CARBON DIOXIDE LASER MYOMECTOMY

Leonard Weather, Jr., RPH, MD
New Orleans, Louisiana

A technique for carbon dioxide (CO_2) laser myomectomy was used in 32 patients from 1981 to 1984; this technique prevents adhesions and blood loss. To assess the effectiveness of this technique, blood loss in the 32 patients was compared with a group of 10 patients who underwent conventional myomectomy. The initial findings indicated that the CO_2 laser is a propitious surgical instrument for myomectomy and that its use yields less blood loss.

The carbon dioxide (CO_2) laser was discovered in 1961 by Patel working at Bell Laboratories, and has been used in clinical practice since 1972.[1] It can be used to cauterize, vaporize, or excise diseased tissue; it destroys diseased tissue by vaporization of cellular water. This technique has been used for approximately 11 years. The advantages of the technique are: increased precision in destroying abnormal tissue, with preservation of the remaining normal tissue; decreased bleeding; and decreased tissue injury and adhesion formation.[2,3]

This study utilizing the CO_2 laser was initiated because of the advantages presented above and its application to myomectomy and two common problems associated with the procedure, blood loss and adhesion formation.[4]

Dr. Weather is Adjunct Assistant Clinical Professor of Pharmacy and Pharmacology, Xavier University College of Pharmacy, New Orleans, and Instructor, Obstetrics and Gynecology, Tulane University College of Medicine, New Orleans, Louisiana. Requests for reprints should be addressed to Dr. Leonard Weather, Jr., 7820 Chef Menteur Highway, New Orleans, LA 70126.

METHODS

Patient Population

From 1981 through 1984, 32 patients underwent laser myomectomy. Twenty-one patients wished primarily to preserve their reproductive potential; 11 had an average of 6.27 years of infertility and hoped to conceive. The patients' average age at surgery was 31.75. Twelve patients had delivered one or more live infants and the remainder were gravida 0. Although fibroids were diagnosed in all 32 patients, additional abnormalities were present: adhesions (23), endometriosis (24), salpingitis (8), and benign cystic tetratoma (1). Twenty-six patients experienced pelvic symptoms, all 26 had pain, and of these, 12 noted abnormal bleeding. In the infertility group, the average age was 31.81 and eight were gravida 0.

Patient Preparation

On the day prior to surgery, the patient receives ibuprofen 400 mg four times daily, which has been shown to decrease postoperative adhesion formation by inhibiting prostaglandin synthetase, platelet aggregation, and leukocyte migration, and stabilizing lysosomal membranes. This decreases the inflammatory response. Dexamethasone 20 mg

TABLE 1. PROCEDURE FOR CARBON DIOXIDE LASER MYOMECTOMY

Preoperative
Day prior to surgery
Ibuprofen 400 mg orally four times daily for prevention of adhesions
Promethazine 25 mg orally four times daily for prevention of adhesions
Day of surgery
Dexamethasone 20 mg intravenously, 2 to 3 hours prior to surgery for prevention of adhesions
Doxycycline 200 mg intravenously, 2 to 3 hours prior to surgery for prophylaxis against chlamydia
Intraoperative
Carbon dioxide laser power density, 300 to 18,000 watts/cm^2 for vaporization or excision of myomas
Special irrigating solution, heparin 5,000 units, dexamethasone 20 mg, and phenergan 25 mg added to 1,000 mL of lactated Ringer's solution for prevention of adhesions
Vasopressin 1.30 dilution may be injected at the incision site for hemostasis
Hyskon (32% dextran 70), 200 mL placed intraabdominally before closure for prevention of adhesions
Postoperative
Ibuprofen 400 mg orally four times daily for seven days for prevention of adhesions
Promethazine 25 mg orally four times daily for seven days for prevention of adhesions
Dexamethasone 3.0 mg intravenously, then 1.5 mg orally daily for three days for prevention of adhesions
Doxycycline 200 mg intravenously postoperative day 1, then 100 mg orally twice daily for three days for prophylaxis against chlamydia

is given two to three hours prior to surgery to decrease fibrinous adhesion formation and to diminish the potential infiltration of fibroblasts, thereby causing a decrease in fibrous adhesion formation. Promethazine 25 mg is given four times daily, commencing the day prior to surgery to decrease mast cell proliferation, stabilize membranes, and limit tissue inflammation to areas of trauma by inhibiting enzyme release, which damages adjacent cells.[5] Doxycycline, 200 mg, is given two to three hours before surgery as a preventive measure against possible undiagnosed chlamydia infections.[6]

Intraoperatively, the carbon dioxide laser beam is directed to tissue sites by an articulated arm and handpiece with power density from 300 to 18,000 watts/cm^2 for vaporization or excision of myomas. Flammable materials should be excluded from the operative field, and the immediate incision area should be draped with cloth towels moistened with sterile water or saline. Instruments should be ebonized to prevent reflection to vital intraabdominal structures. Rhodium mirrors and quartz rods should be used, the former to reflect the laser beam to inaccessible areas and the latter to act as a backstop for the laser's energy. After opening the abdomen and completing exploration, all packing material is soaked with a special irrigation solution and the abdominal cavity is flooded to protect the surrounding viscera.[2,7] A dilute solution of vasopressin may be injected at the incisional site; no additional hemostatic assistance is needed, such as rubber-shod clamps or tourniquets[8] (Table 1).

