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## **Breast Capsulorrhaphy Revisited: A Simple Technique Utilizing a Gore-Tex Mesh**

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ORIGINAL ARTICLE

# Breast Capsulorrhaphy Revisited: A Simple Technique Utilizing a Gore-Tex Mesh

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**Introduction:** Mammary prosthetic migration is a complication seen not infrequently after breast surgeries. Many factors can contribute to the displacement. When migration occurs, the patient is often left with a sense of disfigurement; and the surgeon faces a challenging repair. We present a case series describing 10 patients who have experienced implant migration and have had successful outcomes after capsulorrhaphies using Gore-Tex (expanded polytetrafluoroethylene).

**Materials and Methods:** A retrospective review was performed of the charts of patients who underwent capsulorrhaphies at the Facial Plastic and Cosmetic Surgery Center between 1993 and 2010. We describe the surgical repair of implant migration using a Gore-Tex reinforced capsulorrhaphy.

**Results:** Retrospective information was gathered for the period 1993 to 2010, during which time a total of 10 patients underwent revisional surgeries for implant migration. Notably, most patients had had multiple procedures before the onset of migration; 6 patients (60%) had had more than one prior breast procedure. Inferior displacement of the implant was the most common type of migration, occurring in 8 patients (80%). Two patients (20%) experienced relapse, and the remaining 8 patients (80%) demonstrated excellent results.

**Conclusions:** Capsulorrhaphies have become a standard method in the repair of mammary prosthetic migration. Although the technique is generally effective, in some cases, additional stability is warranted. The adjunctive use of a Gore-Tex synthetic mesh can provide the necessary additional reinforcement. Gore-Tex used as an adjunctive procedure with capsulorrhaphies has resulted in long-lasting and cosmetically desirable outcomes.

The migration of mammary prostheses is a complication of breast surgeries, often leading to cosmetically unacceptable results. Migration can occur in any direction, but most displacements occur inferolaterally.<sup>1</sup> In rare instances, migration has even resulted in invasion into the pleural cavity.<sup>2</sup> Capsulorrhaphies have played a vital role in the restoration of migrated prostheses to a more desirable position.

In 1986, Spear and Little<sup>3</sup> wrote the first notable publication on capsulorrhaphies, in which they established capsulorrhaphies as the standard treatment for migration. From that point forward, various modifications have ensued, including the use of capsular flaps and acellular dermis-assisted reconstructions.<sup>4-6</sup> Our preference is Gore-Tex (expanded polytetrafluoroethylene; WL Gore & Associates Inc, Medical Products Division, Flagstaff, Ariz), in large part due to its proven history of safety and compatibility throughout the body. We present the results of 10 cases in which capsulorrhaphies were performed in conjunction with Gore-Tex reinforcement to address the complication of implant migration.

## Methods

A retrospective review was performed of the charts of all patients who underwent capsulorrhaphies between 1993 and 2010. Patients who experienced breast implant migration as a postoperative complication were identified. Subsequently, patients in whom Gore-Tex reinforced capsulorrhaphies were performed were included in this study. The relevant surgical and demographic information was collected from the chart review. In this article we describe, in detail, the surgical technique used to repair implant migration using Gore-Tex reinforced capsulorrhaphy.

An extensive preoperative assessment is conducted on the patient before surgery. The patient is examined in the sitting and supine positions. The patient is

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appropriately marked, including the desired position of the new inframammary fold. General anesthesia is our preferred method. An inferior periareolar incision is our preferred approach, but any approach, especially through existing incisions, is suitable. There has been no reported causation between surgical approach and implant migration. Routine perioperative antibiotics are given intravenously (Figure 1).

Dissection through the breast parenchyma and subcutaneous fatty tissue is accomplished by electrocautery. The implant is approached in a supracapsular manner. The capsule is entered, and the incision around the prosthesis is enlarged, allowing for greater access to and easier removal of the mammary prosthesis. After the prosthesis is removed, percutaneous punctures are made consistent with the markings drawn preoperatively, thereby outlining the planned incisions on the anterior capsule. A crescent-shaped portion of the capsule is subsequently excised, extending from the original inframammary fold to the anterior chest wall.

