Prepectoral Direct-to-Implant Breast Reconstruction without Placement of Acellular Dermal Matrix or Mesh after Nipple-Sparing Mastectomy

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Background: The aim of this study was to report the results of prepectoral direct-to-implant reconstruction in nipple-sparing mastectomy without acellular dermal matrices or mesh.
Methods: A multicenter cohort of patients undergoing prophylactic or therapeutic nipple-sparing mastectomy was included from 2013 to 2020. All sizes and types of breasts were included, except those with previously failed reconstruction, previous radiotherapy with severe skin damage, locally advanced breast cancer, gigantomasty, severe degree of ptosis, tumors close to the nipple-areola complex (<1 cm on magnetic resonance imaging), or combined autologous-based reconstruction.
Results: A total of 280 immediate breast reconstructions were performed in 195 patients. The mean age was 45 years and 32.8 percent of patients were postmenopausal. The mean follow-up period was 16.5 (±17.43) months. Eighty-five patients (43.6 percent) underwent bilateral mastectomy; 116 mastectomies (41.4 percent) were prophylactic and 164 (58.6 percent) were therapeutic. Sixty-eight reconstructions (24 percent) had at least one acute complication, the most common being implant explantation (9.2 percent), which was more frequent in smokers. Late complications included rippling (grades 3 and 4) in seven cases (3.8 percent) and capsular contracture (Baker II through IV) in 29 cases (15.7 percent) [22 Baker II (11.9 percent), six Baker III (3.3 percent), and one Baker IV (0.5 percent)]. One implant rotation was observed. No deformity animation was observed. Cosmetic results were considered good or excellent in 87.3 percent of patients.
Conclusions: Overall complications were similar to those reported in acellular dermal matrices, mesh, or subpectoral series, except for a higher explantation rate. This technique is safe and economically advantageous, as it is a one-stage technique without acellular dermal matrices and mesh. These are preliminary data and larger and comparative studies are needed. (*Plast. Reconstr. Surg.* 150: 973, 2022.)
CLINICAL QUESTION/LEVEL OF EVIDENCE: Risk, III.

Nipple-sparing mastectomy is performed for breast cancer treatment as well as for prophylactic reasons. It involves the removal of almost all breast tissue, with preservation of skin and the nipple-areola complex. A variety of skin incisions may be used to perform the procedure and the main related complications are similar to those of skin-sparing mastectomy: flap necrosis, dehiscence of scar, hematoma, seroma, infection, and implant extrusion. Because of a higher risk of nipple-areola complex necrosis with periareolar incision, radial and inframammary fold incisions are increasingly selected by most surgeons, with satisfactory cosmetic and oncologic outcomes.[1–7]

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There has been a gradual evolution in surgical techniques, and every year, the proportion of direct-to-implant reconstruction is increasing, although the use of an expander remains a frequently used technique.[1] The advantages of one-stage immediate breast reconstruction are the economic benefits of avoiding a second surgery, lower levels of discomfort of multiple visits for expansion, and provision of better quality of life and high patient satisfaction.[1,5] However, patients must be selected properly to avoid poor cosmetic outcomes and additional complications.[6] Implant placements can be prepectoral or subpectoral. Because it is easier to execute, creating less pain and discomfort in the postoperative period, and has an absence of animation deformity attributable to pectoralis major muscle spasm, the prepectoral implant has become an acceptable option for women after mastectomy.[1,6–10] This technique, being a recent advancement, continues to evolve, but there are some remaining controversial issues regarding indications, limits, specific complications, and long-term results.

Acellular dermal matrix and mesh have been used routinely by many surgeons in immediate reconstruction with the implant in the subpectoral with partial or total detachment of the pectoralis major muscle and in the prepectoral position.[7] They serve as a pocket to reinforce the implant and to relieve tension on the skin flap and as a layer of vascularized regenerative tissue between the implant and mastectomy flap.[10,11] In the literature, there are not many articles reporting prepectoral direct-to-implant reconstruction after nipple-sparing mastectomy through the inframammary fold without the use of acellular dermal matrix or mesh in a large series of patients. Therefore, the aim of this study was to report the preliminary results of immediate breast reconstruction after nipple-sparing mastectomy by the inframammary fold, using direct-to-implant reconstruction in the prepectoral area, without acellular dermal matrix or mesh, in a large series of patients undergoing nipple-sparing mastectomy. Complication rates and associated risk factors and cosmetic outcomes were analyzed in this cohort of 280 nipple-sparing mastectomies.

