Original Article

Evaluation of Complications Following Nipple Areola Sparing Mastectomy with Immediate Implant-Based Breast Reconstruction in Patients with Large Ptotic Breasts

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ABSTRACT

Background: Nipple sparing mastectomy has become a preferred method in breast cancer patients but safety of this procedure in large ptotic breasts needs to be documented to broaden its application. We aimed to assess complication rates of patients undergoing NSM and immediate implant-based reconstruction with skin reduction to determine the safety of reduction in this patient group.

Methods: Patient with breast cancer and ptotic breasts whom received nipple sparing mastectomy and immediate implant-based breast reconstructions were analyzed, operated between April 2020 to last month of 2023 in Shiraz, Iran. Post-operative complications were recorded and analyzed.

Results: The mean age and BMI of patients were 40.76 ± 5.0 and 23.72 ± 3.27 year, respectively. The median post-operative24 months (min 14, max 34). None of patients had disease recurrence. The most common complication was the flap full thickness necrosis, occurring in a total of 7 (20%) breasts. The incidence of full thickness necrosis was just seen in patients with ptosis grade III, and the most common site for the necrosis was the suture line [4/7 (12%)]. The other 3 patients had full thickness partial necrosis of NAC. We did not have any complete NAC necrosis.

Conclusion: Nipple sparing mastectomy and immediate implant insertion in ptotic breasts, is a valuable method of reconstruction with acceptable rate of complications.

KEYWORDS
Nipple Areola sparing mastectomy; Implant; Breast; Ptosis; Complications

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INTRODUCTION

Nipple-sparing mastectomy (NSM) with immediate breast reconstruction by implant is becoming the preferred option of breast reconstruction after the evidence of improved aesthetic and psychological outcomes without oncological compromise in carefully selected breast cancer patients [1–3].

Previously, the patients with large and ptotic breasts were excluded from option of NSM and immediate implant-based reconstruction,

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due to increased overall complications and aesthetic concerns [4, 6]. Implant volumes were insufficient to fill and support the excess skin that is left after the mastectomy and doing skin reduction simultaneously with NSM would endanger patients to nipple or skin necrosis [6–8]. Skin reducing mastectomy, without preserving the nipple, is a preferred method in such patients as its safety has been demonstrated [9]. However, some recent research has showed that safety of these procedures needs to be documented to broaden their applications and expand the anatomical indications of NSM [10].

We aimed to assess complication rates of patients undergoing NSM and immediate implant-based reconstruction with skin reduction to determine the safety of reduction in this patient group.

MATERIAL AND METHODS

Following approval from the institutional review board approval and obtaining informed consent, and ethics approval (IR.SUMS.MED.REC.1403.487), data were reviewed retrospectively at Shiraz Medical University Hospitals, Shiraz, Iran. Spanning from April 2020 to 2023, 25 patient records were analyzed. All patients were breast cancer patients that received mastectomy and immediate implant-based breast reconstructions. Included patients fulfilled the oncologic criteria for NSM. Patients with large and ptotic breasts (grade II– III) that required skin reduction and NAC transposition were also offered the option of reduction. No exclusion criteria were applied for the reduction.

Patient's demographics, comorbidities, medical history, oncological treatment history including chemotherapy and radiotherapy, and surgical outcomes were analyzed as well as the reconstructive process and the follow-up data for two years were recorded.

Surgical Procedure

Patients were marked preoperatively while standing. Midline, lateral, and medial borders of the breast were delineated. The distances of mid clavicular line to nipple and sternal notch to nipple were measured. The inframammary fold was delineated bilaterally. The ideal nipple position was marked based on the level of the inframammary fold, and the height of the patient. Markings were applied according to the vertical reduction mammoplasty technique if there were ptosis present.

Mastectomies were performed through the vertical incision. All mastectomies were performed by the same oncosurgeon, and the methods were constant throughout the study. Breast tissues were removed carefully to preserve the subdermal vascular plexus. Skin reduction or de-epithelization was not performed during mastectomy. Based on the intraoperative frozen sections, axillary dissection was performed for patients with tumor-positive sentinel lymph nodes. The subcutaneous tissue below the nipples was also carefully biopsied, and nipples were resected if they contained tumor cells. Such cases were not included in this study. Subpectoral pockets were prepared Pectoral muscle fibers were separated medially from the ribs. At the inferior margin, the pectoralis muscle was dissected from its origin and elevated. New markings were applied with the sizer implant in the pocket to determine the nipple position and amount of the skin reduction. The NAC was cut with a cookie cutter of 42 mm. Only the tissues surrounding the NAC were carefully de-epithelized to preserve the subdermal vascular plexus of the dermal flap. After de-epithelization, NAC was transposed to its new position and fixated with 5–0 Monocryl sutures that were placed loosely and separately. NAC transposition of approximately 3–7 cm was achieved. The implant was placed into the submuscular pocket. Excess mastectomy skin flaps were de-epithelized and used to cover the inferior part of implants and were carefully reduced by transforming the vertical incision into an inverted T to achieve tension-free closure. Additional foreign materials (such as acellular dermal matrices (ADMs) or mesh were not required.

