, crude touch sensation, pressure sensation, pain, and projectile responsiveness to touch. We asked the patients to compare each criterion with their condition before the surgery. NSM is not only an oncologically safe procedure, but also certain benefits, including preservation of breast skin envelope and better aesthetic outcome, are associated with this method. However, high rates of nipple necrosis as the main complication are hindering the establishment of the procedure as the routine approach. Our results demonstrated that sensation in surgical site after NSM was relatively acceptable as we recorded an average sensitivity of 5.2 × 2.4 and 5 × 2.29 for the flap and NAC sensation, respectively. In addition, 11 cases of necrosis were recorded within three months after the surgery; however, only two of the patients required the skin graft or reconstructive surgery.

While several studies have been conducted on the breast skin sensation, the lack of a certain measuring technique has impeded the opportunity to draw a unified conclusion or perform a meta-analysis.[17] Dossett et al., evaluated the skin and NAC sensation in 53 patients using the self-reported questionnaires and reported a better-preserved sensation in 38 patients undergoing the NSM in comparison with 15 patients undergoing the skin-sparing mastectomy (SSM), yet both groups reported the limited sexual arousal and nipple stimulation postoperatively.[18] Yueh et al. reported that from eight women who described their postoperative sensitivity and aesthetics of their retained nipples after the NSM, the average nipple sensitivity score was equal to 2.8. Two women failed to identify the sensation in their NAC, while one of the patients reported the full recovery of all the sensations.[5] Another study on the long-term nipple and skin sensation evaluated via the pressure-specified sensory device (PSSD) showed that even though the reconstructed breast had the diminished skin sensitivity, the mean cutaneous thresholds for skin sensitivity appeared to be better for the patients who underwent the NSM by 10.6 g/mm^2 compared to the non-NSM group. They also reported that the nipple sensitivity was better preserved in the NSM group. It was also established that radiotherapy and chemotherapy were not associated with the sensitivity changes; meanwhile, revision surgeries have been reported to cause a decrease in the skin sensitivity.[19] The exact mechanism of achieving better sensation

in some patients than others who underwent NSM is yet unknown.

Several studies have addressed the complications and the patients' outcome, but the overall complication rate varies between 0%-48%.[5, 7, 14-16, 20, 21] Ischemic complications after the NSM are considered to be one of the most important complications of this method of mastectomy, as they could debase the aesthetic outcomes and may threaten the reconstruction and delay the adjuvant treatments. Nipple and skin necrosis have been reported as more ominous and prevalent complications.[22-26]

Consistent with our results, the rarity of overall major necrosis after the NSM is mentioned in the prior studies.[27-30] Some studies have considered the technique of nipple- and areola-sparing mastectomy as the cause for further complications since the extensive dissection may imperil the blood supply to the complex, thus leading to the necrotic changes.[22, 31, 32] A systematic review of 296 studies has revealed that the prevalence of necrotic complications is 13.7% with NAC necrosis and mastectomy flap necrosis each accounting for 7.5% and 7.8%, respectively. Several studies have suggested a number of factors associated with this complication, including the type of mastectomy incision. Incisions that involve more than one third of NAC may develop necrosis more likely.[33] Another suggested factor is reconstruction methods in which some believe that the risk of necrosis is minimum in autologous reconstructions.[34] On the contrary, another study considers this method to be an independent risk of necrosis.[33]

The patients' follow-up was the limitation of the current study as a few of our follow-up visits were delayed for one or two days. Additionally, another limitation may be the evaluation of sensation, influenced by the lack of a unified measuring technique for this matter.

Conclusion

Nipple-sparing mastectomy as one of the most common surgical procedures is associated with a higher rate of sensation recovery compared with other methods. However, some might be susceptible to necrotic complications due to certain risk factors, patient selection for the surgery is recommended.

Conflict of Interest

None declared.

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