PATIENTS AND METHODS

Patient Selection and Population

This multicenter cohort included patients with prepectoral direct-to-implant reconstruction after nipple-sparing mastectomy through the inframammary fold without adding acellular dermal matrix or mesh from January of 2018 to June of 2020 in Curitiba, Brazil, and from June of 2013 to April of 2020 in Buenos Aires, Argentina. Nipple-sparing mastectomy was offered to all women, with all sizes and types of breasts, for prophylactic or therapeutic purposes. Patients who underwent either unilateral or bilateral nipple-sparing mastectomy were included. Exclusion criteria consisted of patient preference for skin-sparing mastectomy, previously failed implant-based reconstruction, previous radiotherapy with severe skin damage and fibrosis, locally advanced breast cancer, gigantomasty, severe degree of ptosis, tumors closer to the nipple-areola complex (<1 cm on magnetic resonance imaging), and combined autologous-based reconstruction. Patients included in the study underwent mastectomy and direct-to-implant reconstruction with teams consisting of breast surgeons (C.S., L.N., R.L., E.S., M.D., I.R., K.F.A.), oncoplastic surgeon consultants (C.U., G.B., F.K.), and a plastic surgeon (E.G.). All surgeons included in the study are active in either Curitiba or Buenos Aires. Chart reviews were performed to identify patient demographic data (age, body mass index, menopausal status, tumor characteristics), comorbidities (especially diabetes and autoimmune diseases), smoking history, breast characteristics (size, ptosis degree by Regnault classification, symmetry, previous surgery), presence of preoperative or postoperative radiotherapy, presence of neoadjuvant or adjuvant chemotherapy, axillary approach at the time of surgery (sentinel node or lymphadenectomy), complications, and length of follow-up. The acute complications analyzed were skin necrosis, nipple-areola complex necrosis, hematoma, infection, seroma, implant exposure, and implant extrusion. Cases of skin or nipple-areola complex necrosis were included but epidermolysis was not. Some patients had more than one complication and these were recorded as separate events. The gap between procedures was also registered. Late complications, such as rippling and capsular contracture, were assessed at least 6 months after surgery using the Vidya classification.[12] Capsular contractures were analyzed using the Baker classification. Cosmetic results were evaluated on patients with more than 6 months of follow-up using the BCCT.core software program (INESC TEC, Porto, Portugal), which generates an overall objective classification of excellent, good, fair, or poor.

Statistical Analysis

Statistical analysis was performed using SPSS version 24 (IBM Corp., Armonk, N.Y.). All

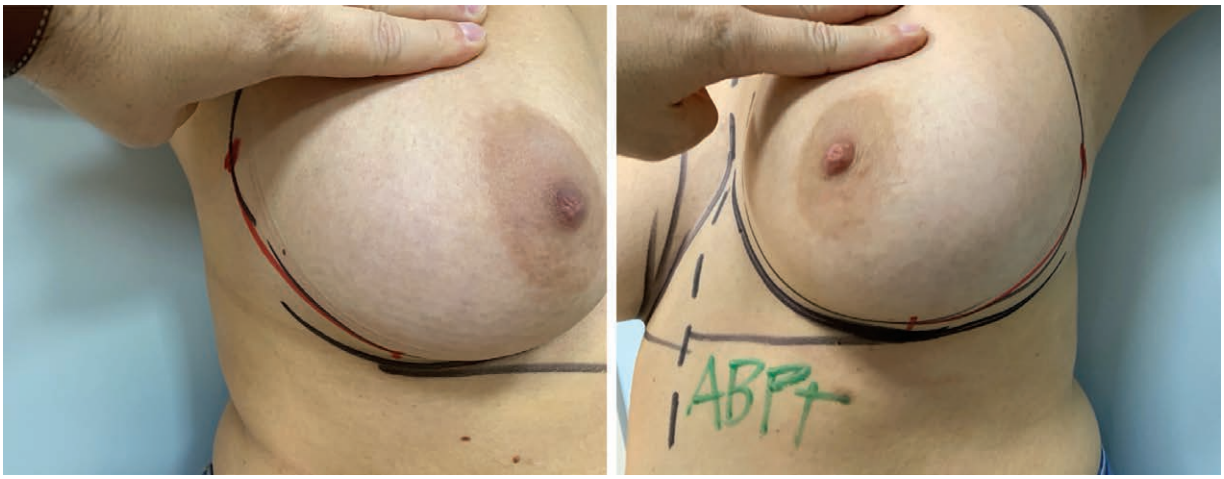

Fig. 1. Incision 1 to 2 cm above the inframammary fold, from 6 to 9 o'clock, allowing good access to the axilla in nipple-sparing mastectomy.

numerical data are presented as mean ± SD and all categorical data are presented as number (percent). Bivariate analysis was performed using *t* tests and Fisher exact test to compare complication rates (with respective odds ratio and 95 percent confidence intervals) between subgroups. The *p* value established was less than 0.05.

Surgical Technique

A midlateral curvilinear incision was made 1 to 2 cm above and along the inframammary fold and extended until the anterior axillary line, with the possibility to extend upward to the midaxillary line when the sentinel node was positive and axillary dissection was necessary (Fig. 1). After completion of an anatomical nipple-sparing mastectomy, skin flaps were evaluated using clinical signs: color, thickness, and bleeding (Fig. 2). All clinically devitalized tissues were removed. Before device insertion, the skin was reprepared with an alcoholic chlorhexidine solution and redraped to maintain the sterile technique. The mastectomy pocket was irrigated with a half-strength povidone-iodine solution and saline in Brazil; in Argentina, a solution with amikacin diluted in saline was used. Hemostasis was then confirmed.

