

A New Technique for Breast Pocket Adjustment: Argon Beam Thermal Capsulorrhaphy

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Summary: Implant malposition remains one of the main complications of aesthetic breast augmentation and alloplastic breast reconstruction with expanders and implants. Many capsulorrhaphy techniques have been described to adjust the breast pocket and correct the malposition. In this study, we tested the efficacy of the argon beam coagulator (ABC) for lateral capsulorrhaphy on breast reconstruction patients at the time of expander replacement with a permanent implant. We also experimentally compared the effects of the ABC and the standard electrocautery on fragments of healthy breast capsule. We noted a 69.5% capsule shrinkage with the ABC versus 46.8% with the standard electrocautery. We concluded that breast capsulorrhaphy using the ABC is a safe and efficient technique for the correction of breast implant malposition in both reconstructive and aesthetic breast surgery. (*Plast Reconstr Surg Glob Open* 2022;10:e4437; doi: [10.1097/GOX.0000000000004437](https://doi.org/10.1097/GOX.0000000000004437); Published online 25 July 2022.)

INTRODUCTION

Implant malposition remains one of the leading causes of reoperation following aesthetic breast augmentation and alloplastic breast reconstruction with expanders and implants.¹ Although there are many factors responsible for a malposition, the main issue is a problem with the pocket that is too small, too large, or in a wrong position for a selected breast implant.² Many techniques have been described to correct an implant malposition, including capsular flaps, suture capsulorrhaphy, and the use of acellular dermal matrix or surgical mesh to adjust the pocket. However, these modalities are time-consuming and technically challenging, with unreliable long-term results.³ The “popcorn capsulorrhaphy” was first described by Randquist and Cohen⁴ in 2009, and then modified and adapted by Calobrace et al³ in 2018. It is a highly efficient technique that utilizes thermal energy to shrink and tighten an oversized breast pocket.³ In alloplastic breast reconstruction using expanders and implants, even when the expander is properly placed and fixed with sutures to the thoracic wall, some degree of lateral displacement may occur due to the lateralizing forces of repeated pectoralis contractions.^{5,6} Adjustment of this laterally overstretched

pocket at the stage of expander replacement with a permanent implant is one of the most important elements to a successful breast reconstruction.⁷ However, management of an oversized and/or malpositioned breast pocket in aesthetic or reconstructive surgery can be unpredictable and technically demanding.⁸ In this article, we describe the use of the argon beam coagulator (ABC) for thermal shrinking of the breast capsule. The ABC has been successfully used in many surgical fields to control hemostasis on raw bleeding surfaces, such as pressure sores, traumatic injuries, burns, and hepatic resections.^{9,10} We tested this technique on breast reconstruction patients for correcting laterally overstretched breast pockets at the time of expander replacement with a permanent prosthesis.

MATERIALS AND METHODS

Comparison of ABC Versus Electrocautery

To experimentally compare the effects of argon thermocoagulation and standard thermal coagulation on the breast capsule, we used a fragment of healthy capsule that we equally split into two halves of similar dimensions. One half (capsule A) was shrunk using the ABC set at a power of 30 watts and a flow of 4.0 standard liter per minute (slpm), while the other half (capsule B) was treated with standard electrocautery in spray mode and a power of 60 watts. (See Video 1 [online], which displays experimental ex-vivo capsulorrhaphy using standard electrocautery

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versus argon beam coagulation.) Pretreatment and post-treatment photographs of the capsule fragments were taken. The pretreatment and posttreatment areas of each fragment were then measured and compared using the ImageJ software.

