Prepectoral Site Conversion for Animation Deformity

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Background: A significant disadvantage of subpectoral breast reconstruction procedures is animation deformity during pectoralis major contraction. In this study, we discuss one surgeon’s experience with elective subpectoral to prepectoral implant site conversion as a definitive solution to animation deformity.

Methods: Authors performed a retrospective review of pre-pectoral and sub-pectoral breast reconstructions performed by a single surgeon. Implants placed in the prepectoral plane were supported with total anterior AlloDerm coverage.

Results: One hundred forty-two breasts in 90 patients who had underwent elective subpectoral to prepectoral implant site conversion. Postoperative resolution of animation deformity was 100%. Overall, complications are minimal with rates at 4.2% for infection, 2.1% for seroma, and 0.7% for hematomata, dehiscence, partial thickness necrosis, and explantation. One patient requested reoperation for reduction in implant volume. Baker grades II–IV capsular contractures are 0% at 43 months.

Conclusion: Breast implant site conversion from the subpectoral to the prepectoral plane is a safe and definitive solution for animation deformity. (Plast Reconstr Surg Glob Open 2019;7:e2301; doi: 10.1097/GOX.0000000000002301; Published online 29 July 2019.)

INTRODUCTION

Subpectoral implant placement has been the gold standard for implant-based breast reconstruction for over 5 decades. In recent years, considerable attention has been focused on performing immediate and delayed reconstruction in the prepectoral space to eliminate many of the complications associated with subpectoral implant positioning. These subpectoral complications include animation deformity, tightness, functional limitations on the shoulder, and problems with implanted distortion.1–8 Attempts to correct some of these esthetic issues with fat grafting have met with mixed and often disappointing results, whereas their impact on functional problems has been negligible.

The recent interest in prepectoral reconstruction, both single and 2-stage approaches, has seen a dramatic improvement in both the esthetic and functional outcomes of implant-based reconstruction when coupled with the use of acellular dermal matrices (ADM). Numerous articles attest to the enhanced esthetic outcomes in terms of cleavage formation, and complete elimination of animation deformity, improved long-term comfort and reduced postoperative pain.9

The senior author migrated to a single-stage prepectoral direct-to-implant approach for breast reconstruction over 5 years ago. The dramatic improvement in esthetic outcome, with particular reference to reduction in animation deformity, improved cleavage formation and postoperative comfort with enhanced shoulder range of motion, triggered an interest in the concept of prepectoral conversion as a means of dealing definitively with the problem of animation deformity in the subpectoral patient population. Having performed two stage, and later single-stage, subpectoral reconstruction for many years, it had been the senior author’s experience that animation deformity is an almost universal problem that causes patients embarrassment and often discomfort on a daily basis. Attempts at ameliorating these problems with fat grafting met with very mixed results and never completely eliminated animation deformity. More so, fat grafting had no impact whatsoever on patient comfort and physical function. The senior author follows all implant patients annually and began specifically asking patients if they were bothered by their animation deformities or experienced discomfort and

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limited range of motion with subpectoral implants, particularly during exercise. Given the surprisingly large number of patients who expressed an interest in alleviating these symptoms, the decision was made to offer prepectoral site conversion to those patients with subpectoral reconstructions in whom animation deformity, implant distortion, and tightness were significant complaints. This article reports our experience with this patient population over a 3-year period.

MATERIALS AND METHODS
A retrospective review of 90 patients, 142 breasts, was performed from April 5, 2015, to May 20, 2018, after Institutional Review Board approval. Data collected from electronic health records included baseline patient demographics, patient risk factors, surgery characteristics, and postoperation complications. All patients underwent breast implant site change from the subpectoral to the prepectoral plane performed by a single plastic surgeon. This procedure was performed primarily as a corrective procedure for symptomatic animation deformity. No exclusion criteria in terms of skin flap thickness, body mass index (BMI), prior smoking history, or diabetes were used for the surgery after patient consent was completed. Thin skin flap thickness was not considered problematic because the flaps have been vascular-delayed by the prior mastectomy, and the use of ADM and cohesive gel implants further reduced any tendency to show significant rippling as is borne out in the data. Radiated patients were included unless their skin was thin, tight, and telangiectatic. Health Insurance Portability and Accountability Act procedures were followed to deidentify patient information during data collection. Descriptive statistics for patient characteristics and surgical outcomes were generated by summing and averaging each variable across the total number of breasts.