Following this, an anatomical textured implant manufactured by Mentor (Irvine, Calif.) (styles 313, 323, or 333), Allergan (Dublin, Ireland) [Natrelle style 410 (banned in Brazil in July of 2019)], or Motiva (Alajuela, Costa Rica) (Ergonomix or Potlytech) was placed in the prepectoral area, chosen according to chest wall measurements and the desired breast shape. Regarding the weight of the breasts, this criterion was not used to define the implant because dense and greasy breasts, even with similar volumes, vary widely in their weights. No

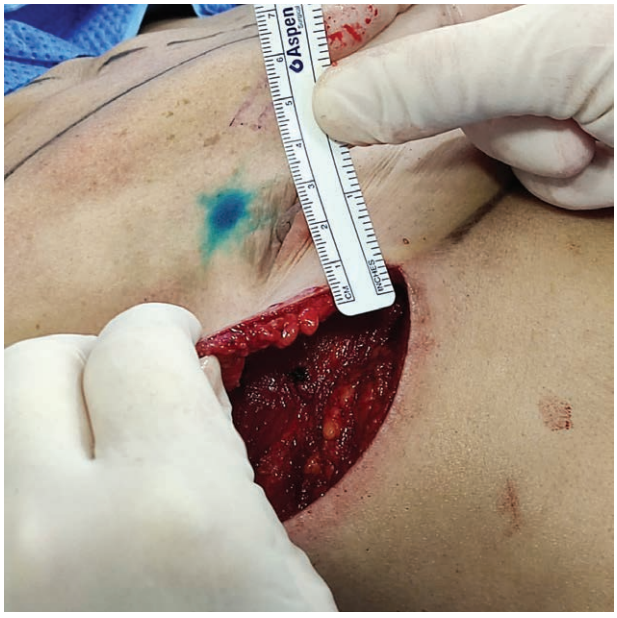

Fig. 2. Flap thickness and viability in nipple-sparing mastectomy by the inframammary fold and prepectoral direct-to-implant reconstruction.

flap fixation to the chest wall was required in this technique, except for the Motiva Ergonomix, which has a flap for fixing. A single closed suction Blake drain (Ethicon; Raritan, N.J.) or similar drains were placed between the implant and the thoracic wall in all mastectomies and tunneled subcutaneously for several centimeters to prevent retrograde bacterial migration. The mastectomy edges were enclosed in two layers with absorbable sutures (hypodermis, subdermis, and intradermal suture). A postoperative surgical bra with lateral padding was used to prevent device migration and rotation in the immediate postsurgical period. In cases of unilateral nipple-sparing mastectomy, the contralateral breast was

operated on at the same surgery for symmetrization in cases of small or medium breasts and with grade 0 to 1 ptosis. In other cases, symmetrization was performed 6 months after surgery, after the end of cancer treatment, or 6 months after the conclusion of radiotherapy.

Postoperatively, all patients were followed up weekly for 4 weeks, every 3 months until 6 months, at 1 year postoperatively, and then every 4 to 6 months. Drains were removed when output volume was less than 50 cc in 24 hours. Prophylactic antibiotic was used in the operating room before induction of anesthesia. In Brazil, patients received oral antibiotics for 48 hours, and in Argentina, until drain removal.

RESULTS

A total of 280 immediate breast reconstructions were performed in 195 consecutive patients (135 from the Brazilian center and 60 from the Argentinian center), using the described procedure, from 2013 to July of 2020. No patient was excluded after mastectomy because of clinically poor flap perfusion. The mean age of the patients was 45 years and 32.8 percent of them were postmenopausal. Forty-two patients (15.4 percent) were previous or current smokers, 92 (32.9 percent) had body mass index over 25 (overweight or obese), and seven (5.4 percent) had diabetes. The mean follow-up was 16.5 (±17.43) months. Eighty-five patients (43.6 percent) underwent bilateral mastectomy and immediate breast reconstruction using this technique; 116 mastectomies (41.4 percent) were prophylactic and 164 (58.6 percent) were therapeutic (Table 1).

When analyzing oncologic cases specifically, 43.9 percent of the reconstructions (n = 123) were in women who underwent chemotherapy: 89 neoadjuvant (31.8 percent) and 34 adjuvant (12.1 percent); and 21.7 percent in women who underwent radiotherapy (n = 61): seven previously irradiated because of breast-conserving treatment in the past and 44 receiving postoperative radiotherapy (Table 1).

Sixty-eight reconstructions (24 percent) had at least one acute complication, the most common being implant explantation in 26 breasts (9.2 percent). Other reported complications were persistent seroma (19 cases), implant exposure (23 cases), hematoma (seven cases), and nipple-areola complex necrosis (four cases). Implant explantation occurred in a midrange of 64 days (range, 12 to 180 days). The most common reason for this was flap or nipple-areola complex necrosis and infection (Tables 2 and 3) (Fig. 3).