At this juncture, the capsule is grossly inspected for calcification and tensile strength. Capsules that are particularly susceptible to deformation will proportionately benefit from additional reinforcement. A mirror-image capsulotomy (ie, counter capsulotomy) is performed when deemed necessary. The capsulorrhaphy is performed by suturing the inferior skin flap to the anterior chest wall at the level of the new



**Figure 1.** Periareolar approach. The entire procedure takes advantage of a minimally invasive periareolar incision, reducing trauma to the soft tissue, leading to a shorter recovery phase, and allowing for a more cosmetically pleasing outcome.

inframammary fold. Breast implant sizers are used to help assess the adequacy of the capsulorrhaphy and to confirm proper positioning.

A dimensionally appropriate strip of Gore-Tex is sutured in an overlay fashion, using Supramid sutures (S Jackson Inc, Alexandria, Va) to fixate it to both the anterior chest wall and the capsule. In this fashion, the Gore-Tex sling acts to reinforce the capsulorrhaphy line, alleviating it from the full weight of the prosthesis. In addition to providing structural reinforcement, the Gore-Tex can provide an additional layer of protective tissue, which is especially important in thin patients.

After complete hemostasis is ensured, the implant is reinserted. The skin flaps are closed in layers. The new inframammary fold is supported with external Robbins tape (Robbins Instruments Inc, Chatham, NJ). The tape is left in place for 1 week, and it acts to eliminate dead space and/or fluid collection.

## Results

Retrospective information was gathered from patient charts for the period 1993 to 2010, during which time a total of 10 patients underwent revisional surgery for implant migration. The mean age of the patients was 33 years (range = 23 to 50 years). The mean volume of the prosthesis was approximately 335 mL (range = 300 to 480 mL). Nine patients (90%) had saline implants, and the other patient had silicone implants. Interestingly, most patients had had multiple breast surgeries before the onset of implant migration (and subsequent capsulorrhaphy repair); 6 patients (60%) had more than one prior breast procedure. Inferior displacement of the implant was the most common type of migration, occurring in 8 patients (80%).

Revisional surgery was performed on the entire patient population using a standard capsulorrhaphy procedure reinforced with Gore-Tex, as described earlier. The average time from onset of migration to capsulorrhaphy repair was 3 months. Most of the capsulorrhaphy procedures were performed using a periareolar approach. An inframammary approach was used for those patients in which that approach had been used previously. Two patients (20%) had a relapse, and the remainder had no complications. According to our data, relapses occurred when the migration was inferomedial or when the implants were placed subglandularly. Upon further scrutiny, limited to the subset of inferior and inferolateral migrations, our technique of capsulorrhaphy using Gore-Tex

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**Summary of Patients with Gore-Tex Reinforced Capsulorrhaphies**


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| Age | Ethnicity | Procedures Performed Prior to Capsulorrhaphy            | Type of Migration | Implant Characteristics*                           | Implant Location | Capsulorrhaphy Approach | Postoperative Complications |
|-----|-----------|---|-------------------|--|------------------|-------------------------|-----------------------------|
| 38  | Caucasian | Breast augmentation Capsulotomy                         | Inferomedial      | Mentor Siltex Saline 375 mL                        | Subpectoral      | Periareolar             | Relapse                     |
| 50  | Caucasian | Breast augmentation Capsulectomy Reduction/augmentation | Inferolateral     | Allergan Natrelle Silicone-Filled 339 mL           | Subpectoral      | Periareolar             | None                        |
| 39  | Caucasian | Breast augmentation Capsulotomy                         | Inferior          | Mentor Smooth Round Moderate Profile Saline 375 mL | Subpectoral      | Periareolar             | None                        |
| 31  | Caucasian | Breast augmentation Capsulotomy                         | Inferior          | Mentor Smooth Round Moderate Profile 300 mL        | Subpectoral      | Periareolar             | None                        |
| 28  | Caucasian | Breast augmentation Capsulotomy                         | Inferior          | Mentor Smooth Round Moderate Profile 360 mL        | Subpectoral      | Periareolar             | None                        |
| 33  | Caucasian | Breast augmentation                                     | Inferior          | Mentor Smooth Round Moderate Profile 325 mL        | Subpectoral      | Periareolar             | None                        |
| 25  | Caucasian | Breast augmentation                                     | Inferior          | Mentor Smooth Round Moderate Profile 375 mL        | Subglandular     | Periareolar             | Relapse                     |
| 23  | Caucasian | Breast augmentation                                     | Inferior          | Mentor Smooth Round Moderate Profile 375 mL        | Subpectoral      | Periareolar             | None                        |
| 28  | Caucasian | Breast augmentation                                     | Inferior          | McGhan BioCell Textured Saline 420 mL              | Subpectoral      | Inframammary            | None                        |
| 41  | Caucasian | Breast augmentation Capsulectomy                        | Inferior          | McGhan BioCell Textured Saline 480 mL              | Subpectoral      | Inframammary            | None                        |

