The Correction of Capsular Contracture by Conversion to “Dual-Plane” Positioning: Technique and Outcomes

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Little has been published regarding the treatment of patients with long-established capsular contracture after previous submuscular or subglandular breast augmentation. This study reviews 7 years of experience in treating established capsular contracture after augmentation mammoplasty by relocating implants to the “dual-plane” or partly subpectoral position. A retrospective chart review was performed on all patients who were treated for capsular contracture using this technique between 1993 and 1999. Data collected included the date of the original augmentation, the original implant location, date of revision and type of implant used, length of follow-up, outcome, and any ensuing complications. Different surgical techniques were used, depending on whether the prior implant was located in a subglandular or submuscular plane. All patients had revisions such that their implants were relocated to a dual plane, with the superior two thirds or so of the implant located beneath the pectoralis major muscle and the inferior one third located subglandularly. Of 85 patients reviewed, 54 had their original implants in a submuscular position and 31 had their initial augmentation in a subglandular position. Of the 54 patients whose implants were initially submuscular, 23 patients (43 percent) had silicone gel implants, 15 patients (28 percent) had double-lumen implants, and the remaining 16 patients (30 percent) had saline implants. Of the 31 patients whose implants were initially subglandular, 20 patients (65 percent) had silicone gel implants, three patients (10 percent) had double-lumen implants, and the remaining eight patients (26 percent) had saline implants. Fifty-one patients (60 percent) had replacement with saline implants (37 smooth saline, 14 textured saline), whereas 34 (40 percent) had silicone gel implants (seven smooth gel, 27 textured gel). The average time from previous augmentation to revision was 9 years 9 months. The average follow-up time after conversion to the dual-plane position was 11.5 months. Only three of 85 patients required reoperation for complications, all of which involved some degree of implant malposition. Of patients converted to the dual plane, 98 percent were free of capsular contracture and were Baker class I at follow-up, whereas 2 percent were judged as Baker class II. There were no Baker level III or IV contractures at follow-up. The dual-plane method of breast augmentation has proved to be an effective technique for correcting established capsular contracture after previous augmentation mammoplasty. This technique appears to be effective when performed with either silicone or saline-filled implants. (Plast. Reconstr. Surg. 112: 456, 2003.)

The silicone breast implant controversy of the 1990s resulted in many women with breast implants returning to their surgeons for advice on how to manage real or imagined problems with their implants.1-21 Although some of these women had only media-driven anxieties with which to cope, others had demonstrable local physical problems, most notably, capsular contracture or implant rupture.2 The large number of such women with breast implants seen during that time period allowed surgeons an accelerated opportunity to develop and review their techniques, while gaining experience in dealing with those situations.

This report describes a method developed during the last decade of dealing with established capsular contracture. The method entailed here evolved from several years of experience with other procedures that the authors found were not as reliable or consistently successful. To confirm our impression regarding the effectiveness of this technique, we reviewed the experience of the senior author (Spear) in treating capsular contracture by relocating the new implant to a partially subpectoral/partially subglandular, or dual-plane, position.
PATIENTS AND METHODS

A retrospective chart review was done for patients who were treated at Georgetown University Hospital by one surgeon (Spear) for implant capsular contracture between 1993 and 1999. Only patients operated on for capsular contracture were included in the series. Patients operated on for rupture, malposition, or other reasons were not included. Only charts with complete operative reports or in which the replacement implant location could be definitively ascertained as dual plane were included in the study. Data were collected regarding the original augmentation date, the original implant location (submuscular or subglandular), type of incision used, volume of the implant used, revision date, type of implant used for revision, incision used in revision, length of follow-up, and any complications that ensued.

All patients received perioperative antibiotics; most received a first-generation cephalosporin. All surgical wounds were irrigated with bacitracin and the implants were bathed in a bacitracin foam solution before insertion into the new pocket. The implants were handled as little as necessary to minimize possible contamination. A closed system for sterile saline infiltration was utilized for saline-filled implants.