Table 1. Patient Characteristics

Characteristics	No. (%) or Mean ± SD
Total	280
Age, yrs	45 ± 9.4
Intervention	
Unilateral	110 (39.3)
Bilateral	170 (60.7)
Prosthesis type	
Allergan/Natrelle	81 (29)
Mentor	190 (67.9)
Motiva	4 (1.4)
Polytech	2 (0.7)
Mean prosthesis volume, cc	460
Prosthesis volume	
<300 cc	12 (4.3)
300–500 cc	179 (64)
>500 cc	85 (30.3)
Axillary lymphadenectomy	32 (11.4)
Mastectomy indication	
Prophylactic	116 (41.4)
Therapeutics	164 (58.6)
Chemotherapy	
Neoadjuvant	89 (31.8)
Adjuvant	34 (12.1)
Radiotherapy	
Preoperative	17 (6)
Postoperative	44 (15.7)
Body mass index	
<18 (underweight)	6 (2.1)
18–25 (normal)	182 (65)
25–30 (overweight)	79 (28.2)
>30 (obesity)	13 (4.7)
Diabetes	8 (2.8)
Smoking history (previous or current)	42 (15)
Menopause	92 (32.8)
Previous breast surgery	82 (29.3)
Augmentation	25 (30.5)
Reduction	25 (30.5)
Benign nodules and lesions	7 (8.5)
Oncoplastic surgery	8 (9.8)
Lumpectomy	11 (13.4)
Contralateral breast surgery	6 (7.3)
Breast ptosis	
0	45 (16)
1	123 (43.9)
2	96 (34.3)
3	13 (4.6)
Breast size	
Small	56 (20)
Medium	126 (45)
Large	85 (30.3)
Extra-large	11 (3.9)

The main risk factors associated with explantation were smoking history (OR, 4.33; 95 percent CI, 1.81 to 10.37; p = 0.0012), body mass index over 25 (OR, 2.21; 95 percent CI, 0.98 to 4.99; p = 0.077), and chemotherapy (OR, 2.23; 95 percent CI, 0.97 to 5.11; p = 0.062). When evaluating other risk factors, implant extrusion was more common in patients with previous radiotherapy, adjuvant radiotherapy, and diabetes, but these findings did not reach statistical significance. Other factors such as axillary lymphadenectomy, previous breast surgery, breast size, and ptosis also did not correlate with this complication.

Table 2. Early and Late Surgical Complications after Prepectoral Direct-to-Implant Immediate Breast Reconstruction without Acellular Dermal Matrix or Mesh in Nipple-Sparing Mastectomy

Complications	No. (%)
Early complications	68 (24)*
Flap necrosis	20 (7.1)
NAC necrosis	4 (1.4)
Implant exposure	23 (8.2)
Persistent seroma	19 (6.8)
Hematoma	7 (2.5)
Infection	12 (4.3)
Implant explantation	26 (9.2)
Late complications (follow-up >6 months†)	184
Rippling (Vidya et al.[12])	
Grade 1	162 (88)
Grade 2	15 (8.1)
Grade 3	6 (3.3)
Grade 4	1 (0.5)
Capsular contracture	
Absence	126 (45)
Baker I	35 (19)
Baker II	22 (11.9)
Baker III	6 (3.3)
Baker IV	1 (0.5)

NAC, nipple-areola complex.
*A total of 68 breasts (may be more than one complication for breast).
†A total of 184 reconstructions evaluated.

Cosmetic results and late complications were evaluated only in patients with a follow-up longer than 6 months (n = 184). Rippling grade 2 was identified in 15 breasts (8.1 percent), but grade 3 or 4, which needs correction, was observed only in seven cases (3.8 percent) (Fig. 3). However, in the first month after surgery, almost all patients had grade 3 rippling. Over the months, the skin adapted to the implant in most patients. Capsular contracture Baker II through IV was observed in 29 reconstructions (15.7 percent): 22 Baker II (11.9 percent), six Baker III (3.3 percent), and one Baker IV (0.5 percent) (Table 2) (Fig. 4). No capsular contracture was observed in 126 breasts (45 percent). A total of 44 breasts (15.7 percent) were irradiated after surgery: loss of implant occurred in 6 (13.6 percent), 11 had no capsular contracture (25 percent), seven had Baker I (15.9 percent), eight had Baker II (18.2 percent), and three had Baker III (6.8 percent). Eight of them were not evaluated. One implant rotation was observed. No deformity animation was observed in this period of follow-up. Cosmetic results were considered good or excellent in 87.3 percent of

Table 3. Risk Factors for Implant Extrusion after Prepectoral Direct-to-Implant Immediate Breast Reconstruction without Acellular Dermal Matrix or Mesh in Nipple-Sparing Mastectomy

Risk Factor	Implant Loss, n (%)	Implant Maintained, n (%)	OR	95% CI	p
Diabetes			1.14	0.16–11.94	0.546
Yes	1 (12.5)	7 (87.5)			
No	25 (9.2)	247 (90.8)			
Smoking history			4.33	1.81–10.37	0.0012
Yes	10 (23.8)	32 (76.2)			
No	16 (6.7)	222 (93.3)			
Body mass index			2.21	0.98–4.99	0.077
Overweight or obesity	13 (14.1)	79 (85.9)			
Normal	13 (6.9)	175 (93.1)			
Preoperative radiotherapy			0.59	0.07–4.67	0.945
Yes	1 (5.8)	16 (94.2)			
No	25 (9.5)	238 (90.5)			
Postoperative radiotherapy			2.16	0.84–5.49	0.150
Yes	7 (15.9)	37 (84.1)			
No	19 (8)	217 (92)			
Menopause			0.72	0.29–1.78	0.628
Yes	7 (7.6)	37 (84.1)			
No	19 (8)	167 (89.8)			
Axillary lymphadenectomy			0.91	0.30–2.80	1.00
Yes	4 (8.7)	42 (91.3)			
No	22 (9.4)	212 (90.6)			
Chemotherapy			2.23	0.97–5.11	0.062
Yes	16 (13.1)	106 (86.9)			
No	10 (6.3)	148 (93.7)			
Breast size			2.31	0.91–5.82	0.113
Large/extra-large	13 (13.5)	83 (86.6)			
Medium	8 (6.3)	118 (93.7)			
			1.59	0.53–4.74	0.447
Large/extra-large	13 (13.5)	83 (86.6)			
Small	5 (8.9)	51 (91.1)			
			0.69	0.21–2.21	0.542
Medium	8 (6.3)	118 (93.7)			
Small	5 (8.9)	51 (91.1)			