Surgical Technique

Breast landmarks are first marked, including the chest midline, the paramedian breast fold, the malpositioned lateral breast border, the planned new lateral border, and the inframammary fold. Under general anesthesia, the expander is removed through a 6-cm inframammary incision. An appropriate round, smooth breast implant is chosen based on the volume of the expander, the breast diameter, and the patient desires. A capsulotomy is performed circumferentially except laterally, at the level of the thermal capsulorrhaphy. The sizer of the definitive implant is inserted into the breast pocket. A crescent representing the desired medial shift of the implant is marked on the lateral breast skin. The width of the crescent is measured, and a second crescent with a width twice larger is marked on the breast capsule. This corresponds to the area of argon beam thermal capsulorrhaphy. The ABC (ConMed HelixAR) is set at a power of 30 watts and a flow of 4.0 slpm, and the capsulorrhaphy is performed until the marked area is completely coagulated and shrunken. (See figure, Supplemental Digital Content 1, which shows the jet of argon gas inducing noncontact thermocoagulation on the breast capsule, <http://links.lww.com/PRSGO/C97>). This takes approximately 2–3 minutes depending on the area to treat. The sizer is then inserted, and the shape of the breast is assessed. If needed, additional breast capsule can be thermocoagulated to achieve supplementary medial shift of the implant. No reinforcing suture is used. Once the desired capsulorrhaphy is completed, the breast pocket is irrigated with triple antibiotic solution, and the definitive implant is inserted.

RESULTS

Comparison of ABC Versus Electrocautery

The pretreatment areas of capsules A and B were 22.6 cm² and 22.2 cm², respectively. The posttreatment

Takeaways

Question: Is there a simple way to adapt the implant capsular pocket size?

Findings: Argon could be a useful tool in our panoply of tools.

Meaning: Concluded that breast capsulorrhaphy using the argon beam coagulator is a safe and efficient technique for the correction of breast implant malposition in both reconstructive and aesthetic breast surgery.

area of capsule A was 6.9 cm² versus 11.8 cm² for capsule B. This represents a 69.5% shrinkage for capsule A versus 46.8% for capsule B.

ABC Capsulorrhaphy

This technique was used on six patients between November 2020 and January of 2021 with an average follow-up of 11 months. The results have been consistently good (Figs. 1 and 2). No complications or recurrences have been identified.

DISCUSSION

To our knowledge, this is the first report on the efficacy of the ABC in breast capsulorrhaphy. Adjusting the breast pocket in revision breast surgery or breast reconstruction surgery is crucial to achieve the best outcome. Numerous factors can lead to breast implant malposition, including poor-quality skin envelope, musculoskeletal abnormalities (pectus excavatum or carinatum), a strong pectoralis major muscle, failure to repair the inframammary fold at the time of the breast augmentation, or an inappropriately dissected pocket. In alloplastic breast reconstruction, superior expander malposition is common with total submuscular placement. Lateral displacement may also occur due to the lateralizing forces of repeated pectoralis contractions. Recently, surgical techniques using tissue engineering and scaffolds,¹¹ omental flaps,¹² and meshes¹³ have been described to decrease the rate of implant malposition. The use of an inguinal hernia mesh in alloplastic breast

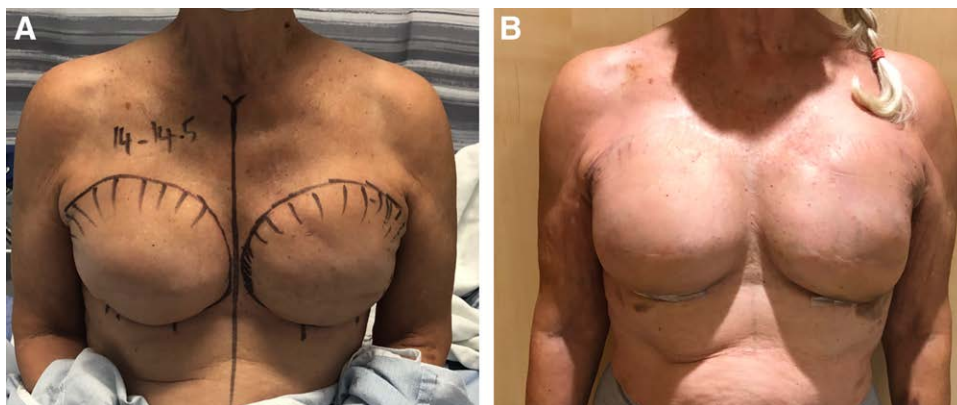


Fig. 1. Results of a bilateral breast capsulorrhaphy. Note the correction of the anterior axillary line and the medial displacement of the breast implants. A, Preoperative markings. B, Postoperative results.