Statistical analysis

All statistical analyses were performed on SPSS 19.0 (IBM Corp., Armonk, NY, USA). To determine risk factors associated with increased postoperative complications, multivariate stepwise logistic regression was used. Categorical variables were analyzed by chi-square test and continuous variables with Student t test where appropriate. A $P < .05$ was considered statistically significant.

Ethical statement

This study was approved by the Shiraz University of Medical Sciences (IR.SUMS.MED.REC.1403.487).

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RESULTS

Demographics

The mean age and BMI of patients were 40.76 ± 5.0 and 23.72 ± 3.27 yr, respectively. There were no patients with a history of smoking. There was one patient with history of psoriasis (Table 1).

Cancer Treatment

None of patients received preoperative chemotherapy. Postoperative chemotherapies were performed in 18 (72%). Postoperative radiotherapy was done in 7 patients (28%).

Mastectomy

There were 9 (36%) bilateral mastectomies, which were all prophylactic for one side, resulting in a total of 34 procedures (Table 1). All incisions were vertical, except one patient with peri areolar incision.

Reconstructive Approach

All patients had grade II or III ptotic breasts which needed wise pattern skin reduction following implant insertion, except one patient that we performed peri areolar skin reduction due to grade I breast ptosis. Type of the reconstructions was one stage immediate implant insertion combined with skin reduction. Implant volumes ranged from a minimum of 400 mL to a maximum of 580 ml. The weight of excised breast tissue was 650 (min 300, max 1000 gr).

Complications

The median follow-up was 24 months (min 14, max 34). None of patients had disease recurrence.

Table 1: Patient demographic characteristics

Variables	Unit
Mean age (yr)	40.76 ± 5.0
Mean BMI (kg/m2)	23.72 ± 3.27
Smoking n	0
Diabetes Mellitus n (%)	2 (8%)
Immunosuppressant disease n (%)	1 (4%) Psoriasis
Mean Weight of resected breast (gr) (Min,max)	585 gr (300gr, 1000gr)
Ptosis grade I	1 (3%)
Ptosis grade II	10 (29%)
Ptosis grade III	23 (67%)
Incision type procedure	
Peri-areolar n (%)	1 (3%)
Wise pattern n (%)	33 (97%)
Mean implant volume (ml) (min, max)	490 ml (400, 580)
Chemotherapy n	18 (72%)
Radiotherapy	7 (28%)

Table 2: Incidence of complications (n=34)

Complication	Number	Percentage
Seroma	3	9
Hematoma	2	6
Full thickness suture line skin necrosis	4	12
Partial NAC necrosis	3	9
Wound infection	1	9
Capsular contracture	0	0
Implant removal	2	6

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The most common complication was the flap full thickness necrosis, occurring in a total of 7 (20%) breasts. The incidence of full thickness necrosis was just seen in patients with ptosis grade III, and the most common site for the necrosis was the suture line [4/7 (12%)]. The other 3 patients had full thickness partial necrosis of NAC. We did not have any complete NAC necrosis. The incidence of hematoma, seroma, infections, superficial tissue necrosis, and capsular contracture have been showed in Table 2. Patients with seroma were treated conservatively but patients with full thickness necrosis underwent surgical debridement due to implant exposure followed by removal of implant for two patients. In 2 breasts with full thickness necrosis over the junction lines of the incision and implant exposure, the implants were salvaged with a local Limberg-like flap. Antibiotics were sufficient to control infections. Implant loss was observed in a total number of two breasts all due to the full thickness necrosis over suture line.

The reduction group was further analyzed as two groups: patients with any complication (n = 13) and patients without complication (n = 12)



Figure 1: Complicated case with several time of operation due to discharge and partial NAC necrosis

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(Figures 2,3). Mean age (41.38 ± 5.74 vs. 42.97 ± 4.73, P = 0.304) and BMI (24.24 ± 3.94 vs. 23.48 ± 2.96, P = 0.502) between complicated and non-complicated groups were comparable and were not statistically significant predictors of complications) group, although the difference was not statistically significant (P = 0.358). However, the complication rate with implants greater than 500 cc was significantly higher than with smaller implants (90.14% vs. 19.7%, P = 0.008). Axillary dissection



Figure 2: Case with good aesthetic result without any complications

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Figure 3: Case with good aesthetic result without any complications

(P = 0.324) and postoperative chemotherapy (P = 0.736) were not found to be statistically significant predictors of complications.