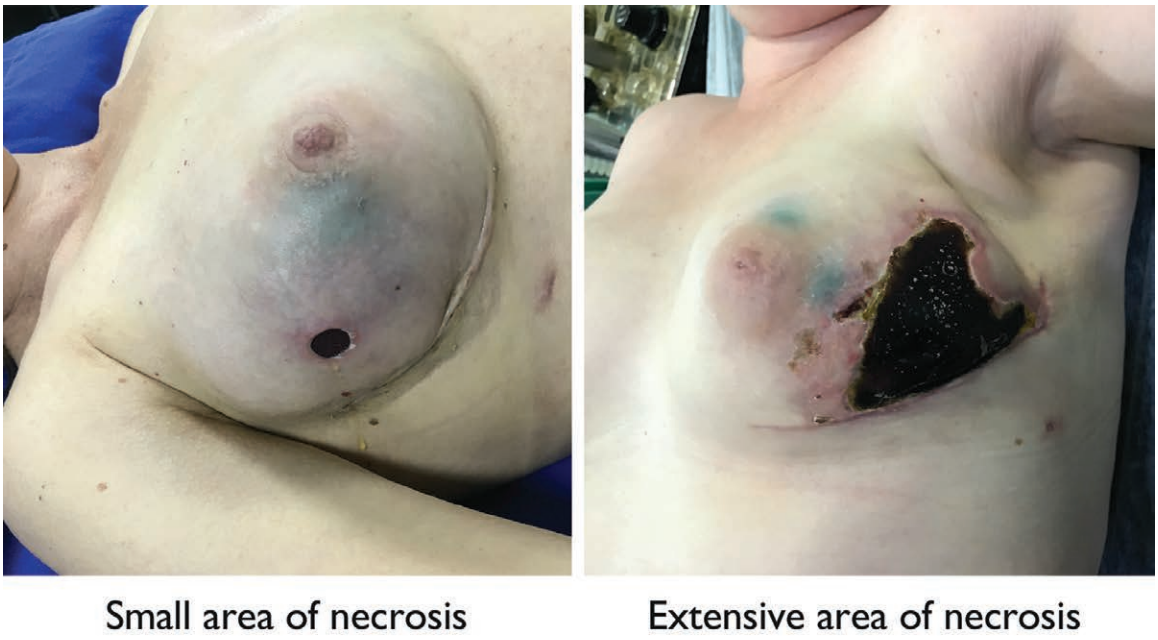

Fig. 3. A small area of necrosis and an extensive area of necrosis after a nipple-sparing mastectomy by the inframammary fold and prepectoral direct-to-implant reconstruction.

patients (Table 4). The incision in the inframammary fold was inapparent in most cases (Fig. 5).

DISCUSSION

There are many techniques for immediate reconstruction after nipple-sparing mastectomy. Patients can opt for temporary expander, direct-to-implant reconstruction, or autologous flaps. The decision depends on the surgeon's experience, available materials in the care center, and the patient's related risk factors, such as smoking history, diabetes, body mass index, breast characteristics (size and ptosis), and the complementary cancer treatment (radiotherapy, chemotherapy, hormonotherapy, lymphadenectomy), all of which can add risks for poor cosmetic outcomes and increasing complication rates.[1–10] Understanding the importance of skin flap perfusion, vascular integrity, and quality of the mastectomy is fundamental to the success of the prepectoral technique.[3]

The ideal anatomical placement of implants in breast reconstruction has been the subject of discussion and has changed over time. The resurgence of a prepectoral technique is relatively recent, although the first breast reconstructions with implants were prepectoral.[3] This technique was abandoned because of a high incidence of infection, capsular contracture, and explantation that was ultimately attributable to thin mastectomy skin flaps and the lack of adequate soft-tissue support.[5] The skin-sparing mastectomy and nipple-sparing mastectomy, which are less aggressive and more anatomical mastectomies, allowed the rebirth of prepectoral implant reconstruction.