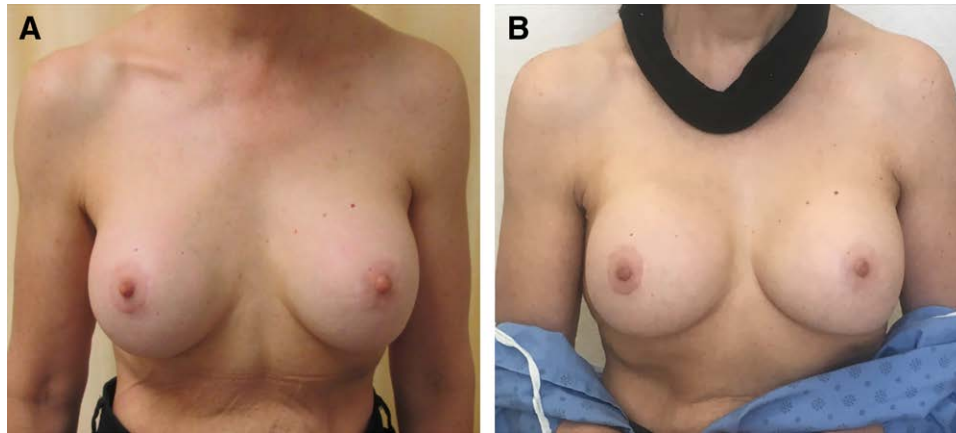


Fig. 2. Results of a revision breast augmentation with bilateral implant exchange and lateral capsulorrhaphy. Note the medial displacement of the implants (A) and the improvement of the breast cleavage (B).

reconstruction is associated with an implant malposition rate of 1.3%.¹³

Spear first described breast capsulorrhaphy using a multilayered suture line with either absorbable or non-absorbable sutures. However, suture placement has some disadvantages. First, suture placement can be challenging as it is difficult to determine the exact suture placement site. Second, passing the needle multiple times through a fragile capsule can weaken or tear the capsule. Third, these sutures can cause dimples along the new lateral breast border.

Thermal capsulorrhaphy techniques where the electrocautery tip is directly applied to the capsule to shrink it have also been used to treat oversized breast capsules. However, these techniques can cause serious skin burns. In the popcorn technique described by Calobrace et al,³ the heating energy is transmitted through the forceps directly to the breast capsule minimizing the risk of skin burns. The popcorn capsulorrhaphy is considered the “gold standard” technique by many plastic surgeons for the management of implant malposition. The recurrence rate after popcorn capsulorrhaphy is 4.8%. We described in this article a similar technique that uses the ABC to shrink the breast capsule. The ABC is a noncontact monopolar electrosurgical technique using high-frequency current directed to target tissues through ionized argon gas. This electrical energy applied to the tissue surface results in superficial coagulation and desiccation causing direct tissue shrinkage.¹⁴ As opposed to thermal capsulorrhaphy using conventional monopolar energy, the penetration depth of the ABC is limited to 1–2 mm, and the risk of underlying tissue necrosis is low. The zone of desiccation caused by the ABC inhibits further electrical conductivity and limits the depth of coagulation so that the ABC effect is self-limiting.^{15,16} Thus, the ABC is safe even in inexperienced hands and has good visibility of the argon flow at the tip of the probe, making it easy to use through small breast incisions.

CONCLUSIONS

Breast capsulorrhaphy using the ABC is a safe and efficient technique for the correction of breast implant

malposition in both reconstructive and aesthetic breast surgery. However, future adequately designed randomized controlled trials are warranted to compare different capsulorrhaphy techniques.

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