DISCUSSION

Advantages of post mastectomy immediate breast reconstruction, including improved levels of psychosocial wellbeing, at least short-term, and faster social reintegration, have made this strategy appealing among patients especially those who are young or middle age [11].

Immediate reconstruction demands better skin flaps than a simple mastectomy followed by a delayed reconstruction and may increase the risk of complications that would compromise adjuvant treatment which is a significant concern amongst medical and surgical oncologists.

However, disadvantages of delayed breast reconstruction that include more scarring and somewhat less favorable cosmetic outcomes, as well as additional surgical procedures and possibly higher cost, has made the immediate breast reconstruction still a valuable choice [12-15]. A large multicenter U.S. study found that delayed reconstruction (of all kinds) was associated with a substantial reduction in complications compared with immediate reconstructions. Patients undergoing delayed breast reconstruction had worse scores of qualities of life than patients with immediate breast reconstruction; however, 2-year post-reconstruction scores were similar between two groups [16, 18].

Another large U.S. study reported a significantly higher incidence of surgical site infection after

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immediate (8.9%) compared with delayed (6.0%) and secondary (3.3%) implant reconstructions with similar results for noninfectious wound complications including necrosis or seroma formation which needed reoperation. In contrast, the incidence of surgical site infection was similar after immediate (9.8%), delayed (13.9%), and secondary (11.6%) autologous reconstructions. The study concludes that the risks for complications should be carefully balanced with the psychosocial and technical benefits of immediate reconstruction. Selected high-risk patients may benefit from consideration of delayed rather than immediate implant reconstruction to decrease breast complications after mastectomy [19]. Both immediate and delayed breast reconstruction has been found to be oncologically safe, although high-quality studies are still lacking.

Previously, combination of NSM and skin reduction was mostly avoided as the classical NSM has the anatomical criteria to exclude large and ptotic breasts [20, 21]. In our patient report of NSM with reduction, the overall skin necrosis rate was comparable with similar single-staged methods [22-26]. However, the complication rate remained significantly high. This could be explained by the disrupted vascularity of the mastectomy skin flap. When mastectomy and skin reduction are combined in a single-staged procedure, the flap vasculature is disturbed leading to decreased perfusion especially in junction lines and NAC, making those areas vulnerable to necrosis [27]. Thickness of the mastectomy skin flaps varied among patients depending on the thickness of their skin. In patients with thicker skin, the mastectomy flaps were also thicker. Preserving of the subdermal plexus, both during mastectomy and reduction, was important for the secure perfusion of the mastectomy skin flaps. Most of the complications were observed over the suture lines where the tension was higher, and the pressure of the underlying implant was applied the most. Also, the larger size of implant was associated with higher rate of skin necrosis. This could be avoided by safer excess skin removal with tension free closure lines.

NAC viability is especially crucial in this patient group. Removal of glandular and ductal tissues beneath the NAC to reduce recurrence further reduces the vascularity of the NAC [28]. In our patients, there was no complete NAC necrosis, and the rate of partial full thickness NAC necrosis was 12%. (Figure 1) The intraoperative status of the NAC circulation is extremely important while determining the type of reconstruction. If any circulatory problems are observed, expanders with a staged procedure should be preferred with minimal or no initial fill in order not to apply any unwanted pressure to the overlying skin and further disrupt the circulation. Another strategy could be doing free nipple graft when we have compromised NAC circulation.

Our strategy for excluding candidates for performing NSM was patients with NAC infiltration, NAC bleeding or with the tumor at less than 2 cm from the NAC, or multicentricity breast cancer. We didn't exclude axillary lymph node involvement from doing NSM. As the results showed no local recurrence after 2 years of study follow up.

The above allows us to believe that immediate breast reconstruction is oncologically safe if adequate precautions are taken; however, care must be taken to avoid complications, and thorough patient selection is therefore critical.

If we have a patient with risk factors, undergoing immediate reconstruction, would expose her to more complications and delay in adjuvant therapy can be expected.

Neoadjuvant treatment preoperatively should always be considered. Despite the numerous benefits, patient selection is therefore critical in evaluating the timing of reconstruction as not all patients are suitable candidates for immediate reconstruction. Delayed reconstruction should be considered for patients with pressing medical comorbidities, obesity, smoking, inflammatory breast cancer, patients going to have post-mastectomy radiation therapy, and for patients distressed regarding their breast cancer diagnosis who are not ready to make treatment decisions [29-31].

Although, large ptotic breasts are vulnerable to flap necrosis while undergoing NSM with skin reduction, immediate reconstruction offers many advantages over delayed reconstruction which we should not forget [28].

CONCLUSION

Patient preference, risk factors and oncologic considerations are always important when planning reconstruction timing. The authors prefer immediate reconstruction when feasible. The timing and technique of reconstruction should be decided on a

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case-by-case basis after a thorough discussion with the patient and preferably also in multidisciplinary meetings.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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