The main benefits of the prepectoral approach include faster surgery, elimination of animation deformity, and less pain in the postoperative period (decreased need for narcotics and faster recovery), as it is a less invasive procedure. Consequently, it is better tolerated by patients than its subpectoral counterpart. Postoperative complications with the prepectoral approach have been shown to be comparable with those reported with partial muscle coverage. Although a number of studies have demonstrated advantages of prepectoral implant breast reconstruction, most studies mainly describe two-stage tissue expander approaches or direct-to-implant reconstruction with the placement of acellular dermal matrix or mesh as support.[8,10,13–18] Li et al.,[17] in a meta-analysis of 16 comparative studies, showed no statistical differences in overall complications, implant extrusion, seroma, nipple or skin flap necrosis, hematoma, reoperation, wound dehiscence, wound or skin infection, or rippling between prepectoral and subpectoral sites, with better BREAST-Q scores and less postoperative pain.

The prepectoral site is not suitable for all patients. The best candidates usually are ones with small- to medium-sized breasts with no or a low degree of ptosis. In addition, they should not have other risk factors, like obesity, smoking, diabetes mellitus, or previous irradiation on the breast.[1,5–7,9]

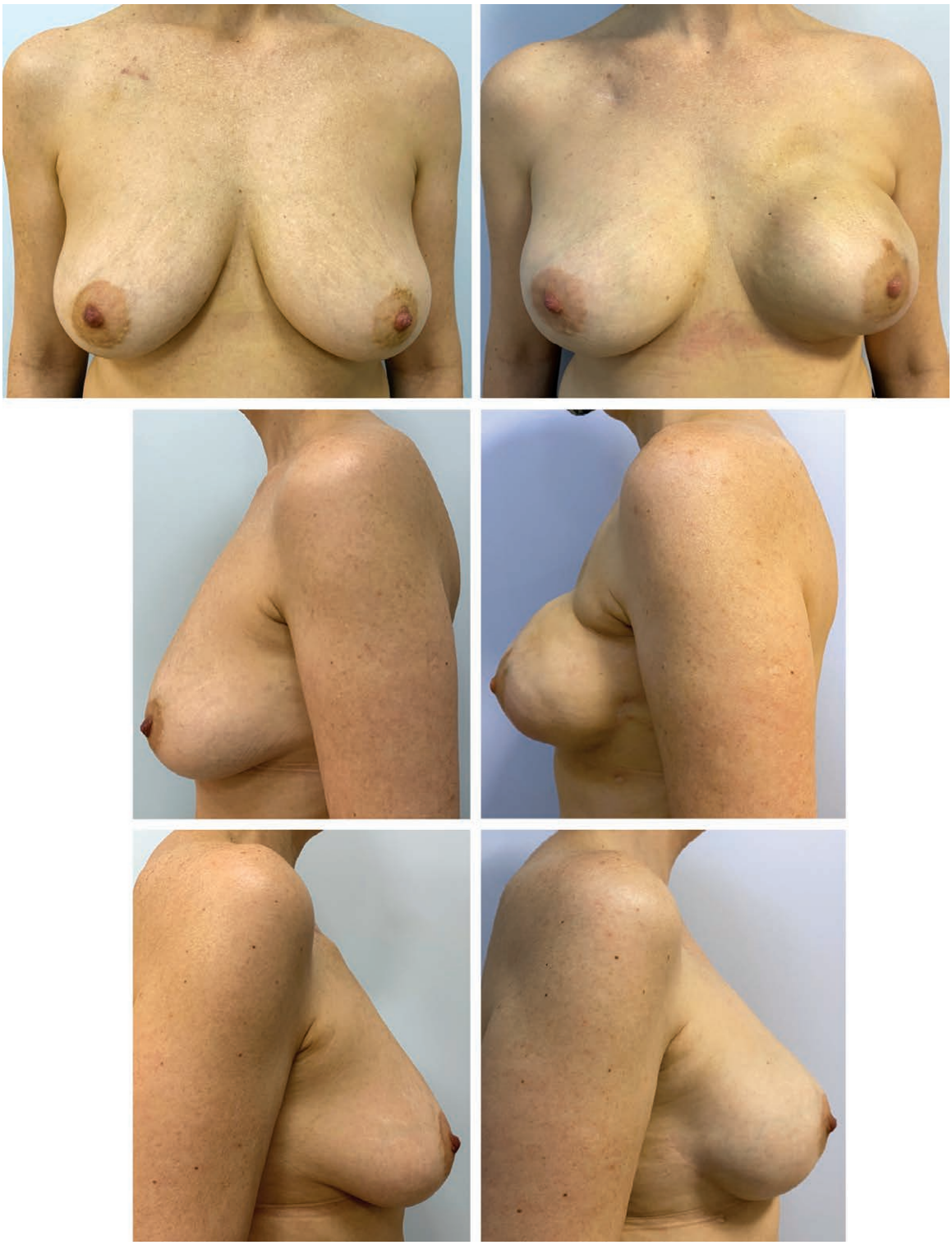

Fig. 4. Capsular contracture Baker III after radiotherapy in a bilateral nipple-sparing mastectomy with prepectoral direct-to-implant reconstruction without mesh or acellular dermal matrix (right mastectomy was prophylactic). Preoperative (*left*) and postoperative (*right*) views.

Even in these favorable cases, many surgeons opt for a two-stage reconstruction.[1,3,4] In our series, we did not use these criteria to select patients.