\*Mentor implants, Mentor Worldwide LLC, Santa Barbara, Calif; Allergan and McGhan implants, Allergan Inc, Irvine, Calif.

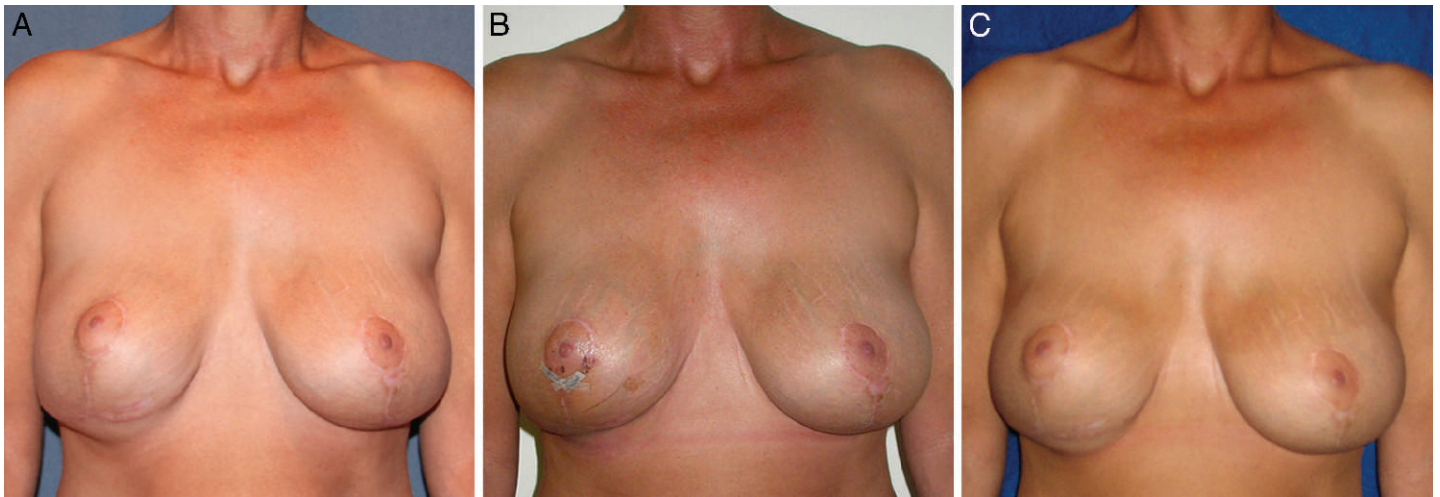
resulted in no postoperative relapse or complications. Infections, seromas, and hematomas were notably absent. There was no evidence of foreign-body reaction to the Gore-Tex. Postoperatively, the breasts maintained an aesthetically pleasing shape and remained in the appropriate anatomic location. Gore-Tex reinforced capsulorrhaphies provided a long-lasting and resilient method of reestablishing the inframammary fold and stabilizing the prosthesis. (See the Table.)

### Discussion

In our experience, implant migration is a relatively uncommon complication after breast procedures. Its incidence is traditionally perceived to be less than that

of other known complications, as evidenced by its relative absence in the literature. Nonetheless, it is a known complication that leaves the surgeon with a challenging reparative endeavor. According to the literature, implant migration occurs in the following descending order: inferolateral (47%), lateral (35%), medial (11%), inferior (4%), and superolateral (4%).<sup>1</sup> In the cases described here, most of our patients ( $n = 8$ ) developed inferior migrations.

