New Options for Immediate Reconstruction: Achieving Optimal Results with Adjustable Implants in a Single Stage

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Background: With the wide acceptance of immediate reconstruction and skin-sparing mastectomy and the precipitous decline in reimbursement for all types of breast reconstruction techniques, it is appropriate to revisit a technique that can achieve optimal reconstruction goals with a single general anesthetic operation.
Methods: A total of 322 consecutive cases in 14 years are reviewed. The mean patient age was 46 years (range, 20 to 76 years). Although this is not the first time a single-stage technique with adjustable implants has been reported, it is the largest series, and the technique was used in all consecutive patients during the past 14 years who were candidates for immediate implant reconstruction. The placement of a smooth-walled, permanently adjustable implant (Spectrum or Becker) entirely subcutaneously in the lower half of the breast, the use of shaping sutures initially, the careful placement of biopsy incisions, and aggressive initial debridement of mastectomy flaps are the keys to obtaining reliable results. Because of the partial or total subcutaneous placement of the implant, this method preserves the ptotic shape of the original breast without the need for subsequent expansion to obtain ptosis.
Results: Complications requiring major general anesthesia reoperations were capsular contracture [$n = 61$ (19 percent)], significant mastectomy flap necrosis ([$n = 6$ (1.9 percent)] seroma or hematoma [$n = 16$ (5 percent)], and periprosthetic infection [$n = 7$ (2.1 percent)]. Four infected implants were salvaged and three were removed and replaced at a later date. Most mastectomy flap necrosis was marginal and revised in the office under local anesthesia [$n = 23$ (7.1 percent)]. The rate of major necrosis requiring debridement in the operating room was 1.9 percent ($n = 6$). Aesthetic results were rated by patient and physician report to be excellent (78 percent), good (17 percent), or poor (5 percent).
Conclusions: This technique achieves the goals of providing a ptotic reconstruction in one operation without the use of latissimus flaps or tissue expansion. The complication rate was low and the author discusses several methods for avoiding complications historically associated with immediate implant reconstruction. (*Plast. Reconstr. Surg.* 119: 28, 2007.)

With the wide acceptance of immediate reconstruction and skin-sparing mastectomy and the precipitous decline in reimbursement for all types of breast reconstruction techniques, it is timely to revisit a technique that can achieve optimal reconstructive goals with a single general anesthetic operation.

PATIENTS AND METHODS

The advent of skin-sparing mastectomy and immediate reconstruction has allowed plastic surgeons working with our general surgery colleagues to achieve improved cosmetic results with all types of reconstructive techniques. As the skin flaps have become more reliable, the complication rate from immediate reconstruction has declined and patient and surgeon satisfaction has increased. Now, over 20 years since the introduction of skin-sparing techniques, we are able to meet the challenge of providing beautiful immediate reconstructions that do not significantly interfere with adjuvant therapy.[1–4] The author has used this technique for 14 years in 322 consecutive cases and has achieved consistently good results. During this time, it has not been necessary to use latissimus flaps or tissue expanders for immediate reconstruction. In addition, there has rarely been a need for postoperative skin expansion beyond two injections of 50

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cc each. Regardless of the fact that expansion is often not necessary, the author prefers postoperatively adjustable implants for fine tuning the result in the immediate postoperative period. Seven factors are essential to consider when aiming for an optimal single-stage result:

1. Sufficient preoperative patient education to manage expectations.
2. The availability of reliable adjustable implants (Spectrum or Becker; Mentor Corp., Santa Barbara, Calif.).[5]
3. Coordination with general surgeon regarding timing of surgery and orientation of the biopsy scar.
4. Preservation or recreation of the normal landmarks of the breast (inframammary fold and anterior axillary line).
5. Operating on the opposite breast during the initial procedure, keeping the fourth dimension (time/gravity) in mind.
6. Accurate assessment and adequate debridement of skin flaps at the time of initial surgery if necessary.
7. Close follow-up for maintaining a low complication rate.

The initial consultation with a reconstructive surgeon occurs within a few days or weeks of receiving a diagnosis of breast cancer; thus, it is frequently the case that the patient is overwhelmed and unable to retain a significant amount of information. Often, the first consultation is reserved for a general discussion of the types of reconstruction available and determining whether the patient is a better candidate for a flap or an implant procedure (or a combination). The patient often returns for a second time when the details of the skin incisions and implant options of saline, silicone, and silicone/saline mixture are discussed. She is also informed that she must perform massage for at least 10 minutes per day for the first year to preserve her excellent results.

There are three main incision options used with this technique. The transverse/oblique incision placement is ideal for small-breasted women who are not candidates for preservation of the nipple-areola complex (Figs. 1 and 2).

The modified Wise pattern mastectomy incisions are used for the ptotic breast. This technique produces the most ptotic result, with little or no need for subsequent volume expansion[6] (Figs. 3 and 4).

