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Videolaseroscopy: A New Modality for the Treatment of Endometriosis and Other Diseases of Reproductive Organs

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INTRODUCTION

RECENT ADVANCES IN ENDOSCOPIC SURGERY have enabled the gynecologic surgeon to treat an increased number of diseases of the reproductive organs through endoscopes with the laser.

Operating directly through the laparoscope has some disadvantages, however, including severe back strain during long procedures. In addition, because only the surgeon can view the operating field, other members of the operating team may become inattentive. To avoid these disadvantages, we have introduced a modality called *videolaseroscopy*. This method is the result of the development and refinement of a new laser videomonitoring technique incorporating the use of a videocamera, videorecorder, and high-resolution videomonitor in conjunction with the laser laparoscope.

Videolaseroscopy permits the surgeon to operate in a more comfortable upright position directly from the videomonitor and thus reduces the fatigue associated with direct visual contact through the laparoscope during long, complicated procedures.

The CO_2 laser is a gas molecular laser that emits light in the infrared range of 10,600 nm. The CO_2 beam is highly absorbed by water in soft tissues up to a depth of 0.1 mm from the point of impact, leaving underlying tissue unharmed and allowing rapid dispersion of heat. Therefore, there is a low risk of thermal damage to underlying or surrounding tissue and vital organs. This characteristic of the CO_2 laser permits thorough treatment of some of the diseases of the reproductive organs, such as endometriosis, permitting ablation of implants and adhesions adjacent to such organs as the ureter, bowels, and blood vessels. Another positive characteristic of the CO_2 laser is its ability to coagulate small blood vessels less than 0.5 mm in diameter.

MATERIALS AND METHODS

In the present study, a total of 311 patients underwent videolaseroscopy for a 12-month period. Of these, 257 patients had endometriosis (stage I to IV/AFS),[1] and 54 patients had other pelvic pathology, such as adhesions or tubal disease.

For the procedures discussed herein, the CO_2 laser was used almost always through the operating channel of the laparoscope via an especially designed coupler by Cabot Medical (Nezhat coupler) or, occasionally, through a specially adapted second puncture trocar.[2] A micromanipulator coupler was attached to the laparoscope or to the second puncture probe.

Fertility and Endocrinology Center, Atlanta, Georgia.

TABLE 1. CLASSIFICATION OF ENDOMETRIOSIS GROUP ACCORDING TO AMERICAN FERTILITY SOCIETY (1979 CLASSIFICATION)

Stage I	58
Stage II	72
Stage III	81
Stage IV	46

TABLE 2. NONENDOMETRIOSIS CASES TREATED BY Co_2 LASER VIDEOLASEROSCOPY

Abdominal and pelvic adhesions with or without hydrosalpinges	35
Hydrosalpinges alone	11
Ectopic pregnancy	8

TABLE 3. PREGNANCY RATE IN 24 MONTHS IN 102 PATIENTS WITH ENDOMETRIOSIS

Stage	*No. of patients*	*No. of pregnancies*	*%*	*Spontaneous abortion*	*%*	*Ectopic pregnancies*
I Mild	24	18	75.1	4	22.0	0
II Moderate	51	32	62.7	4	12.5	0
III Severe	19	12	63	2	17.0	1
IV Extensive	8	6	75.0	1	16.6	0
Total	102	65		11		1

No major complications were reported in any patients undergoing the procedure, and minor complications included those associated with laparoscopic procedures (e.g., incisional pain or shoulder pain secondary to trapped CO_2 gas).

All patients were discharged within 24 hours.

DISCUSSION

The CO_2 laser has been used previously for the treatment of several diseases of the reproductive organs by laparotomy and by laparoscopy.[7-11] Videolaseroscopic treatment of endometriosis and other diseases of the reproductive organs can be relatively simple and inexpensive, especially if it is effected at the same time as diagnostic laparoscopy.

In terms of efficacy of treatment, our study shows favorable results compared to published pregnancy rates for different stages of endometriosis treated by drugs or conservative surgery.[5-11] Of particular interest is the conception rate for patients with endometriosis classified as severe and extensive. Moreover, with this technique, we were able to excise large endometriomas up to 11 cm. In addition to treating endometriosis, we have treated hydrosalpinges and ectopic pregnancies. With the use of videomonitoring systems, we have decreased the operating time and back strain associated with direct laparoscopic visualization.

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The patients referred to our center were from all over the United States and sometimes from foreign countries. This was especially true of patients with stages III and IV/AFS endometriosis who wished to be treated without the long recovery periods associated with laparatomy. The possible need for laparotomy or more extensive additional procedures, such as colostomy or hysterectomy, was discussed preoperatively with the patients, especially those with advanced stages of endometriosis.