The most frequent early complication was implant explantation. Most of the time, this was associated with flap necrosis or infection,

Table 4. Objective Cosmetic Outcomes by BCCT.core Software after Prepectoral Direct-to-Implant Breast Reconstruction without Acellular Dermal Matrix or Mesh in Nipple-Sparing Mastectomy

Cosmetic Outcomes	No.* (%)
Excellent	54 (38.3)
Good	69 (49)
Fair	18 (12.7)
Poor	0

*Total of 141 reconstructions in 91 patients.

particularly in smokers. The rate of 9.2 percent in our series is higher than some prepectoral publications using acellular dermal matrix and mesh, where 2 to 4 percent were reported.[3–11,13–28] This could be attributed in part to patient selection. In our series were included patients at risk for complications, such as obese patients, patients after neoadjuvant chemotherapy, diabetic patients, and smokers. We believe that, as the aim of our study was to show the feasibility of this type of reconstruction without using acellular dermal matrix or mesh, including a high-risk population, which truly represents the general population of patients who are candidates to this type of surgery, helped us in the final conclusions of this study. Rotation was observed in just one case. Significant rippling (grade 3 or 4), which was expected to be more frequent here as there was no muscular cover, was observed only in a few cases (seven of 184 breasts). In the event of rippling and wrinkling, several factors require consideration, including the thickness of the flaps, the implant-to-mastectomy ratio, and implant cohesivity. Rippling and wrinkling is considered by many surgeons as common in the setting of prepectoral reconstruction. Up to 1 month after surgery, all patients in our series had grade 3 rippling; 6 months later, only a minority of them did and needed treatment.

Capsular contracture is a common adverse outcome following implant breast reconstruction, often associated with radiation treatment. Chu et al.[6] in a literature review also showed that preoperative and postoperative radiation were associated with a higher rate of implant loss, with statistical significance. Muscle fibrosis can be a contributor to breast reconstruction contracture after radiation. Sobti et al.[19] found greater rates of capsular contracture in the subpectoral versus prepectoral group [$n = 28$ (51.8 percent) versus $n = 12$ (30.0 percent); $p = 0.02$]. When compared with prepectoral cases, direct-to-implant reconstruction in irradiated patients with subpectoral implant placement was nearly four times as likely to result in capsular contracture ($p < 0.01$). In addition, in our series, significant capsular contracture (Baker II to IV) was present in 29 cases (15.7 percent). In 14 of them, adjuvant radiotherapy was present. Without radiotherapy, only 15 breasts (6.3 percent) had capsular contracture.

Mesh and acellular dermal matrix can serve as a layer of vascularized regenerative tissue between the implant and mastectomy flap and allow stabilization of the reconstructed breast.[9] Although acellular dermal matrices have been widely adopted by plastic surgeons, Salibian et al.[13] have demonstrated that thick mastectomy skin flaps and strict preservation of the native inframammary fold may obviate the need for acellular dermal matrix. Their 10-year retrospective review of 250 prepectoral breast reconstructions without acellular dermal matrix reveal clinically significant capsular contracture in 7.6 percent of patients and implant displacement in 0.8 percent. Cosmetic outcomes were graded as good to very good in 85.2 percent of patients. A systematic review and meta-analysis of complications following nipple-sparing mastectomy and reconstruction with direct-to-implant reconstruction and acellular dermal matrix by Heidemann et al.[21] suggest that the use of acellular dermal matrix can be associated with a higher rate of acute complications. The authors presented 4 percent nipple-areola complex necrosis, 12 percent infection, 5 percent seroma, and 1 percent hematoma.[7] All percentages were equivalent to our study, requiring further studies to prove the association between acellular dermal matrix and acute complications.

Using acellular dermal matrix and mesh is expensive, ranging from $1000 to more than $20,000. In our series of 280 prepectoral direct-to-implant breast reconstructions, no acellular dermal matrix or mesh was used, and complication rates and outcomes were similar to those of the acellular dermal matrix and mesh series. The cosmetic results in our series, which were objectively assessed by BCCT.core in 91 patients, were considered good or excellent in 87.3 percent of cases. Data on prepectoral direct-to-implant breast reconstruction without acellular dermal matrix and mesh, however, are limited.

Flap necrosis is one of the main complications and occurs in 3 to 7 percent of cases.[1] A meta-analysis by Daar et al.[4] showed a nipple-areola complex necrosis rate after nipple-sparing mastectomy by inframammary fold of 6.82 percent. In our series, nipple-areola complex necrosis occurred in only four breasts (1.4 percent) and flap necrosis in 20 breasts (7.1 percent). Mastectomy skin flaps can vary based on thickness, dimensions, and