The final technique is used for women with ductal carcinoma in situ or small lesions at sufficient distance from the nipple-areola complex to allow nipple-preserving mastectomy with coring out of the nipple tissue.[7–10] For the right patient, these results are similar to an augmentation and extremely aesthetically pleasing to the patient (Figs. 5 and 6).

Orienting the Biopsy Scar for Optimal Results

Traditionally, it has been assumed that incisions made on the breast along concentric lines are more cosmetically acceptable. In the case of breast biopsy placement, this is not always the case. By strictly adhering to the old principles of radially placed skin biopsy incisions (particularly in the lower pole of the breast), much skin is wasted, which may be beneficial if the patient requires mastectomy. Instead, we find it helpful to conceive of the breast as having cosmetic units similar to those in other areas of the body. These units are composed of the nipple-areola complex, the medial lower pole, the lateral lower pole, and the upper pole. Thus, incision lines should be hidden from view when the patient looks down at her breast or wears a bra or bathing suit, if at all possible.

By applying the principles of cosmetic placement of incisions used in all areas of plastic surgery, the biopsy scar placement can allow both adequate access for the general surgeon and improved appearance in bras and bathing suits. In the author's experience, the incisions placed perpendicular to these concentric lines or radially from the nipple in the lower pole of the breast heal equally well and afford more reconstructive options.

In small, nonptotic breasts, the biopsy incisions should be oriented along the proposed mastectomy incisions whenever possible. Lateral quadrant incisions should be placed radially from the nipple. The most difficult situation is when the tumor is in the lower outer quadrant of a small breast, because this skin is needed to preserve ptosis. In this case, it is best to keep the biopsy incision as close to either the nipple-areola complex or the inframammary fold as possible. This allows the skin in the inferior pole to be preserved. In addition, the author will mobilize and advance skin from the chest wall and use inframammary fold sutures placed internally to recreate the fold when more inferior pole skin is needed (Fig. 7).

In ptotic breasts, the best incision is a modified Wise pattern incision. Biopsy scars in this case are oriented along potential incision lines. The lower pole biopsy incision poses no problem using this incision because the skin over the tumor can be liberally excised and sent off with the specimen. The remaining inferior pole skin is deepithelial-

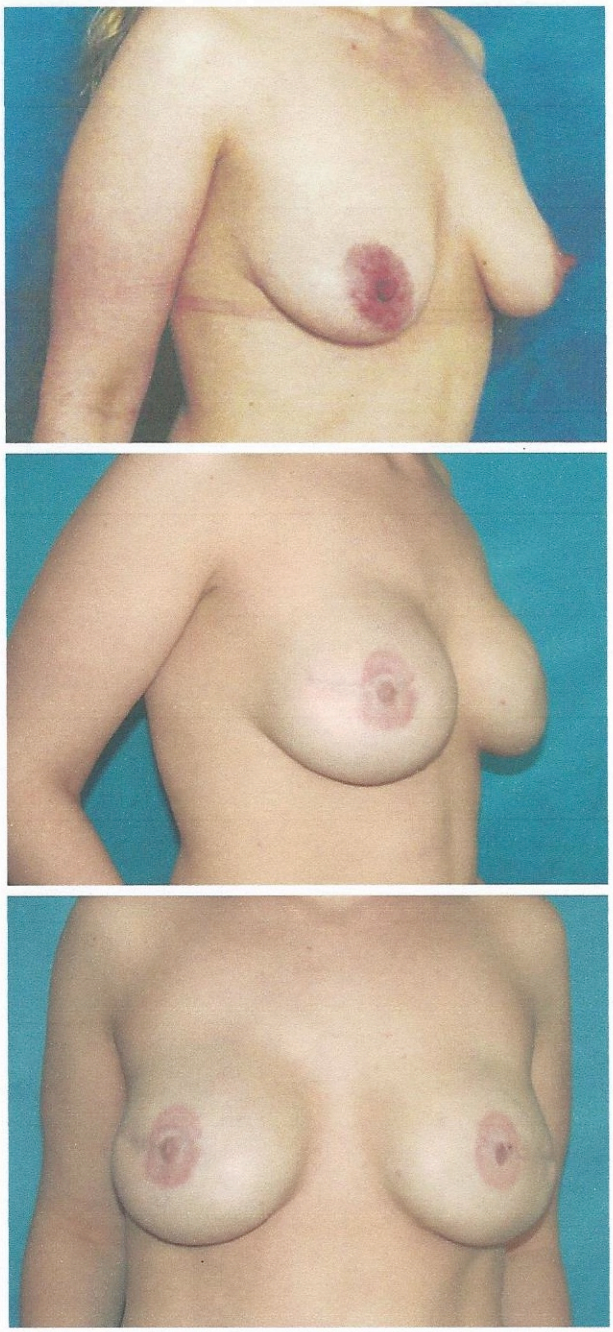

Fig. 1. The patient is shown before (*above*) and at 8 weeks (*center*) and 2 years (*below*) after single-stage reconstruction. The nipple-areola complex is created under local anesthesia at the same time as port removal.

ized to provide a secure double layer of closure over the implant (Fig. 8).