Before treating a large endometrioma, careful laparoscopic assessment was made to reduce the chance of draining a pelvic malignancy. The cysts that had the appearance of an endometrioma were first aspirated for cytologic study. Peritoneal washings were also performed if the suspicion of malignancy existed.

The procedures were performed under general endotracheal anesthesia with the patients in the lithotomy position. The bladder was drained, and a cervical cannula was placed for manipulation of the uterus and for intraoperative injection of diluted indigo carmine. Each patient received 1 g intravenously of Mefoxin (Merck, Sharp and Dohme, West Point, PA) at the start of the procedure as a prophylactic single dose. The laparoscopic procedure was performed in a standard, routine manner.

An atraumatic alligator grasping forcep was introduced through the second puncture site for traction or manipulation as needed during surgery. If necessary, a third or fourth incision was made above the pubis bone for the purpose of retraction or manipulation of the pelvic organs.

A focused beam with power densities of 6000 to 18,000 W/cm^2 (0.5 mm spot size at a 15 to 45 W setting) was used to vaporize and cut. Endometriomas up to 14 cm in diameter and any peritubal or periovarian adhesions were treated through the laparoscope with the CO_2 laser.

We have avoided the significant back strain associated with operating directly through the laparoscope by refining videomonitoring techniques. A focused beam was used to vaporize endometriosis implants from the ovary, cul-de-sac, tubes, uterosacral ligaments, pelvic sidewall, bladder flap, and peritoneum or capsule of endometriomas. When the cavity of the endometrioma was opened, the internal wall was examined for excrescent tumor. Large endometriomas were aspirated and irrigated several times with a double-bore needle routinely used for ovum retrieval in in vitro fertilization programs. The endometriomas were then bivalved, and the capsule was dissected and removed when possible. Any residual capsule was then vaporized. Ovarian edges usually collapse like a shell—there is no need to apply sutures. This reduced the possibility that the ablation of the capsule would be incomplete. The capsules of endometriomas may be up to 4 to 5 mm thick, making it difficult and time consuming to vaporize the entire capsule. Pelvic adhesions were dissected and removed. Salpingostomy and fimbrioplasty were performed in the manner previously described.[3] For the conservative management of ectopic pregnancy, an antimesenteric incision was made in the area of the ectopic pregnancy, which was shelled out and removed.

RESULTS

Operating time for these 311 patients ranged from 20 minutes to 2½ hours, according to the stage of endometriosis or severity of the pelvic disease. The procedure was essentially performed on an outpatient basis. However, in a few instances, the patient stayed longer, up to 20 hours after surgery. Tables 1 and 2 detail the classification of patients; 257 patients had endometriosis, and 54 had other pelvic pathology.

Table 3 shows the number of pregnancies in 102 patients who had infertility attributed to endometriosis. Other factors contributing to infertility, for example, male factor or ovulation factors, were eliminated. Of particular interest are the results for severe and extensive endometriosis, which are very favorable in comparison to those obtained with laparotomy and hormonal treatment of endometriosis.[4-8]

None of the patients experienced any postoperative infection, bleeding, or thermal damage secondary to CO_2 laser therapy. In two of the patients with very thick hydrosalpinges, it was difficult to keep the hydrosalpinges patent, and we were not able to evert the tubes open. Thus a minilaparotomy was performed. One patient, following salpingectomy after a ruptured ectopic pregnancy, had uncontrollable bleeding and required a laparotomy.

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The use of the videocamera, videorecorder, and videomonitor in conjunction with laser procedures provided two benefits. Fatigue brought on by long, complicated procedures can be minimized, since the surgeon works in a more comfortable upright posture, working from the monitor rather than by direct eye contact with the scope. Second, a videorecording of the procedure is available for future procedures.

Among the advantages of videolaseroscopy over laparotomy are a faster recovery period and a shorter hospital stay. The formation of postoperative adhesions is probably diminished by minimal handling of the tissue, less exposure to air (thereby reducing secondary dryness of tissue), elimination of glove powder, and suturing of the tissue.

Finally, use of the laser can preclude the formidable complications associated with the use of cautery. The energy of the CO_2 laser is focused very precisely, so that the tissue beyond 100 microns is unaffected. It is a matter of time before up to 95% of laparotomies performed for the conservative management of endometriosis and other benign diseases of the reproductive organs will be avoided—videolaseroscopy is the most probable replacement.

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