

Endoscopic CO₂ Laser-Assisted Capsulotomy (Minimally Invasive Method for Treatment of Capsular Contracture)

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Abstract

Introduction: Capsular contracture is a common problem which cosmetic/plastic surgeons and their patients face on daily basis. Capsular formation is part of the body's natural response to form a layer of scar tissue around a breast implant as it heals. This scar tissue is referred to as the capsule. When the capsule begins to contract, however, it creates pressure on the implant, causing pain, hardening of the breast, and distortion of the breast shape. This can happen to one or both breasts. Several procedures are currently available for treatment of capsular contracture. However, like any surgical procedure they all carry a risk of morbidity. This retrospective study looks at the effectiveness and overall patient satisfaction with the endoscopic laser-assisted capsulotomy, and suggests that it is a safe and effective method of treating capsular contracture, while minimizing morbidity and scarring, at the same time allowing patients to return to their daily activities almost immediately post procedure.

Materials and Methods: As previously described by Dr. Perenack¹ (former fellow of the senior surgeon) the endoscopic, laser-assisted capsulotomy has been utilized by the senior author for 15 years. We present our experience with 56 patients over a 7-year period. The operation is performed through a small (5mm-7mm) periareolar access incision into the capsule, followed by horizontal and radial release of the capsular contracture utilizing a CO₂ laser visualized with a 4 mm endoscope with a specialized sleeve designed and built by the senior surgeon. Each patient was assessed by the senior surgeon both pre- and post-operatively. Capsular contracture was graded based on Baker's classification method. Procedure was performed on patients with silicone and saline implants. Not all patients in the study had undergone breast augmentation in our center. Postoperative complications as well as patient satisfaction were also noted.

Results: Of 56 patients in the study, 6 (10.7%) were excluded. Two of the 6 patients had prior radiation therapy, 1 patient had reconstructive breast surgery for cancer prior to having the implant put in, 2 patients had a deflation three months post procedure and 1 patient had the procedure to treat an implant which had not adequately settled.

One out of 50 patients included in the study 1 patient (2%) presented with Baker II capsular contracture, but has been lost to follow up. According to the chart review, the patient was happy with the results post procedure and Baker I score was achieved.

Thirty six out 50 patients (72%) presented initially with a Baker III capsular contracture. Out of 36 patients there were 20 patients (55%) who were lost to follow up and long term result of the procedure could not accurately be established. Out of 16 patients with long term follow-up 6 patients (38%) achieved a score of Baker I and were pleased with the results. Ten patients (62%) experienced improvement initially but recurred shortly after (2-6 months).

Thirteen out of 50 patients (26%) presented initially with a Baker IV capsular contracture. Out of 13 patients 7 (54%) were lost to long term follow up and long term result could not accurately be established. Two out of 6 patients (34%) followed long term achieved a score of Baker I and were pleased with the results. Four patients (66%) recurred shortly after the procedure (2-6 months).

Complications included: one infection post procedure requiring removal of the implant (in the patient who underwent prior radiation therapy and was excluded from the study). Two patients required placement of a drain (both were lost to follow up).

Mean follow-up of patients was 21 months.

Patients and Methods

A retrospective case review was performed on patients who presented at the Facial Plastic and Cosmetic Surgery Center with capsular contracture between April 2001 and August 2007. We utilized Baker classification (Table 1) to evaluate capsular contracture and response to treatment. Included in the study, were patients who had undergone cosmetic augmentation in our center as well as elsewhere. We excluded patients who had prior radiation therapy, reconstructive surgery for breast cancer as well as patients who had the procedure performed to correct position of the implant. Laser –assisted endoscopic capsulotomy was performed on 56 patients. A total of 69 breasts were treated (Table 2). One of the effected breasts (1.5%) presented with Baker II contracture. Forty six (66%) breasts presented with Baker III contracture and 14 (20%) presented with Baker IV capsular contracture. All patients underwent surgical treatment that consisted of laser-assisted endoscopic capsulotomy. The endoscopic instrument was developed by the senior author and consists of a 4-mm, 30 degree commercially available scope in a surrounding sleeve with double stopcocks. The stopcocks allow irrigation when needed to clean the end of the scope. The endoscope and sleeve are fitted into a 2-piece outer sleeve which has been specially fabricated. This outer sleeve has two ports for dual suction and a guide tube for the CO₂ laser wave guide. A hooded end of the sleeve serves to lift the implant away from the laser field and provides a precise aiming point.