Surgical Technique

The plastic surgeon schedules the case with the general surgeon to work simultaneously. Using two surgical fields, the opposite breast augmentation, reduction, or mastopexy/augmentation are performed at the same time as the mastectomy. If the reconstruction is bilateral, the first reconstruction is performed simultaneously with the second mastectomy. This allows the surgical time to be between 2 and 4 hours in all cases. This way of working also educates our general surgical colleagues about the single-stage technique and illustrates the aesthetic reasons for small incisions and proper orientation of scars.[11]

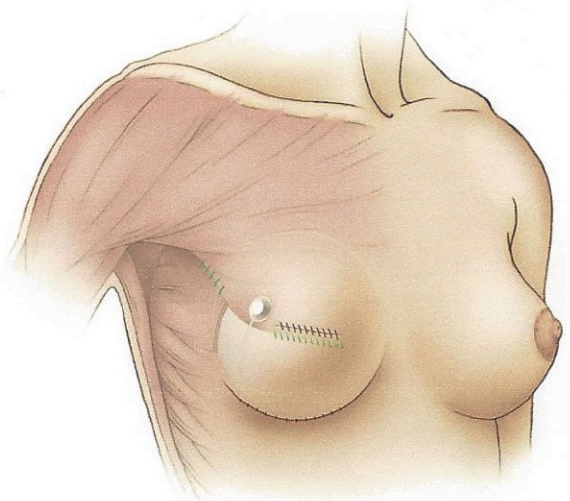

Fig. 2. The basic technique for breasts with mild ptosis or no ptosis. The pectoralis muscle edge is sutured to the deep dermis of the inferior skin flap. The port is placed on the muscle adjacent to the skin incision.

Once the mastectomy is complete, the skin flaps are inspected and aggressively debrided back to bleeding edges. It is essential that this be performed during the first operation, regardless of whether the aesthetic result is compromised. The author operated with 15 different general surgeons in this series. The rate of mastectomy flap viability was surgeon-specific; thus, the author would design more liberal flaps and debride more aggressively when indicated during the initial operation. Sometimes, this compromised the overall cosmetic outcome, but the extremely low implant loss is a direct result of early, aggressive treatment of skin necrosis. The flaps are inspected again when the wounds are tacked closed under tension, and further debridement occurs if necessary. If there is subsequent marginal necrosis, it is usually minimal and easily dealt with in a minor office procedure under local anesthesia only. It is an error to wait for the skin to "declare itself" for more than 72 hours, as an infection may set in. Adjuncts such as heating pads (over towels) and nitropaste are used if congestion is present but punctate bleeding exists.