OPERATIVE PROCEDURE
An incision is made through the original mastectomy scar, and the previously placed subpectoral implant is removed. With the upper mastectomy flap everted using digital pressure from the outside, the juncture of the caudal border of the pectoralis major muscle with the native previously placed ADM is identified. This junction is incised with electrocautery until the superficial aspect of the pectoralis major is identified and the prepectoral plane is identified. The muscle border is grasped with tissue forceps and with gentle downward traction on the pectoral muscle, the plane between the superficial aspect of the pectoralis major muscle and the overlying upper mastectomy flap is developed (Fig. 1). Dissection is carried upward across a broad front separating the mastectomy skin from the underlying muscle until the upper aspect of the new breast pocket has been defined. This corresponds to the uppermost limits of the preoperative skin markings. Medial dissection is carried down to the level deemed appropriate to achieve an attractive natural cleavage for the patient. Laterally, the dissection is carried out toward the anterior axillary fold. This broad-based dissection allows the muscle to be returned to the chest wall without tension. The pectoralis major muscle is then sutured to rib periosteum with four or five 3-0 Vicryl sutures (Ethicon, Somerville, N.J.). With the pocket thus prepared, it is lavaged first with 50% povidone iodine solution followed by a triple antibiotic solution. A sheet of 16×20 cm thick ADM (Alloderm; Allergan Corp Dublin) is then trimmed
Table 1. Patient Characteristics: 90 Patients (N Breasts = 142)

| Variable               | Average | Minimum | Maximum |
|------------------------|---------|---------|---------|
| Age                    | 55      | 29      | 77      |
| BMI                    | 28      | 19      | 42      |
| Days for drain removal | 11      | 5       | 42      |
| Follow-up weeks        | 77      | 9       | 184     |
| Current smoker         | 8 (8.9) |         |         |
| Smoking history        | 46 (51.1)|        |         |
| Preoperative radiation | 21 (14.8) |        |         |
| FX implant profile     | 114 (80.3)|       |         |
| FF implant profile     | 6 (4.2) |         |         |
| Other implant profile  | 22 (15.5)|        |         |

Table 2. Postoperative Complications (N Breasts = 142)

| Complication                              | N (%) |
|-------------------------------------------|-------|
| Contour deformity                         | 41    (28.9) |
| Fat grafting                              | 26    (18.3) |
| Rippling                                  | 7     (4.9) |
| Infection requiring PO antibiotics        | 5     (3.5) |
| Minor seroma                              | 2     (1.4) |
| Major seroma                              | 1     (0.7) |
| Infection requiring IV antibiotics        | 1     (0.7) |
| Explantation                              | 1     (0.7) |
| Necrosis requiring local wound care       | 1     (0.7) |
| Dehiscence                                | 1     (0.7) |
| Hematoma                                  | 1     (0.7) |
| Change in implant size                    | 1     (0.7) |
| Capsular contraction                      | 0     (0.0) |
| Necrosis requiring debridement            | 0     (0.0) |
| Animation deformity                       | 0     (0.0) |
| Red breast syndrome                       | 0     (0.0) |
same topic, the same authors found a self-reported rate of animation deformity of 53% out of 69 respondents. The same questionnaire attempted to determine the clinical significance of breast animation deformity. They found lifting weights and exercising as the activities most commonly affected in this cohort of patients at 24% and 19%, respectively. A few additional studies explored the negative impact of subpectoral implant placement on pectoralis muscle thickness and power.1–8,12,13 Roxo et al.13 demonstrated a 49.8% reduction in pectoralis muscle thickness 12 months after subpectoral breast augmentation, whereas de Haan et al.4 found a 20% reduction in adduction power after subpectoral breast reconstruction.

In a similar study to that of Spear et al.,8 Becker and Fregosi3 evaluated the significance of breast animation deformities after subpectoral breast reconstruction. All 25 respondents reported visible deformity upon contraction of pectoral muscles, with 20 (80%) confirming movement of the breast with muscle contraction bothering them. Furthermore, 9 patients affected by their animation deformity rated their displeasure as 6+ or higher on a 10-point scale. Two patients reported pain with contraction, whereas 6 patients (25%) report it impacting personal relation-
ships. It affected daily life in 12 patients (50%). Finally, 10 patients responded in the affirmative to the question of whether or not animation deformity negatively impacting them emotionally or psychologically. In another study, Ni
gro and Blanchet4 found similar rates of self-reported ani
mation deformity in breast reconstruction patients (75%).
According to these studies, animation deformity is a more
significant issue in breast reconstruction patients. Breast
reconstruction patients are more likely to have thinner
breast flaps that unfortunately makes implant movements
less discreet.14

With our experience being similar to the report by
Becker and Fregosi,3 we have sought a definitive method
for correction of breast animation deformity in patients
reporting a clinically significant impact from the com-
plexion in their daily lives. Fat grafting proved to be an
unsatisfactory solution in our hands, and we did not at-
tempt Botox injection because the concept seemed flawed
in terms of both its temporary nature, cost, and the side
effect of weakening an already compromised pectoralis
major muscle.3,15–17 Other methods to reduce animation
deformity include pectoralis muscle splitting that may lead
to more patient morbidity,18,19 implant size change, capsu-
lotomy, or capsulorrhaphy.20 To reduce the impact of these
problems on patients’ daily lives, the senior author began
converting symptomatic subpectoral implant reconstruc-
tions to the prepectoral position. This procedure has few
complications and solved the problem of animation de-
formity in all patients. The “tenting technique” of ADM
suturing used on immediate prepectoral direct-to-implant
reconstructions was used to accurately control the newly
established prepectoral pocket.10