For those patients whose original implants are subglandular, a total or near-total capsulectomy is initially performed. After as much capsule as technically and safely possible is removed, the edge of the pectoralis major muscle is identified (Fig. 1) and a pocket is dissected beneath the muscle using primarily sharp dissection with fiber optic lighting and electrocautery, and a minimum of blunt dissection (Fig. 2). The pectoralis major muscle is released entirely across its inferior origin, and the subpectoral pocket is released as far medially as necessary to achieve the desired pocket shape and medial breast border. The initial capsulectomy typically recreates a reasonable approximation of a desirable subglandular breast pocket. The subsequent release of the pectoralis major muscle along its lower border should extend as far medial as the space created by the capsulectomy, unless it is apparent that to do so the breast pocket would extend too far toward the midline. Progressive release of the pectoralis major muscle from inferiorly to superiorly along the sternal border should be done judiciously, if at all. Excessive medial or superior release of this muscle risks the creation of synmastia, window-shading, or an unnatural medial breast fullness.

FIG. 1. Identifying the border of the pectoralis major.

FIG. 2. Creation of a space beneath the pectoralis major muscle.

FIG. 3. Placement of implant in the dual-plane position.
Laterally, the pectoralis major muscle should be separated from the pectoralis minor and serratus anterior muscles with the dissection ultimately joining the subpectoral pocket with the space created by the capsulectomy. Any apparent excess space, medially, inferiorly, or laterally, is closed with either internal or percutaneous sutures. The new implant is then placed within the pocket such that the superior two thirds or so is in a subpectoral plane, leaving the inferior one third in the subglandular space (Fig. 3). Three to five half-mattress stabilizing “marionette” sutures are placed between the skin and pectoralis major muscle to stabilize the inferior muscle edge at or near the level of the areola (Fig. 4). These marionette sutures are critical in closing off the upper portion of the previous subglandular space to prevent the new implant from dislodging back into the previous purely subglandular pocket.

For those patients whose original implants were primarily or entirely submuscular, the operation is very different, and in particular, capsulectomy is typically more selective. Using the previous inframammary or periareolar incision, the operation begins with the creation of

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**Fig. 4.** (Above) Implant in position with marionette sutures placed at the inferior edge of the pectoralis major muscle. (Below, left) Implant in position in a patient with previously placed subglandular implant, before placement of marionette sutures. (Below, right) Implant in position with residual subglandular space obliterated by marionette sutures.
the subglandular portion of the new dual-plane, partly subpectoral pocket in a virginal space. Before entering the previous submuscular pocket, dissection proceeds in the subglandular plane from the level of the inframammary fold vertically up to the level of the inferior border of the areola. For patients with more soft tissue or ptosis, the dissection can go as far superior as the upper border of the areola. In patients with significant ptosis, a mastopexy may be required. This dissection creates the lowermost portion of a standard subglandular pocket and always exposes the inferior edge of the pectoralis major muscle. After this new part of a subglandular pocket is created, the inferior or lowermost border of the muscle is identified. Dissection is begun along the lower border of the pectoralis major muscle, which exposes the capsule of the existing submuscular implant. The capsule is opened widely along the lower muscle border and the implant is removed. The existing subpectoral pocket is modified as needed to create the desired dimensions. The submuscular or subfascial pocket inferior to the pectoralis major muscle can be closed off with one or more sutures tacking down those tissues to the chest wall to prevent the implant from migrating back into that space inferiorly. Capsulectomy is performed here only as much as necessary to allow proper redraping of the soft tissues over the implant. Percutaneous or marionette sutures are not needed when converting from the submuscular to the dual-plane position (Fig. 5).

RESULTS

A total of 85 patients were identified who met all the criteria for this review. Fifty-four patients had their original implants in the submuscular position, and 31 had them in the subglandular position initially. The average time from initial operation to revision was 9 years 9 months (originally submuscular, 10 years 6 months; originally subglandular, 9 years 6 months). The average time for follow-up after pocket conversion was 11.5 months for all patients (originally submuscular, 11.7 months; originally subglandular, 11.1 months) (Table I). Fifteen patients (28 percent) with previous submuscular implants were noted to have im-

<p>| TABLE I |
| Time Interval for Conversion to Dual-Plane Positioning |</p>
<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Total</th>
<th>Submuscular</th>
<th>Subglandular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to revision, months</td>
<td>117</td>
<td>101</td>
<td>143</td>
</tr>
<tr>
<td>Follow-up, months</td>
<td>11.5</td>
<td>11.7</td>
<td>11.1</td>
</tr>
</tbody>
</table>
plant rupture at the time of revision, and the previous subglandular implants were ruptured in 10 patients (32 percent).