Capsulorrhaphies have been used with good success to correct for implant migrations. Capsulorrhaphies take advantage of a naturally occurring fascial layer present in the breast. As previously described by the senior author, the inframammary fold can be thought of as a confluence of fascial tissue contributed by the

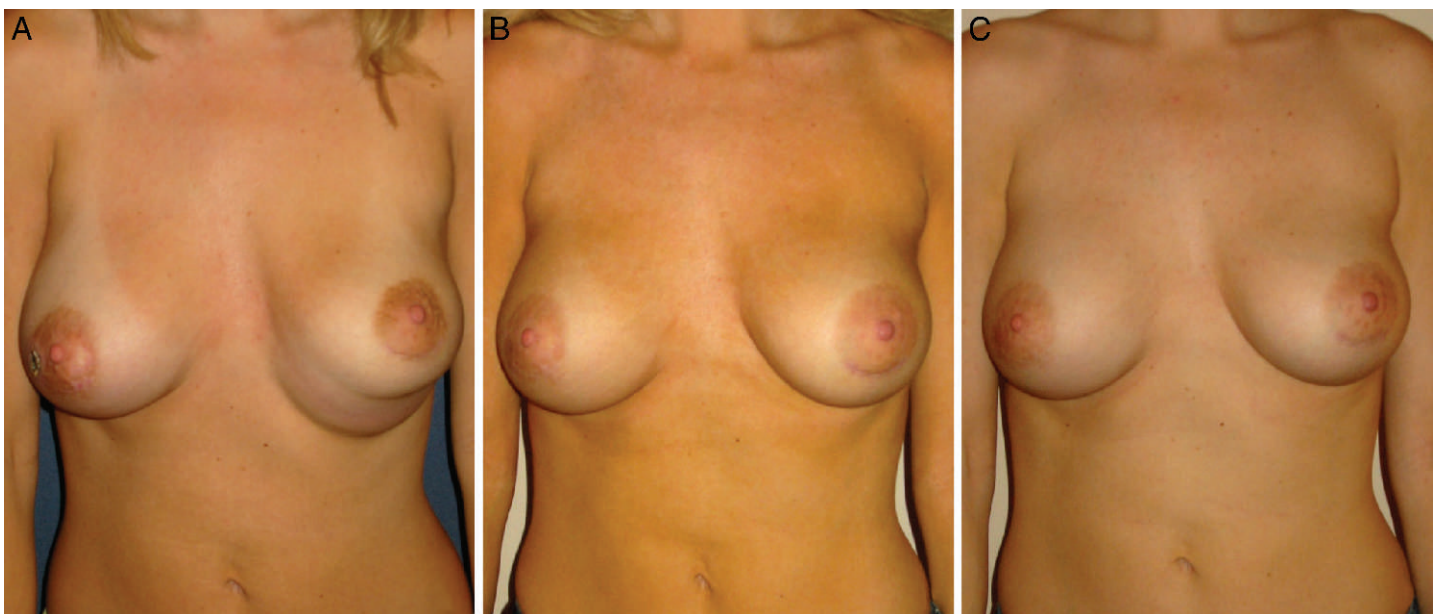


**Figure 2.** Patient with inferolateral displacement of her mammary prosthesis. The patient is a 50-year old woman with inferior and inferolateral migration of her right mammary prosthesis after (A) a reduction-augmentation procedure. (B) The patient at her 1-week follow-up after a reparative capsulorrhaphy procedure. (C) The patient at her 3-month follow-up.

various muscles found regionally: pectoralis major, serratus anterior, rectus abdominus, and external oblique muscles.<sup>7</sup> Our familiarity with this band of tissue arose in large part from our experience with transaxillary procedures performed endoscopically. Examining the inframammary fold from an internal to external vantage point, affords the ability to visualize the confluence of fascia that ultimately creates an inframammary fold and allows for the effectiveness

of capsulorrhaphies. This layer is optimally positioned, offering a relatively nonelastic, tensile-resistant force that can support the tissues. Conversely, substantive violation of this fascial confluence, as may occur with repeated surgeries, will inevitably lead to iatrogenic migration inferiorly and a resultant lowering of the inframammary fold (Figures 2 and 3).