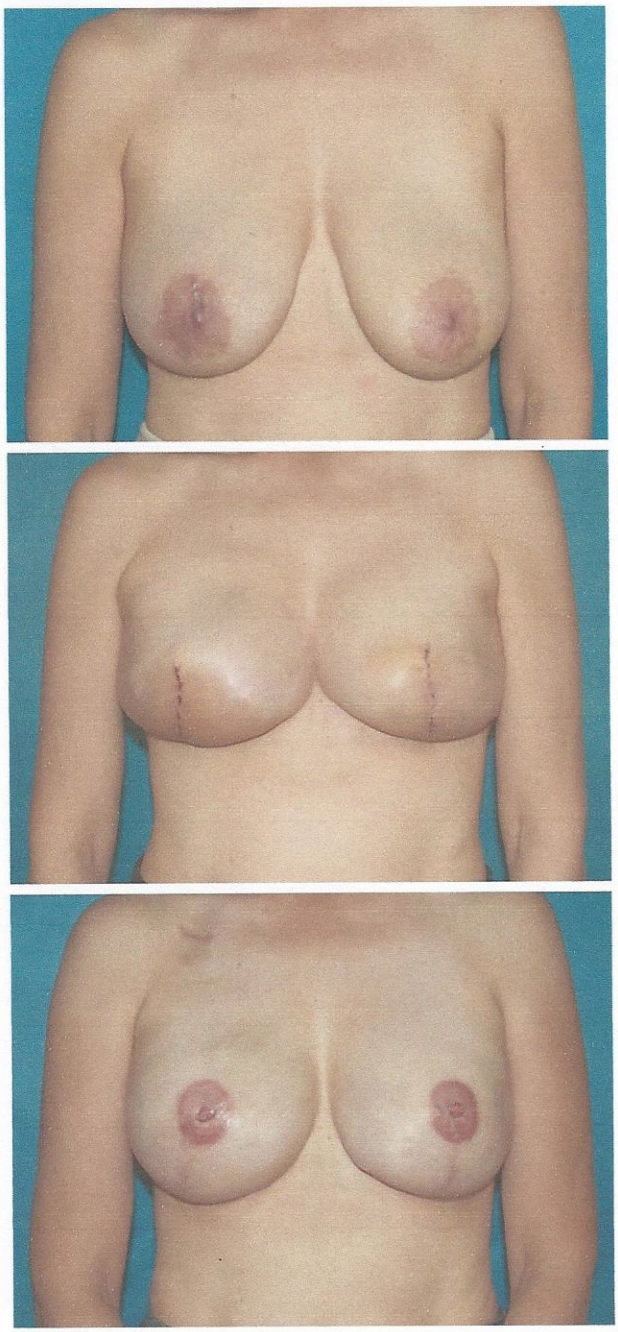

Fig. 3. This patient is shown 1 year after Wise pattern mastectomy and implant reconstruction with 6 weeks of postoperative irradiation on the right side and augmentation mastopexy on the left side.

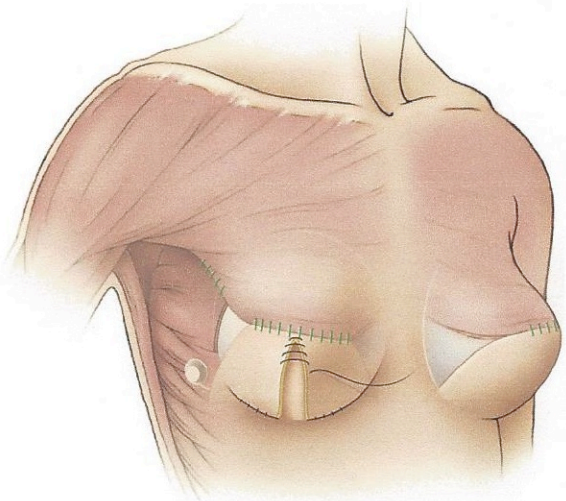

Fig. 4. The Wise pattern reconstruction technique. The deepithelialized dermal flap inferiorly is sutured to the inferior edge of the pectoralis major. The two skin flaps are placed over this dermal muscle bra and sutured as in a breast reduction. The port is positioned laterally along the inframammary fold under the skin.

The implant is placed subpectorally in the upper pole to allow a double layer of muscle and dermal closure along the incision line and minimize rippling in the superior pole. The key to obtaining ptosis in the first operation is to place the implant subcutaneously in the lower pole. Care is taken to create a double-layer closure by suturing the muscle to the deep dermis of the inferior skin flap so that there is no dermal incision closed directly over an implant.

The first step is to elevate the pectoralis muscle, creating as much cleavage as possible but leaving the presternal attachments down to the fifth rib. The pectoralis muscle can be thinned medially, provided that some presternal attachments and perforating vessels are preserved. The muscle is released inferiorly as low as possible, leaving enough length to suture it to the inferior skin flap. A small strip of serratus and pectoralis minor muscle is elevated by applying Allis clamps to the edge of the pectoralis minor and releasing it inferiorly to suture it to the lateral pectoralis major without creating a tension band over the implant. This serves to prevent implant migration into the axilla. This strip also helps taper the superior pole of the reconstruction, allowing a more natural teardrop shape to the final reconstruction.

The implant is then placed in the pocket, with the port exiting laterally. The pectoralis muscle is sutured to the deep dermis of the inferior skin flap, allowing sufficient overlap of muscle under the incision. Often, there is a small area medially or laterally with no muscle coverage, but there is always some extra skin that can be deepithelialized and inverted when dog-ears are removed, thus creating a double layer of closure throughout (Fig. 2).

Fig. 5. Patient is shown preoperatively (*above*) and 2 weeks after bilateral nipple-sparing mastectomy (*center*) through the inframammary incisions with coring out of the nipple. (*Below*) Both nipples survived and were sensate to touch. The port is under the adhesive bandage because the implant was inflated just once with an additional 50 cc of saline.

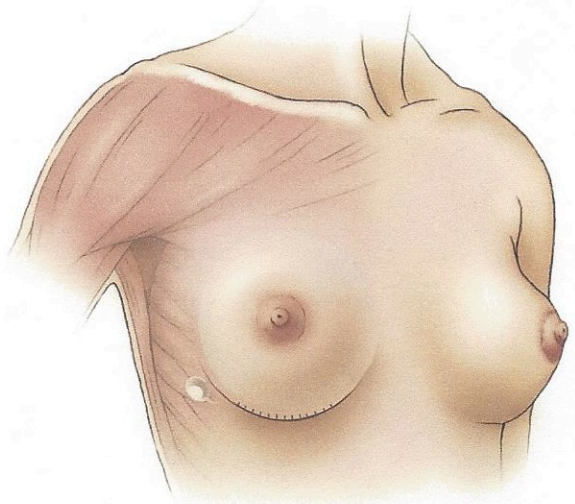

Fig. 6. Nipple-preserving mastectomy through an extended inframammary incision and subcutaneous placement of a Becker 50 implant. The port is placed in a small pocket along the inframammary fold.