Among the 54 patients with previously submuscular implants, 15 patients were found to have ruptured implants. Ten patients (19 percent of the 54 patients) had silicone gel implants, three patients (6 percent) had double-lumen implants in which only the saline component was found to be ruptured, one patient (2 percent) had a double-lumen implant in which both components were ruptured, and one patient (2 percent) had a saline implant that was thought to have slowly deflated over time and that was noted to be ruptured at the time of the operation. Among the 31 patients with original subglandular implants, 10 patients were found to have ruptured implants. Nine patients (29 percent of the 31 patients) had silicone gel implants, and one patient (3 percent) had a double-lumen implant with evidence of both compartments being ruptured. None of the patients with ruptured implants had any preoperative complaints or physical findings suggestive of implant rupture. These patient groups were selected for this review because they were operated on primarily for capsular contracture not implant rupture.

Fifty-one patients (60 percent) had replacement with saline implants (37 smooth saline, 14 textured saline), and 34 (40 percent) had replacement with silicone gel implants (seven smooth gel, 27 textured gel) (Table II). Few complications occurred, with only three patients (3.4 percent) requiring reoperation for implant malposition (Table III). One patient had an implant that was positioned too high, one patient’s implant was positioned too far medially, and the third patient had an implant that was positioned too far laterally.

Of the 54 patients whose implants were initially submuscular, 23 patients (43 percent) had silicone gel implants, 15 patients (28 percent) had double-lumen implants, and 16 patients (29 percent) had submuscular implants.

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TABLE II
Types of Implants Used as Replacements

<table>
<thead>
<tr>
<th>Type</th>
<th>Total (%)</th>
<th>Silicone Gel (%)</th>
<th>Saline (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth</td>
<td>44 (52%)</td>
<td>7 (8.2%)</td>
<td>37 (43.5%)</td>
</tr>
<tr>
<td>Textured</td>
<td>41 (48%)</td>
<td>27 (31.8%)</td>
<td>14 (16.3%)</td>
</tr>
<tr>
<td>Smooth or textured</td>
<td>85 (100%)</td>
<td>34 (40%)</td>
<td>51 (60%)</td>
</tr>
</tbody>
</table>

TABLE III
Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implant malposition</td>
<td>3/85 (3.5%)</td>
</tr>
<tr>
<td>Infection</td>
<td>0/85</td>
</tr>
<tr>
<td>Implant rupture</td>
<td>0/85</td>
</tr>
<tr>
<td>Hematoma</td>
<td>0/85</td>
</tr>
<tr>
<td>Seroma</td>
<td>0/85</td>
</tr>
<tr>
<td>Total</td>
<td>3/85 (3.5%)</td>
</tr>
</tbody>
</table>
tients (30 percent) had saline implants. Of the 31 patients whose implants were originally subglandular, 20 patients (65 percent) had silicone gel implants, three patients (10 percent) had double-lumen implants, and eight patients (26 percent) had saline implants.

Of 85 patients, 83 (98 percent) were assessed as having soft implants with a Baker I level of capsule contracture at final follow-up; two patients (2 percent) had a Baker II contracture. No patient had a Baker III or Baker IV classification postoperatively (Figs. 6 through 8).
DISCUSSION

This experience with 85 patients who uniformly had their capsular contractures successfully corrected by repositioning of their implants in the partly subpectoral or dual-plane position provides a number of important conclusions. Of greatest importance, this report describes techniques that allow for correction of established capsular contracture after previous subglandular or submuscular breast augmentation (Figs. 9 through 13). The techniques illustrated in this report specifically create a fresh, virtually scar tissue-free environment for the placement of the new implant. By creating separate subpectoral and subglandular spaces and then joining them at a customized variable level somewhere between as high as the upper areolar edge to as low as near the inframammary fold, this technique creates a dual-plane position similar to that described by Tebbetts in primary breast augmentation. Like Tebbetts, we have found that the purposeful dissection in each plane followed by appropriate positioning of the inferior edge of the pectoralis major muscle helps create a desirable breast shape, avoids a double-bubble deformity, minimizes muscle distortion, and corrects long-standing capsular contracture.