Technique of Laser Myomectomy

Seedling myomata may be vaporized without utilization of sutures. The area should be washed with the special irrigation solution and all char removed with moist cotton-tipped applicators. The procedure for removing larger fibroids is virtually bloodless and minimally traumatic to surrounding musculature. The initial incision is traced with a series of 1.0 to 1.5 mm spots and power density of 300 to 400 watts/cm^2. The spots are connected and the serosal surface is incised using a spot size of 0.5 mm and 12,000 to 20,000 watt/cm^2. Next the spot is enlarged, the power is turned down, and the capsule is vaporized. Traction is applied and the capsule disappears. With this procedure, the myoma will rise out of the uterus. The base is cut and the residual portion is vaporized (Figures 1 and 2). The tumor bed is irrigated, and the uterine

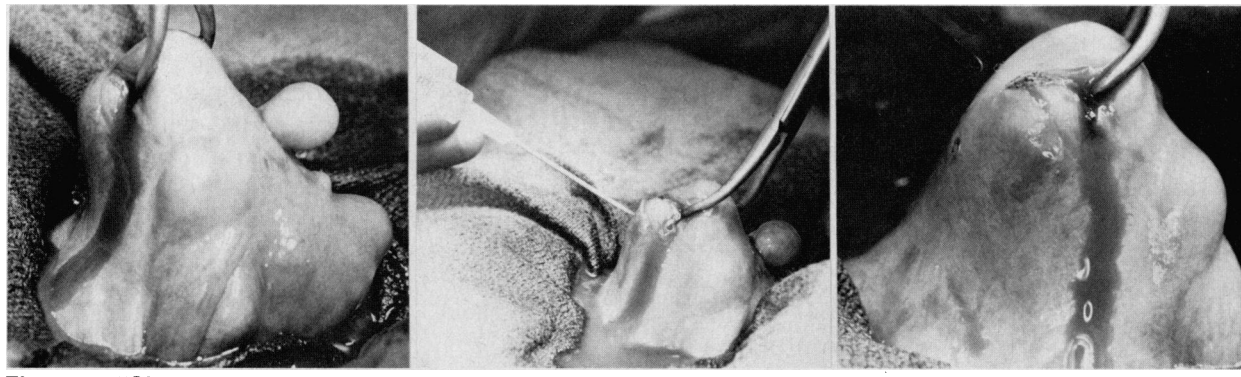

Figure 1. "Sixteen-week" size irregular myomatous uterus (left). Injecting uterine myomas with dilute solution of pitressin (middle); laser vaporization of subserous myoma (right)

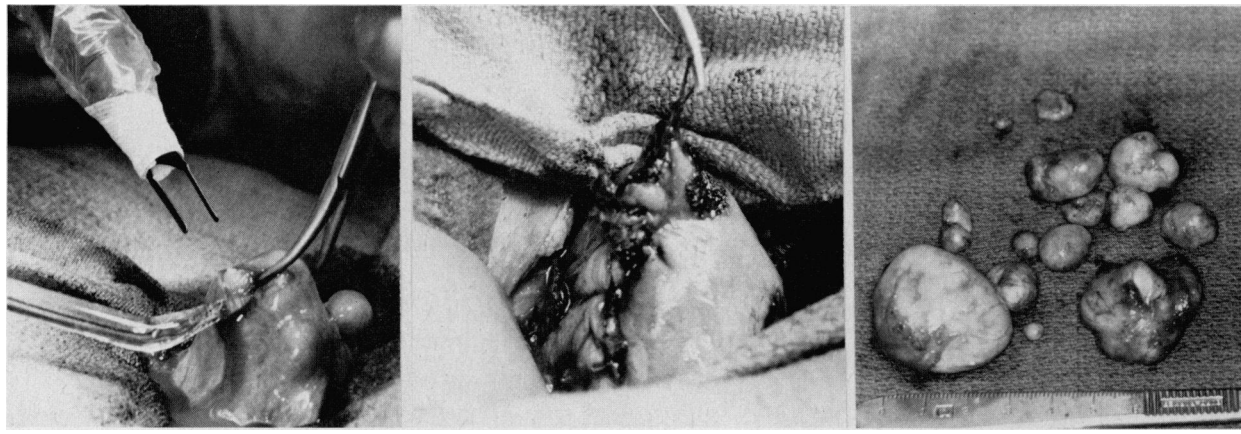

Figure 2. Use of glass rod with laser vaporization of subserous myoma (left). Post-laser excision and vaporization with closure of serosal layer of the uterus (middle). Fibroid tumors excised by laser technique (right)

defect is closed in two layers with 00 chromic catgut. The serosa is approximated with a 0000 subcuticular stitch.[7,8] Prior to closing the abdomen, 200 mL of 32 percent dextran 70 is placed intraabdominally.[9] Postoperatively, dexamethasone, promethazine, ibuprofen, and doxycycline are given.