Wise Pattern Technique

When using Wise pattern incisions, the markings are generous to allow for subsequent debridement if necessary, with the T incision extending up to 9 cm from the top of the areola to the inframammary fold. The inferior skin flap is not discarded but is deepithelialized and folded under the medial and lateral flaps, providing a double layer of coverage in the inferior pole. Care is taken to preserve the inferior skin until the superior flaps are inspected under tension of closure, as a small inverted V of skin may need to be preserved if the medial and lateral flaps must be debrided extensively (Fig. 4).

As with any operation, it is important to have a "plan B" available. In the case of a Wise incision, it is possible to convert it to a transverse incision if the inferior skin has not yet been deepithelialized. The author has used this option only once but has planned for it several times. By using staples to approximate the tension of wound closure on flaps and overall shape, the best option becomes readily evident intraoperatively. When learning the technique, caution with tissue handling of thin mastectomy flaps should be exercised, and one should be sure that what remains is vascularized reliably.

This type of reconstruction provides the most natural immediate outcome and rarely needs postoperative volume adjustment. Another key to reliable skin flaps is to avoid injury to the presternal intercostal perforating vessels during the mastectomy. Interrupting these vessels will certainly compromise the distal medial flap. The Wise technique is to be avoided in the obese diabetic or smoking patient. We have also discovered that

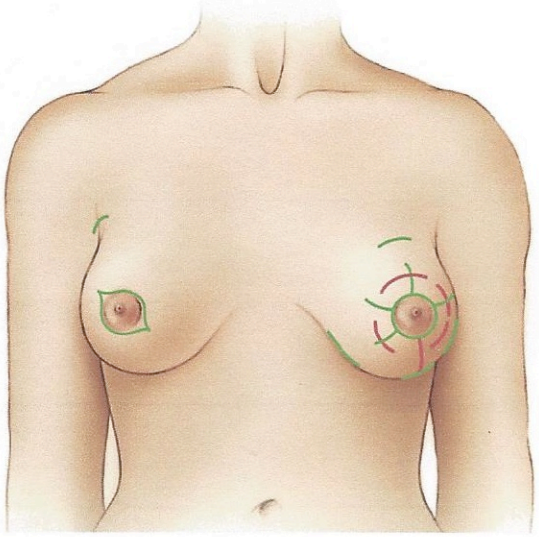

Fig. 7. Ideal incisions for biopsy placement for nonptotic breasts (*red*, "do not"; *green*, "do").

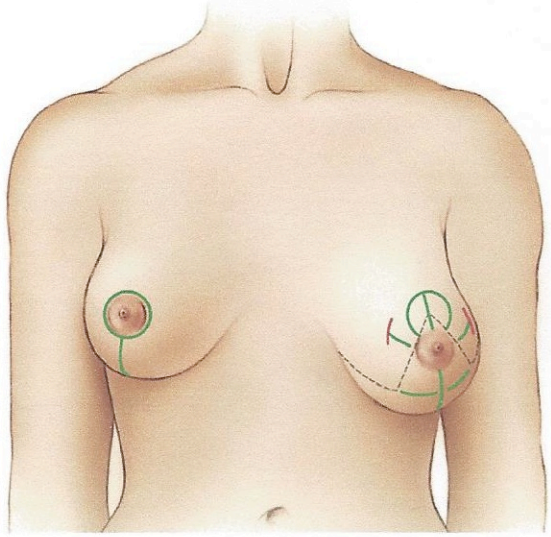

Fig. 8. Ideal incisions for biopsy placement for ptotic breasts (*red*, "do not"; *green*, "do").

patients older than 65 years have less reliable skin flaps and must be approached with caution.

Subcutaneous and Nipple-Preserving Technique

All three types of incisions can be used with an entirely subcutaneous implant placement. These patients must be carefully selected early on, and this technique is to be used only when the flaps left by the general surgeon are robust. This technique is also preferable when using a nipple-preserving mastectomy performed with an inframammary fold incision. In these cases, the author prefers a smooth-walled Becker 50 or a smooth-walled silicone gel implant. The entirely subcutaneous technique has several advantages: quicker recovery with less pain; no muscle indentation with motion; and improved overall ptosis initially, with increased ptosis over time (Fig. 6).

It is possible to place the implant subcutaneously using any of the three incisions. The entirely subcutaneous technique has evolved over the past few years as we have learned which patients are better candidates for this procedure. The subcutaneous technique is ideal for Wise pattern incisions, where there is a double layer of coverage in case of marginal necrosis. It is also suited to transverse incisions in small-breasted patients with reliable skin flaps. In larger patients, the implant is too mobile and results in too much ptosis and subsequent motion-induced seromas. When using the subcutaneous technique, there is liberal use of shaping sutures to recreate the inframammary fold and anterior axillary line, thus avoiding increased mobility and improving outcome (Figs. 9 and 10).

