Safety of nipple/skin-sparing mastectomy in breast cancer patients who had breast implants

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Abstract

Background: With the increasing prevalence of cosmetic breast augmentation, the number of breast cancer patients with pre-existing implants is also rising. Clinically, implants appear to alter native breast anatomy by compressing soft tissue. This raises an important question: when patients with implant-modified anatomy undergo Nipple-sparing mastectomy (NSM) or Skin-sparing mastectomy (SSM) with implant-based reconstruction, does this altered anatomy influence postoperative complication risk? This study evaluates implant-associated anatomical remodeling and its impact on postoperative wound complications after implant-based breast reconstruction following NSM or SS).

Methods: We retrospectively analyzed 810 patients undergoing NSM/SSM with DTI reconstruction (2019.03.–2025.03.). Breast subcutaneous fat thickness was measured on preoperative MRI, and density was assessed using BI-RADS/Volpara. Propensity score matching (1:4) was performed using 12 variables. Acute and late complications were compared using stratified, adjusted logistic regression.

Results: Patients with pre-existing implants had significantly thinner breast subcutaneous fat ($p < 0.001$), while breast density was similar between groups. Density–thickness correlation was preserved only in patients without implants. Pre-existing implants did not increase acute complications, and late complications were significantly lower (OR 0.40, p = 0.040).

Conclusion: Pre-existing implants were associated with thinner breast subcutaneous fat but no increased risk of postoperative complications. Late complications were significantly lower in the implant group. Implant-related remodeling does not appear to compromise surgical safety.

Introduction

Implant-based breast augmentation: Increasingly common; long-term implant placement may cause breast anatomical remodeling, including thinning of subcutaneous fat tissue.

Postoperative complications: Factors such as BMI and smoking are known risks, but the impact of implant-related anatomical remodeling on complications remains unclear.

Study aim: to evaluate whether **pre-existing implants** and their associated **anatomical remodeling affect acute or late postoperative complications** following nipple-sparing mastectomy (NSM) or skin-sparing mastectomy (SSM) with implant-based reconstruction.

Methods and Materials

Study design: Retrospective single-center study including 810 patients who underwent NSM or SSM with implant-based reconstruction (2019.03–2025.03) at Seoul National University Bundang Hospital, Korea. Medical records were reviewed for postoperative complications and clinical factors.

Imaging measurements: Breast subcutaneous fat thickness was measured on preoperative MRI using 3D Slicer software (version 5.8.1). Inner/outer and upper/lower curves were defined, and the shortest distances from the skin to glandular tissue at the 1/4, 1/2, and 3/4 points were averaged for analysis. Breast density was assessed on mammography using Volpara (version 3.4.1/1.5.5.1) or radiologist-reported BI-RADS density.

Propensity score matching: A 1:4 nearest-neighbor PSM (caliper 0.1) was performed using 12 clinical variables. Matched data included subclass (pair ID) for stratified analyses.

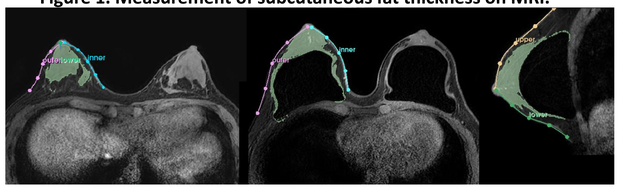
Statistical analyses: Breast subcutaneous fat thickness was compared between groups. Density was also compared between groups. Acute and late complications were analyzed using stratified logistic regression, with additional adjustment for variables showing SMD > 0.1 after PSM (age, BMI, chemotherapy, hypertension).

Table 1. Characteristics before and after propensity score matching.

Variable	Before			After			
	Group 1 (N=755)	Group 2 (N=55)	p-value	Group 1 (N=172)	Group 2 (N=50)	p-value	SMD
Age	46.6 ± 8.1	45.8 ± 6.3	0.358	46.7 ± 7.5	45.8 ± 6.2	0.436	**0.132**
BMI (kg/m²)	22.5 ± 3.4	21.4 ± 3.0	0.025	21.9 ± 3.0	21.5 ± 3.1	0.382	**0.139**
Smoking	58 (7.7%)	13 (23.6%)	0.0	24 (14.0%)	8 (16.0%)	0.893	0.057
DM	23 (3.0%)	1 (1.8%)	0.915	2 (1.2%)	1 (2.0%)	1.0	0.067
HTN	65 (8.6%)	1 (1.8%)	0.128	11 (6.4%)	1 (2.0%)	0.393	**0.219**
RTx	264 (35.0%)	23 (41.8%)	0.379	65 (37.8%)	19 (38.0%)	1.0	0.004
CTx	301 (39.9%)	30 (54.5%)	0.046	82 (47.7%)	27 (54.0%)	0.531	**0.126**