RESULTS

One hundred fifty fibroids were removed from 32 patients with an average of 4.69 per patient, and 16 patients were noted to have tumors greater than 5 cm.

Of the 11 infertility patients, two delivered live infants, one experienced premature menopause, three had husbands with low sperm counts, and three were lost to follow-up and presumed not pregnant.

Ten cases done with the conventional surgical technique were compared with the carbon dioxide laser technique. Blood loss was estimated by the author, who was the operating surgeon. For conventional myomectomy, 2,650 mL of blood was lost, for an average of 265 mL per patient. With the laser, 5,880 mL was lost from 32 patients, for an average of 183.75 mL per patient.

DISCUSSION

Myomas are the most common benign tumors arising in the pelvic viscera of women. Their incidence is approximately 20 percent in women of reproductive age, and three to nine times higher in black women.[10] In women who have completed their family and who have large, rapidly growing, and significantly symptomatic fibroids, or in women with symptomatic fibroids and severe adnexal disease, hysterectomy may be the treatment of choice. In women desirous of future reproductive function, a conservative surgical approach should be strongly entertained.[11,12] The indications for myomectomy are menorrhagia, metrorrhagia, menometrorrhagia, pressure, pain, pelvic mass, recurrent fetal wastage, and infertility. Whatever the indication, the two major concerns are excessive blood loss and postoperative adhesions.[4,13] Both of these can have a direct bearing on an important indication for the procedure, infertility.

If myoma is the only abnormal finding in a couple's evaluation of infertility, 50 percent of those patients will conceive. In addition, approximately 75 percent will conceive within one year, and up to 82 percent will conceive within $1^1/_2$ years.

Because approximately 50 percent of postmyomectomy patients will conceive, the route of delivery should be addressed. The author advocates vaginal delivery unless the endometrial cavity has been entered or extensive dissection has taken place, which usually involves entrance into the endometrial cavity. However, Beyth and Ohel[14] have described a technique wherein tantalum clips are applied subserosally in the incision at surgery and follow-up hysterography is done in 3 to 6 months to assess the length of the scar and thickness of the uterine wall at the site to determine whether cesarean section should be done.

It should be understood that a large myoma or pelvic-abdominal mass of 12 weeks' gestation or greater can mask an ovarian tumor.[13] In addition, sonography is not always correct. When the patient is desirous of future reproductive function, myomectomy may be the treatment of choice; and carbon dioxide laser myomectomy appears to be the better choice.

CONCLUSIONS

Using the CO_2 laser with proper laser instrumentation and after appropriate laser-surgical training, maximal hemostatis with decreased blood loss and adhesion formation should be realized in patients undergoing myomectomy. If reasonable surgical skill and prudence are exercised, the results of conservative surgery with laser myomectomy should be good.

Literature Cited

1. Bellina J. Infertility surgery and the laser. In: Patton GW, Kistner RW, eds. Atlas of Infertility Surgery. Boston: Little, Brown, 1984, pp 187-188.

2. McLaughlin DS. Metroplasty and myomectomy with CO_2 laser for maximizing the preservation of normal tissue and minimizing blood loss. J Reprod Med 1985; 30:1-9.

3. Sand PK, Bowen LW, Ostergard DR. A primer on laser use in gynecology. Female Patient 1985; 10:91-97.

4. Fayez JA. Uterine factors in fertility. Female Patient 1985; 10:23-24.

5. Stangel JJ, Nisbet JD, Settles H. Formation and prevention of postoperative abdominal adhesions. J Reprod Med 1984; 29:143-154.

6. Stangel JJ, Kwon TH. Pelvic adhesions, Part II: Management and prevention. Female Patient 1984; 9:23-24.

7. Baggish MS. What's current in intra-abdominal laser applications? Cont Ob/Gyn March 1985:78-79.

8. McLaughlin DS. Micro-laser myomectomy technique to enhance reproductive potential: A preliminary report. Lasers Surg Med 1982; 2:109-124.

9. DeCherney AH. Preventing postoperative pelvic adhesions with intraperitoneal treatment. J Reprod Med 1984; 29:157-161.

10. Jones HW, Jones GS. Myoma of the uterus. In: Jones HW, Jones GS, eds. Novak's Textbook of Gynecology. Baltimore: Williams & Wilkins, 1981, pp 427-441.

11. Buttram VC, Reiter RC. Uterine leiomyomata: Etiology, symptomatology, and management. Fertil Steril 1981; 36:433-444.

12. Brooks R, Frederick I. The occasional need for myomectomy. Obstet Gynecol 1979; 53:437-441.

13. Baggish MS. Mesenchymal tumors of the uterus. Clin Obstet Gynecol 1974; 17:51-58.

14. Beyth Y, Ohel G. Postmyomectomy evaluation of uterine scar: A new hysterographic method. Fertil Steril 1983; 39:564-565.