This configuration provides for accurate visualization of the capsule, allowing bleeding control and constant monitoring of the location of the implant (see Figures 1 through 3).

The procedure is performed under general anesthesia on outpatient basis. Tumescent infiltration composed of dilute Lidocaine and Epinephrine solution is injected into pericapsular space of the effected breast using a 20 Gage spinal needle. Care is taken not to damage the implant during the injection. This helps to assure hemostasis during surgery and minimize postoperative discomfort.

A 5-mm to 7-mm inferior periareolar incision is made using a blade. The dissection is then carried down to the capsule which is entered using electrocautery. The endoscope is inserted into peri-implant space (see Figure 4) and examination of the implant and capsule is carried out. Examination of the gel implants insures that there is no leak, which would be an indication for implant replacement and contraindication for capsulotomy. As the capsulotomy is carried out, the guard on the end of the instrument protects the implant from laser injury. A CO₂ laser provides the energy source through a delivery tube that fits in one of the sleeves of the instrument. Multiple circumferential incisions are made in the capsule as well as multiple radial cuts to free the implant fully from the constriction of the capsule. The procedure is generally totally bloodless. Hemostasis is rarely necessary but can be done with the laser. Rarely, there is a need for a small silicone drain which is placed in the peri-implant space and removed 1-3 days postoperatively.

After adequate release is obtained the patient's breast is assessed by manual palpation and observation of symmetry to assure complete release of the contracture. This is achieved prior to closure in all patients. In most cases only steristrips are needed to close the incision.

For purposes of this retrospective study, an acceptable outcome was one where Baker score of I was achieved following capsulotomy. A Baker score of III or IV was considered unacceptable. For patients who were lost to follow-up the Baker score was assigned according to the last recorded visit in the chart.

Discussion: Capsular contracture continues to be the most common problem associated with breast augmentation.

The IOM report stated that, for studies involving both silicone gel-filled and saline-filled breast implants, the capsular contracture rates were 36-81% for silicone-gel filled breast implants and 8-41% for saline-filled breast implants.³

Prospective studies of saline-filled breast implants approved by FDA in May 2000 showed rates of grade III or IV capsular contracture of 9% at 3 years and 10-11% at 5 years for augmentation

patients. The same studies showed rates of grade III or IV capsular contracture of 25-30% at 3 years and 29-36% at 5 years for reconstruction patients.⁴

Over the years many methods have been proposed to treat this common problem. Closed capsulotomy technique, proposed by Baker⁵ required significant pressure to be applied on the implant by squeezing, fell out favor due to high risk of implant rupture and hematoma formation and is no longer an approved method of treatment.

Open capsulotomy is another method of treating capsular contracture which involves an incision either in the periareolar or inframammary region. It may either be performed by retracting the implant or explanting it prior to performing the capsulotomy. Sun Y¹⁰ reported 17 out of 26 patients achieving satisfactory results after performing an open capsulotomy and partial capsulectomy through a periareolar incision. The procedure involved excision of a wedge of capsular tissue as well as radial relaxing incisions of the remaining capsule, followed by regular massaging exercise. Sugimoto T¹¹ reported good results in 20 out of 23 patients utilizing similar technique. He suggested radial incisions of the capsule sectioning it into petal flaps and then suturing them to increase volume of the capsule. Spear, Carter and Ganz¹² suggested relocating sub-muscular or sub-glandular implants with capsular contracture to a “dual-plane” or partly sub-pectoral position. They reported 98% success rate after an average 11.5 months follow up in 85 patients. Baran et al.¹³ proposed leaving the capsule intact and repositioning the implant in a new pocket above or below the original capsule. Good results were seen in 19 out of 22 patients after 1 year follow up.