At times, this layer and the adjacent soft tissue are relatively thin and forgiving. In these instances, various



**Figure 3.** Patient with inferior displacement of her mammary prosthesis. The patient is a 31-year-old woman with (A) bottoming-out of her left mammary prosthesis after an augmentation procedure. (B) Her results 3 months after a reparative capsulorrhaphy procedure. (C) The patient after more than 1 year.

solutions have conventionally been proposed, such as reinforcement with multiple rows of sutures, attachment to the periosteal layer of the anterior chest wall, and prolonged postoperative periods of taping. However, once the desired position of the inframammary fold has been obtained, little can be done to enhance its stability. Gore-Tex offers an elegant solution to this dilemma. As in our patients, in whom the breast had succumbed to a bottoming-out effect, Gore-Tex can suitably act to protect the capsulorrhaphy by diverting forces away from the suture line. In this manner, Gore-Tex provides an additional layer of protection and structural reinforcement, which is especially beneficial in thin patients.

Expanded polytetrafluoroethylene, commonly known as Gore-Tex, was first discovered in 1958 in the basement of cofounders Bill and Vieve Gore.<sup>8</sup> It has been used successfully in a variety of applications. Perhaps it is most commonly known for its widespread use in abdominal wall reconstruction and hernia repair, which presents similarities to capsulorrhaphy procedures, at least in terms of mechanics. Gore-Tex is also used in the treatment of atrial septal defects, vascular grafts, biliary disease, and guided tissue regeneration.<sup>8</sup> In the context of capsulorrhaphies, Gore-Tex offers unique properties in that it resists deformation and has adequate tensile strength (16 N/cm) to withstand anatomic forces.<sup>9</sup> It has a porosity of <25  $\mu\text{m}$ , which allows the ingrowth of collagen from the fascia, but compared with other synthetic meshes, ingrowth of larger adjacent tissue is significantly limited.<sup>9</sup> Thus, Gore-Tex is more suitable for the cosmetic procedures of the breast, where significant ingrowth of tissue may distort the anatomy. It is chemically inert, noncarcinogenic, and capable of being sterilized.

Undoubtedly, many factors play a role in the migration of implants. Certainly, multiple surgeries (as pertains to the cases described here) may have been a contributing factor. This may indicate a cumulative weakening effect on the breast soft-tissue envelope. A prosthesis that is overfilled or an exchange to a smaller prosthesis can lead to migration. Particular attention must be given to the diameter of the prosthesis, especially as it relates to anatomically thin, narrow women. Other factors that contribute to breast migration include genetic predisposition, as with various chest-wall deformities (thoracic hypoplasia and pectus excavatum). Capsular contracture can contribute to implant migration. An overzealous surgeon, whose dissection sufficiently weakens the breast pocket, can also be responsible for migration. With our patients, many factors ultimately contributed to the eventual

migration, most notably multiple surgeries, increased prosthetic size and volume, and aging.

Therefore, it is important to appreciate the inherent physical limitations with which the breast envelope can be expanded, and this is primarily based on the principles of elasticity and the anatomic characteristics of the breast. However, it must also be realized that implant migration is largely unpredictable. No matter how meticulous the preoperative assessment, migration can occur. Gore-Tex used as an adjunctive procedure with capsulorrhaphies has demonstrated reliability and durability in the repair of prosthetic migration. It has demonstrated long-lasting, cosmetically acceptable results. The patients have done very well postoperatively and their inframammary fold and prostheses have stabilized. Further complications often associated with the insertion of foreign substances into the body (eg, infections, foreign-body reactions, extrusion) have been nonexistent. Again, many factors contribute to implant migration, and Gore-Tex offers a viable solution to this complication. With Gore-Tex, it becomes possible to structurally reinforce those areas that are susceptible to implant migration.

### Conclusion

We have presented a case series of 10 patients who experienced migration of their mammary prostheses. Many factors ultimately contributed to the complication, including multiple prior surgeries, increased prosthetic size, and aging. Taking advantage of the unique structural and physical properties of Gore-Tex, reinforced capsulorrhaphies were performed, thereby restoring the inframammary fold and implants to a more cosmetically desirable position. Our patients continue to have long-lasting and stable results, as much as 5 years after revisional surgery. Undoubtedly, prosthetic migration will continue to be prevalent as a complication of breast surgeries, and in those cases in which additional stability is warranted, the adjunctive use of a Gore-Tex synthetic mesh can yield excellent results.

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