A few authors have also published their experience
with this solution. Hammond et al.21 described the out-
comes of the procedure performed on 19 breasts. The
average follow-up time for this study was 13.8 months. All
patients had 100% resolution of their breast animation de-
formity. However, complications included 21.2% capsular
contracture, 5.3% seroma, a high rate of 31.6% reopera-
tions, and no rippling/contour deformities or infection.
Our follow-up time is now 43 months and with lower rates
of significant complications than reported by Hammond
et al.21 The differences in capsular contracture rates are
particularly striking. Hammond et al.21 reported a rate
of 21% compared with ours of 0%. The major difference
between these studies and our own is the use of anterior
ADM coverage in all of our cases, and implants were in-
eracted using the biofilm reduction protocol by Deva et
al.21 including the use of a Keller funnel. These techniques
were employed to prevent complications like capsular
contracture,10,11,22,23 Our capsular contracture (grades II–
IV) rate after a follow-up period of 3.5 years is 0%. In our
series, the reoperation rate was only 1%.

Our most common complication was minor contour
deformity (usually slight edge visibility of the superomedi-
al aspect of the implant at its juncture with the chest wall or
hollowing) at a rate of 28.9%, with 18.5% of these patients
receiving fat grafting during follow-up. Lesavoy et al.24 also
performed a similar procedure for the correction of ani-
mation deformity postsubpectoral breast augmentation.

These authors also report 100% resolution of animation
deformity, with complications including one hematoma
secondary to an extensive capsulectomy and postoperative
hypertension, 6-month reoperation of 2.8%, and 2 Baker
grade II capsular contractures not requiring reoperation.

Gabriel et al.25 published results of a smaller series of 57
patients and 102 breasts with a history of subpectoral breast
reconstruction undergoing 2-stage tissue expander/im-
plant reconstruction or direct-to-implant prepectoral site
conversion procedures. Average BMI and follow-up time
were 27.3 kg/m2 and 16.7 months, respectively. In their
patients, authors tacked acellular dermal matrix to the
subcutaneous tissue of the breast flap for anterior cover-
age of the implant. Very few complications were reported:
seroma in 2 breasts, skin necrosis in 3 breasts, and wound
dehiscence in 1 breast. Some patients underwent autolo-
gous fat grafting for further soft-tissue coverage although
the frequency of this was not reported.25 These results fur-
ther support the concept that prepectoral site conversion
is an effective solution for animation deformity.

The etiology of animation deformity following subpec-
toral implant reconstruction is the unavoidable adhesion
between the pectoralis major muscle, the overlying mast-
tectomy skin flap, together with adhesion to the underly-
ing implant capsule. Attempts at breaking this contiguity
with subcutaneous fat grafting have been somewhat disap-
pointing, and fat grafting completely fails to address the
other associated issues of tightness, decreased range of
shoulder girdle motion, and muscle weakness. Prepectoral
conversion using the ADM anterior tenting technique
provides a thoroughly effective solution to the problem
of animation deformity. Our patients’ subjective reports
of increased comfort and shoulder range of motion have
prompted us to commence a prospective evaluation of
these physical parameters in our prepectoral conversion
patients in the hope that we may be able to quantify their
self-reported improvements in function and appearance
postconversion.

The present study is limited by its retrospective nature.
Second, animation deformity was objectively evaluated by
a senior surgeon with extensive experience in breast re-
construction but subjectively by patients. Currently, there
is no widely accepted scale for animation deformity. Ham-
mond22 cited that in his own experience with site conver-
sion procedures, that most patients do have some degree
of lingering animation deformity because the implant cap-
sule adheres to the pectoralis muscle. Further study with
objective methods to assess the esthetic and functional ef-
ects of animation deformity should be performed.

CONCLUSIONS

Animation deformity is a postoperative complication
present in a significant number of patients undergoing
subpectoral breast reconstruction. Unless specifically ex-
amined for, it is easily overlooked by surgeons. Increasing
number of studies document that patients are frequently
perturbed by the physical appearance and discomfort of
the deformity. Attempts at breaking this contiguity with fat
grafting have been disappointing. In particular, fat graft-
ing fails to address the other associated issues of tightness, decreased range of shoulder girdle motion and muscle weakness that our patients present with. We are currently undertaking a study to objectively quantify esthetic and functional improvement in these patients postconversion using Breast-Q and Disabilities of the Arm, Shoulder and Hand (DASH) questionnaires coupled with independent physical therapy evaluation. In our hands, conversion from the subpectoral to prepectoral plane is a safe and effective procedure to solve the issue of animation deformity, improving both cosmetic and reported functional outcomes in our patients with very low complication rates.

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