Implant Choice

The author was an early advocate of shaped implants but has abandoned their use (not including cohesive gel) for several reasons. We have found that the key to obtaining a natural shape of the final result is a soft implant with an adequate skin envelope. With a contracture or with insufficient skin for the implant size, all shaped implants will move toward a round sphere. The single most important factor when selecting an implant is base diameter. It is essential to provide adequate base diameter for the patient's chest wall. The Becker 50 implant provides a wide-based reconstructive option for larger patients. The author also weighs the mastectomy specimen and adds or subtracts the volume adjustment for the opposite breast to estimate implant size. For example, if the breast is 650 g and a 200-g reduction is performed on the opposite breast, a 500-cc Becker 50 implant or a 475-525 Smooth Spectrum implant will be chosen. The author always rounds up in size for Becker implants because it is possible to underinflate the Becker 50, with excellent results.

The Fourth Dimension

Whenever performing breast surgery, it is essential to keep in mind that the forces of motion and gravity are always at play and greatly influence the short- and long-term results. To achieve symmetry in a single stage, anticipation

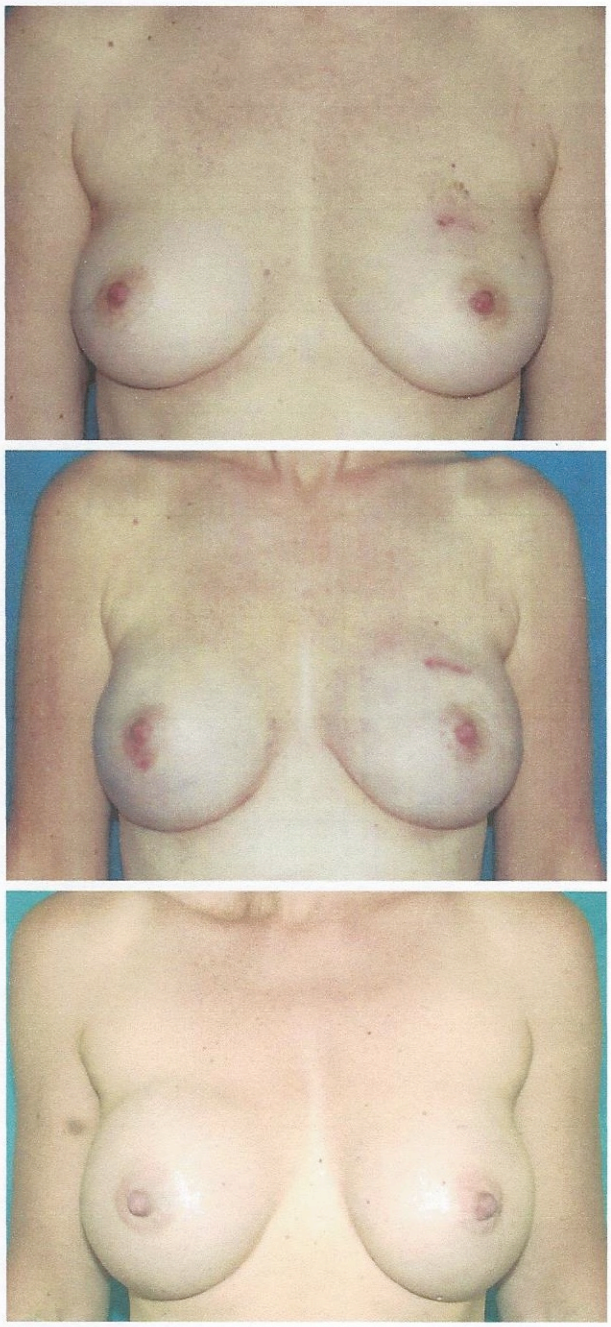

Fig. 9. Preoperative (*above*) and 2-week (*center*) and 6-month (*below*) postoperative photographs of a patient illustrating bottoming-out with Lejour incision mastectomy and no dermal flap in the inferior pole to support the implant. Notice the bottoming-out of the implant.