This series also confirms the experience of others that the removal of previous periprosthetic capsule or scar tissue is compatible with, if not critical in, successfully correcting encapsulated implants. Whether converting from the subglandular or the submuscular space, a fresh subglandular pocket was created or recreated in the lowermost portion of the breast. In the more ptotic or loose breast, the final implant space might be constructed such that from the upper edge of the areola on down to the inframammary fold, the implant would be in the

Fig. 9. Patient M.M. (above) 10 years after complete submuscular implant placement and (below) 7 months after replacement with smooth, round saline implants relocated to the dual-plane position.
subglandular position. In the less ptotic or nulliparous breast, only the bottom 10 to 20 percent of the implant might rest in the subglandular plane.

This experience also confirms that subpectoral positioning can be highly successful in achieving results with a low risk of capsular contracture. This is particularly remarkable in this series because all of the patients already had established capsular contracture and, thus, could rightly be considered at higher risk for capsular contracture at reoperation.

Also of interest in this review is that the type of implant made no difference in the outcome. Silicone and saline implants, whether textured or smooth, were equally successful in these patients. The saline implants used in these patients were all saline-filled devices manufactured by McGhan Medical (Inamed Corporation, Santa Barbara, Calif.) or Mentor Corporation (Santa Barbara, Calif.) and have been recently approved for clinical use by the United States Food and Drug Administration. The silicone gel-filled implants used were Mentor or McGhan implants, which are available in the United States under the auspices of adjunct or other studies sponsored by the Food and Drug Administration. Those silicone gel implants are currently pending review by the administration, with Premarket Approval application submission scheduled for late 2002 and hearings expected in 2003. The design of these silicone implants, in a sense, is postmodern in that they were designed to withstand Food and Drug Administration scrutiny and, thus, were made with more durable, thicker, and low-bleed silicone elastomer shells. Similarly, the silicone gel of these devices is more consistent

Fig. 10. Patient R.S. (above) 8 years after complete submuscular implant placement and (below) 3 months after replacement with McGhan-style low anatomic saline implants relocated to the dual-plane position.
in molecular weight and more cohesive than earlier devices. The postmodern silicone gel-filled implants in this review were equally as good as saline breast implants in avoiding capsular contracture. The absence of capsular contracture in the 34 patients who had silicone implants placed in the dual-plane position gives support to the expectation that the newer silicone gel-filled implants will have a lower incidence of periprosthetic capsular contracture than earlier devices, particularly when placed in a partly subpectoral environment. Because of the small number of patients and short follow-up, this report lacks sufficient statistical power to prove that point.

In the case of encapsulated subglandular implants, earlier efforts at correction with closed capsulotomy, open capsulotomy, and total capsulectomy with subglandular replacement were to varying degrees unsuccessful, with a disappointing incidence of recurrence. Similar efforts at correcting submuscular capsular contracture were equally inconsistent.

The technique described in this report for correcting subglandular capsular contracture derived from the desire to perform a total or near-total capsulectomy and place the implants subpectorally without the implants either slipping back into the subglandular space or alternatively resulting in a double-bubble deformity from muscle, scar, or fascia restricting the proper inferior descent of the implant. Whether originally subglandular or subpectoral, regardless of which operation was performed, all patients wound up with similar anatomical situations with their implant in a dual-plane position.

CONCLUSIONS

Long-established periprosthetic capsular contracture can be confidently and reliably...
corrected by replacing the existing implants with saline or postmodern silicone gel-filled implants in a carefully created dual-plane, partly subpectoral position using the techniques described in this review. Although other techniques may work in some or even most patients, the technique we describe is straightforward, anatomic, precise, and highly successful in correcting capsular contracture while avoiding other deformities and complications.

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REFERENCES
8. Malata, C. M., Feldberg, L., Coleman, D. J., Foo, I. T., and Fig. 12. Patient J.O. (above) 3 years after subglandular implant placement and (below) 5 years after replacement with round smooth saline implants relocated to a dual-plane position.