Endoscopy has gained popularity over the years, however, in most cases not for therapeutic purposes but for diagnostic.⁶ Kompatscher⁷ described the endoscopic equipment and technique to perform endoscopic capsulotomy, however he lacked long term follow-up of the patients who underwent the procedure. Herrmann U.⁸ published a report in 1995 describing successful treatment of capsular contracture in 20 patients utilizing endoscopic technique in Germany. L. Yu⁹ from China recently published a report on a small series of patients (11) who underwent a transaxillary, endoscopic partial capsulectomy utilizing a 10mm scope. This procedure, although showed favorable results for 11 patients in this study, with no additional scars on the breast, required ex-plant of the implant prior to performing the procedure and has a short follow-up time of 4-6 months.

Conclusion: To our knowledge, we are one of the few centers in the world performing capsulotomy utilizing endoscopic technique. Because most capsulotomy procedures are performed utilizing an open technique also involve some degree of partial capsulectomy, it is difficult to compare effectiveness of one versus the other. Significant number of our patients have been lost to follow up due to the fact that many treated patients had come from out of state and out of town, however, the available data shows that this is an effective technique in

correcting capsular contracture for many patients, while minimizing complications, scarring and morbidity; allowing patients to return to their daily activities almost immediately post-procedure. Based on the available data we feel that endoscopic capsulotomy is an effective way to treat capsular contracture and we will continue to collect data to more accurately define proper patient population which will best benefit from this procedure.

References:

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Table 1. Baker Classification of Capsular Contracture

Grade 1	None-augmented breast feels as soft as an unoperated one.
Grade 2	Minimal-the breast is less soft and the implant can be palpated but is not visible.
Grade3	Moderate-the breast is more firm, the implant can be palpated easily, and distortion of the breast is present
Grade 4	Severe-the breast is hard, tender and cold. Distortion is marked.

Table 2. Outcomes of Treatment

Initial Baker Grade	Post-Op Baker I	Post-Op Baker II	Post-Op Baker III	Post-Op Baker IV	Lost to Follow-Up
II 1/50 patients (2%)	Na	Na	Na	Na	1 (100%)
III 36/50 patients (72%)	6/16 (38%)		10/16 (62%)		20/36 (55%)
IV 13/50 patients (26%)	2/6 (34%)			4/6 (66%)	7/13 (54%)