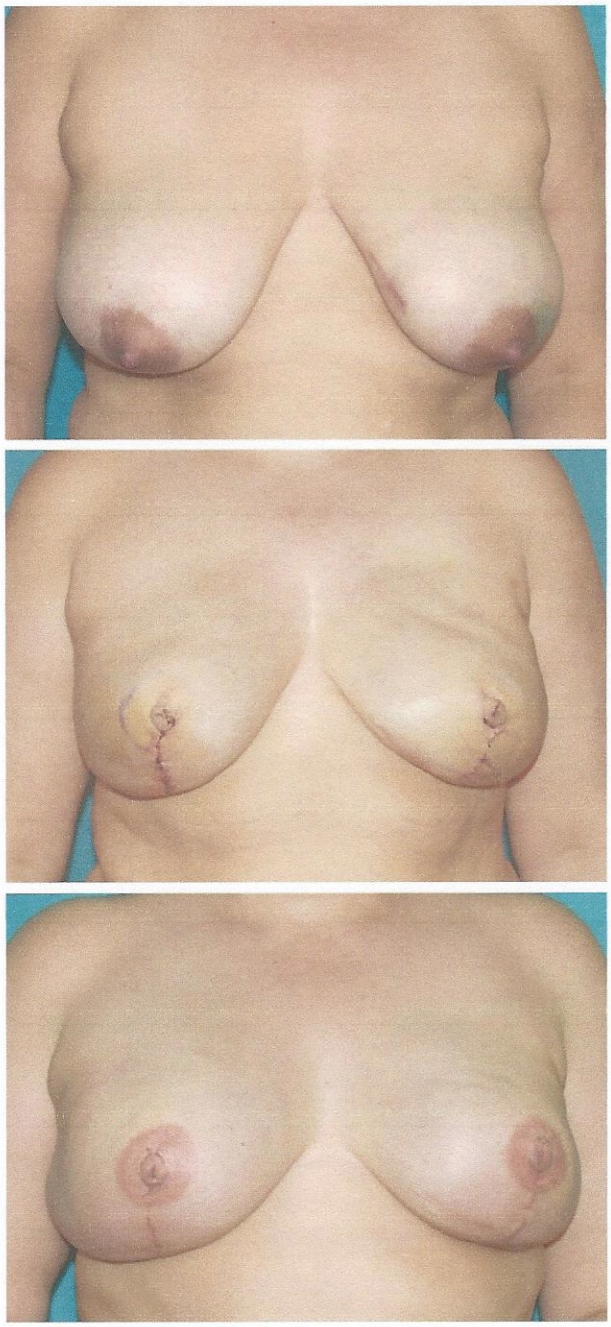

Fig. 10. This patient underwent bilateral Wise pattern mastectomies with immediate nipple reconstruction and subcutaneous placement of a Becker 50 implant. She is shown preoperatively (*above*), 2 weeks postoperatively (*center*), and 6 months postoperatively (*below*) after nipple tattoo and port removal.

of these forces must be taken into account. This is the most difficult and subtle factor that influences the surgical learning curve with this technique. The patient depicted in Figure 11 illustrates the principle of the fourth dimension in breast surgery. She is a 72-year-old woman in whom the author attempted to anticipate both skin stretch and gravitational forces. She currently has an underinflated Spectrum implant in place and does not desire to switch the implant to a silicone implant or to inflate the implant to get rid of rippling.

Fig. 11. Photographs obtained preoperatively, immediately postoperatively, and 2 weeks and 6 months postoperatively. Note the author's attempt to compensate for the fourth dimension in the patient's immediate postoperative results; the reduction was quite high relative to the reconstruction, allowing for significant ptosis over the long term because of the patient's advanced age of 72 years. The patient insisted on an underfilled Spectrum implant on the left and was unwilling to add more saline or switch to silicone before removal of the port.

Nipple-Areola Reconstruction, Port Removal, and Adjuvant Therapy

The author uses either a local flap[12] or a nipple-sharing technique with immediate tattooing. The procedure is performed with local or no anesthesia in the office or in a minor surgery suite. If the patient is to undergo chemotherapy, this is completed at least 2 to 4 weeks previously. It is preferable to make a nipple before irradiation, as survival of the small nipple flap in an irradiated site is poor. There has been no increased incidence of infection using immediate tattooing, and there is an overall psychological advantage for the patient.

If the patient is to undergo preoperative chemotherapy or postoperative irradiation or chemotherapy, this does not preclude the use of this type of reconstruction. It is possible to preserve soft results even with the advent of postoperative radiation therapy.[13] The keys to a soft irradiated breast are to create a large flap without redundant skin and to maintain close follow-up during and after chemotherapy and radiation therapy. At the earliest sign of redness, the plastic surgeon is consulted to determine whether there is a seroma or cellulites present. If spitting sutures are identified, the area is excised and closed in an office procedure. Early aggressive treatment virtually always preserves the reconstruction in the author's experience by preventing fulminant periprosthetic infections, which are difficult to eradicate and lead to capsular contracture and possible implant extrusion at a later date.

RESULTS

Marginal skin necrosis (7.1 percent) was treated by early local excision and closure in the office within the first 7 to 10 days (Tables 1 and 2).

Table 1. Demographics*

Characteristic	No. (%)
Tumor characteristics: prophylactic (only)	39 (12)
Ductal carcinoma in situ, multifocal or extensive	81 (25)
Invasive (grade I–III)	202 (63)
Radiation therapy	65 (20.2)
Lumpectomy radiation failures	20 (6.2)
Postoperative radiotherapy	45 (14)
Chemotherapy	158 (49)
Neoadjuvant	10 (3.2)
Adjuvant	148 (46)
Local or regional recurrence	12 (3.7)
Cancer-related death	4 (1.2)

*Mean age at surgery, 46 years; range, 20–76 years.