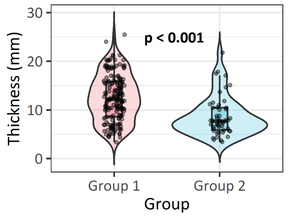
Group 1 = patients without pre-existing breast implants; Group 2 = patients with pre-existing breast implants. DM = diabetes mellitus; HTN = hypertension; RTx = radiotherapy; CTx = chemotherapy. Mean ± SD for continuous variables, n (%) for categorical; SMD < 0.1 = balanced.

Figure 1. Measurement of subcutaneous fat thickness on MRI.



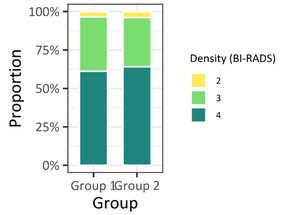
Representative axial MRI showing segmentation of subcutaneous fat and measurement of shortest skin-to-glandular distances along inner/outer and upper/lower contours.

Figure 2. Breast subcutaneous fat thickness by group.



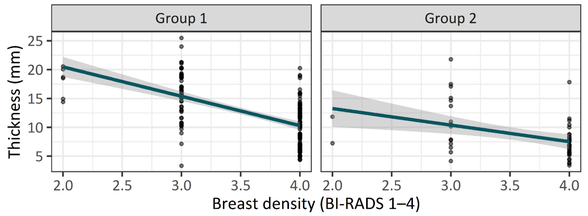
Patients with pre-existing implants had significantly thinner breast subcutaneous fat ($p < 0.001$).

Figure 3. Breast density distribution by group.



Density was nearly identical between groups (Group 1: mean 3.58, median 4, IQR 1; Group 2: mean 3.60, median 4, IQR 1).

Figure 4. Correlation between breast density and subcutaneous fat thickness in patients with and without pre-existing implants.



Breast density was inversely correlated with subcutaneous fat thickness in Group 1 ($r \approx -0.49$, $p < 0.001$) but not in Group 2 ($r \approx -0.29$, $p = 0.060$).

Table 2. Complication rates between groups (adjusted model).

Complication	Group 1 (n, %)	Group 2 (n, %)	Adjusted OR (95% CI)	p-value
Acute	34/172 (19.8%)	9/50 (18.0%)	1.10 (0.43-2.82)	0.836
Late	62/172 (36.0%)	11/50 (22.0%)	**0.40 (0.16-0.96)**	**0.040**

Acute = complications within 30 days; Late = complications after 30 days.

Results

Propensity score matching: Baseline characteristics were balanced except for age, BMI, HTN, and CTx (SMD > 0.1).

Breast subcutaneous fat thickness: **Thinner in the implant group ($p < 0.001$).**

Breast density: Similar between groups.

Breast subcutaneous fat thickness–density relationship: **Strong negative correlation in patients without implants (partial $r \approx -0.49$, $p < 0.001$), but absent in the implant group, suggesting implant-related remodeling.**

Postoperative complications: Acute complications showed no difference; **late complications were lower in the implant group (OR 0.40, p = 0.040).**

Conclusions

Anatomical remodeling: **Pre-existing implants were associated with thinner breast subcutaneous fat**.

Postoperative complications: Acute complications were unchanged; however, **late complications were significantly lower in the implant group**.

Overall: **Implant-associated remodeling did not compromise surgical safety**, though validation in larger multi-center cohorts is needed.

Discussion

Anatomical remodeling: Pre-existing implants were associated with significantly thinner breast subcutaneous fat, while breast density remained similar between groups—indicating that **implant-related remodeling affects superficial soft tissue thickness but not parenchymal density**.

Complication risk: Acute complications were unchanged, **while late complications were markedly lower in the implant group** (OR 0.40, p = 0.040).

Limitations: Sample size was insufficient for complication-specific analyses (e.g., infection, seroma, contracture).

Implication: Implant-associated thinning did not compromise postoperative safety; larger multi-center studies are needed for confirmation.

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