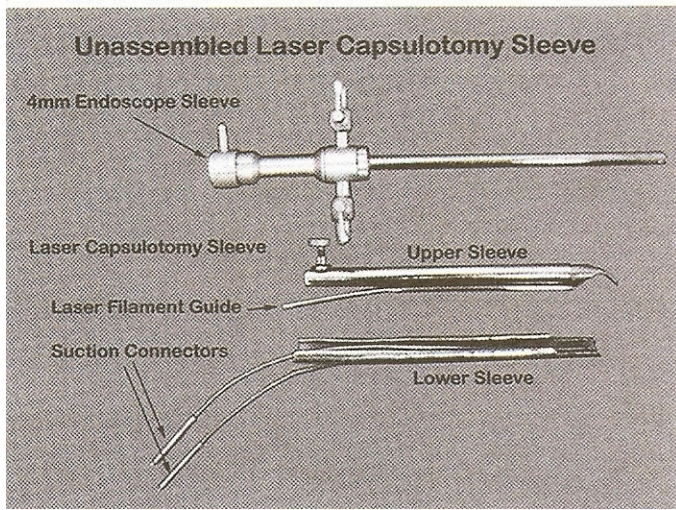


Figure 1

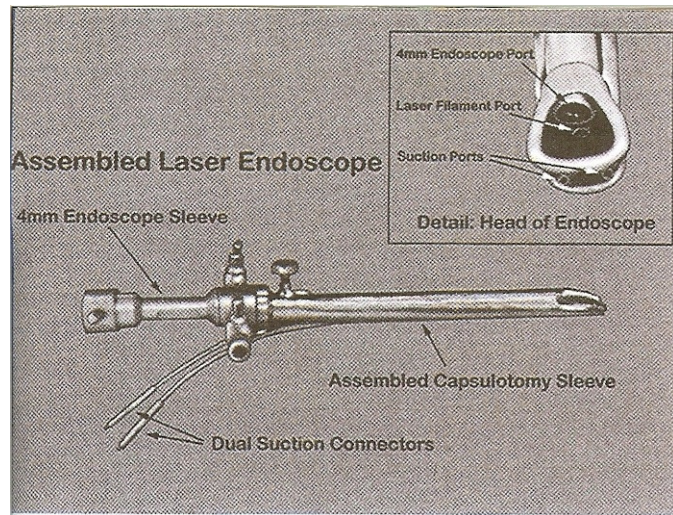


Figure 2

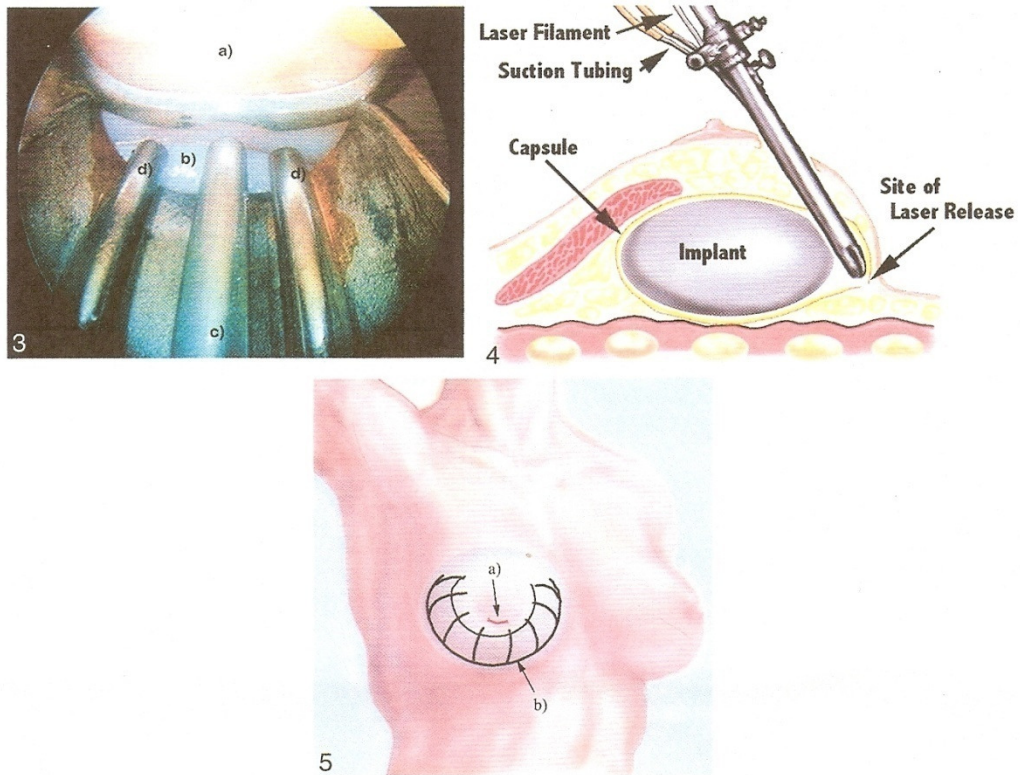


Figure 3. View of implant/capsule interface through endoscope: (a) capsule, (b) implant, (c) laser filament sleeve, and (d) suction tubing.

Figure 4. Endoscope placement in peri-implant space.

Figure 5. Capsulotomy pattern and incision: (a) incision, (b) capsulotomy pattern.