Table 2. Complications

Complication	No. (%)
Implant loss (replaced with delayed implant or TRAM flap	7 (2.2)
Infection (all in patients undergoing adjuvant therapy)	4 (1.2)
Replaced with TRAM flap	4 (1.2)
Chronic capsular contracture	3 (1)
Infection	1 (0.3)
Marginal skin necrosis (office revision under local anesthesia only)	23 (7.1)
Major flap necrosis (general anesthesia revision)	6 (1.9)
Hematoma/seroma	16 (5)
Periprosthetic infections	7 (2.1)
Capsular contracture (grade 3–4)	61 (19)
Deflation	3 (0.9)

TRAM, transverse rectus abdominis musculocutaneous.

Major necrosis (1.9 percent) was treated by early aggressive debridement under general anesthesia (this complication is general surgeon–specific).

The rate of chronic seromas necessitating conversion to a smooth-walled device was 4 percent (early in the series when Siltex texturing was used). Prolonged and late seromas occurred in only three patients after switching to smooth-walled devices.

Immediate infection (2.1 percent) occurs only with undrained seromas, hematomas, or undebrided necrotic mastectomy flaps. Late infections are possible during chemotherapy or irradiation or after medical or dental procedures (we use prophylactic antibiotics for all dental procedures).

Primary capsular contracture Baker class 3 to 4 (19 percent overall) decreases with early aggressive massage (over the past 3 years, 11 percent of nonirradiated patients developed capsular contracture Baker class 3 to 4). Chronic capsular contracture led to conversion to transverse rectus abdominis musculocutaneous flap in three patients (1 percent). Infection led to implant removal in four patients (three during chemotherapy and/or irradiation and one secondary to methicillin-resistant *Staphylococcus aureus* infection acquired during the initial procedure).

In the early series, there were some periprosthetic implant infections that were treated early by means of aggressive debridement of the capsule, pulsed lavage irrigation with triple antibiotic solution, and conversion to a smooth-walled device. All of the reconstructions were preserved except for the seven mentioned above. Because these infections occurred almost exclusively with textured implants, the author has converted entirely to smooth-walled implants for immediate reconstruction for several reasons:

1. The increased incidence of seroma and late seroma with textured implants in this series.
2. The difficulty of eradicating bacteria from the pocket if a textured implant is used, because of textured interstices of the implant that retain bacteria.
3. Decreased rippling overall.
4. More natural appearance and feel of implant under thin mastectomy flaps.

Early experience with new cohesive devices did not solve the rippling problem, in part because of the textured surface. However, the author does not yet have sufficient experience to be certain. With increased use of Becker 50 implants inflated to capacity, rippling was minimal. Recent experience with Mentor moderate plus gel implants has shown that they can replace the use of Becker 50 implants in selected cases where adjustability is not necessary.

DISCUSSION

This article is intended to introduce a technique that is easily learned and provides natural results with immediate implant reconstruction after the first operation. The complication rate is lower than with most immediate implant reconstruction series.[14–16] The recovery from this operation is rapid, as the implant is in a partial or total subcutaneous position. Although the use of a partial subcutaneous position of the implant is not new,[1] using our technique, the muscle covers less than half of the implant, leaving the implant more mobile and allowing for more initial ptosis and a natural shape. Unlike a recently published series of immediate reconstructions with the biodimensional single expander/implant in which 47 percent of patients required latissimus flaps, in this series, no patients required latissimus flaps or total muscle coverage of the implant.[16,17] With careful

biopsy incision placement and aggressive early debridement of flaps, there was enough skin available for all of the reconstructions. The most frequent complication is capsular contracture, which is consistent with all implant techniques.

For patients who will require subsequent adjuvant therapy, this technique provides a breast mound with a natural shape before chemotherapy or irradiation. If she later develops capsular contracture, a second operation may be needed, usually with excellent results if the patient performs massage early and aggressively. In either case, we have found that women are much happier with a breast that has capsular contracture than with a flat irradiated chest with no subsequent options for implant reconstruction. There is a distressing trend toward delaying reconstruction because of anticipated capsular contracture after irradiation, particularly in thin, young, active women, who are not ideal flap candidates and yet are emotionally distraught at the thought of living without a breast. This tendency is unfortunate, because implant reconstruction is often the only practical option available to these patients, and they are usually happy, even with a capsular contracture. In addition, capsulectomy with an aggressive postoperative massage regimen in these patients prevented further encapsulation in over 50 percent of patients in our series.[14]

CONCLUSIONS

We have found that giving women an option for an adjustable implant reconstruction adds very little surgical and recovery time to the mastectomy. The reconstruction is usually complete within 2 months (without adjuvant therapy). Having this type of immediate reconstruction provides the patient with a reason for optimism in an otherwise dark situation. She tends to focus on the reconstruction, her postoperative implant massaging, and the new appearance of her lifted and augmented bust line, which we believe enhances her healing and recovery both physically and emotionally.

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DISCLOSURES

The author has no financial interest in the Mentor Corporation and receives no money whatsoever from the sales of their products.

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