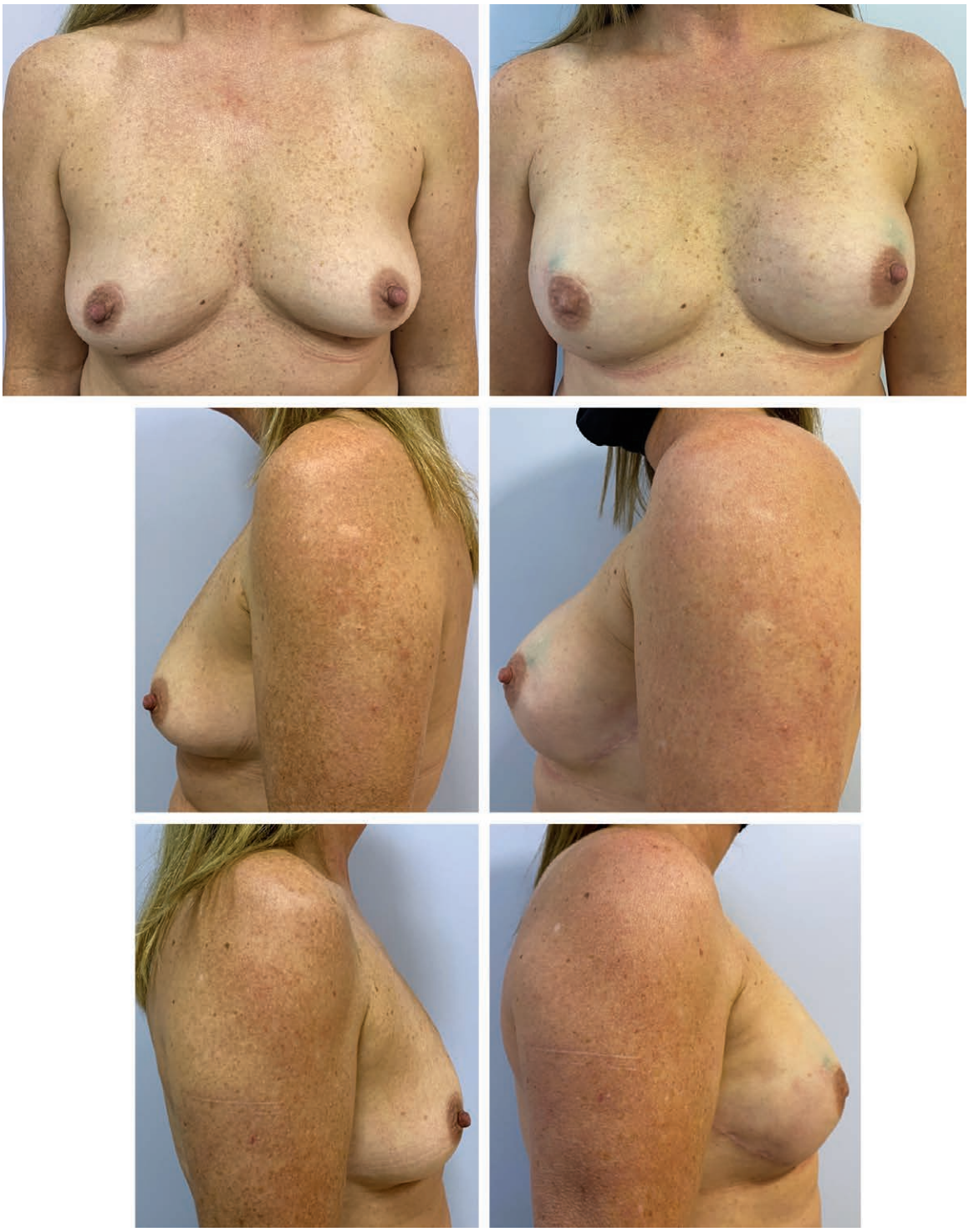

Fig. 5. Good aesthetic long-term outcome after bilateral nipple-sparing mastectomy with prepectoral direct-to-implant reconstruction without mesh or acellular dermal matrix (left mastectomy was prophylactic). Preoperative (*left*) and postoperative (*right*) views.

perfusion. Therefore, skin flap assessment is a critical component and determinant of success in prepectoral reconstruction. The quality of the mastectomy and thickness of skin flap is less important than the perfusion. Thinner and younger patients typically have thin mastectomy flaps and overweight or obese or older patients tend to have thicker mastectomy skin flaps. The normal subcutaneous layer of the breast varies from person to person and ranges from 2 to 3 cm. In situations

where the mastectomy skin flaps are thicker and well perfused, either a tissue expander or a permanent implant can be placed in the prepectoral space.

CONCLUSIONS

This cohort represents the preliminary results of a large series of direct-to-implant prepectoral breast reconstruction after nipple-sparing mastectomy by the inframammary fold without the placement of an acellular dermal matrix or mesh. This report shows that overall surgical complications with this technique did not substantially differ from previously reported acellular dermal matrix, mesh, or subpectoral series. However, the explantation rate was higher in comparison with some prepectoral acellular dermal matrix and mesh series. This may be attributed in part to the patient selection in our series. We included high-risk cases, and this finding may open space for future studies comparing direct-to-implant versus two-stage reconstruction. Rippling and capsular contracture rates were not higher here. These data demonstrated that this technique is promising, is safe, and could be economically advantageous, as it is a one-stage technique without acellular dermal matrix or mesh. In addition, there is no animated breast. These are medium-term results. Cosmetic outcomes after 6 months were satisfactory in most of our cases. Skin flap perfusion, vascular integrity, and quality of the mastectomy are fundamental to the success noted in this study. Larger and comparative studies are required to better elucidate patient and reconstructive factors that can lead to reduced complications and better selection of patients.

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