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Videolaseroscopy for the treatment of endometriosis associated with infertility

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Recent advances in laparoscopic surgery have enabled the gynecologic surgeon to treat an increased number of diseases of the reproductive organs by using the laser through the laparoscope. This article reviews the results of 243 patients with infertility associated with endometriosis ranging in severity from mild to extensive who were treated by the same surgeon using CO₂ laser laparoscopically with videocamera augmentation and control. Of the 243 infertility patients, 168 (69.1%) achieved pregnancy. The pregnancy rates were 71.8% in 39 patients with stage I disease, 69.8% in 86 patients with stage II disease, 67.2% of 67 patients with stage III disease, and 68.6% in 51 patients with stage IV disease. The life table and two-parameter exponential model were used to calculate monthly fecundity, "cure," and "probability of pregnancy" rates. The results indicate that videolaseroscopic treatment of endometriosis associated with infertility, in surgically experienced hands, is at least as efficacious as other forms of therapy for mild and moderate cases of disease, but appears to be more successful than laparotomy for the more severe and extensive stages of disease. *Fertil Steril* 51:237, 1989

The application of carbon dioxide (CO₂) laser for laparoscopic gynecologic surgery was introduced in 1979 by Bruhat et al.¹ in France and Tadir et al.² in Israel. Since that time, with improved instrumentation and because of the versatility of the CO₂ laser, progressively more complex operative surgical procedures are being performed via laparoscopy for the treatment of a variety of benign pelvic diseases.³⁻¹⁰ Recent reports by several authors strongly support that, in experienced hands, laser laparoscopy is effective in the treatment of infertility and pain associated with mild to severe endometriosis.³⁻¹⁰

In this study, we wish to report our experience with laser laparoscopy and videoaugmentation and

control (videolaseroscopy) in a large number of patients whose infertility was associated with endometriosis, ranging from stage I to stage IV,¹¹ and were treated by the same surgeon with extensive experience in laser endoscopy. Patients with male factor, ovulatory, or hormonal disorders were excluded from this study.

MATERIALS AND METHODS

This study includes 243 patients with infertility associated with endometriosis who were treated by the senior author by videolaseroscopy. Videolaseroscopy involves the use of CO₂ laser through the laparoscope with videocamera augmentation and control.^{4,5} These 243 patients were diagnosed at laparoscopy and appropriately staged according to The American Fertility Society classification scheme.¹¹ All couples underwent a complete infertility evaluation that consisted of medical history, physical examination, hormonal evaluation when indicated, genital cultures, semen analyses, postco-

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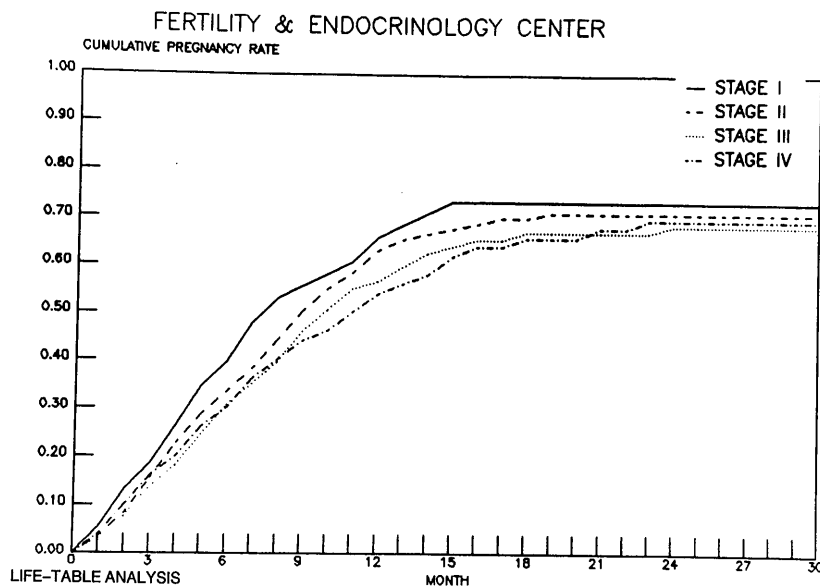


Figure 1 Life-table analysis.

ital tests, endometrial biopsy, and hysterosalpingogram. To adequately assess the efficacy of videolaseroscopy in treating endometriosis-associated infertility, couples with additional infertility factors were excluded from this study. Therefore, the 243 couples reported in this study suffered from infertility with endometriosis as the only noted cause, and were treated only with videolaseroscopy.

Videolaseroscopy was carried out using a Cooper 500Z or 880Z CO₂ laser (Cooper Lasersonics, Santa Clara, CA), and a direct coupler with a 28 cm zinc arsenide lens to focus the beam at the end of the laser laparoscope (Cabot Medical, Langhorne, PA; Wolf Medical Instruments, Rosemont, IL). For rapid and precise dissection and vaporization, maximal power was used in the enhanced superpulse mode. The maximal superpulse mode achieves a 480 W peak instantaneously, and with 1.0 msec pulse widths yields 52 W average power to tissue. Using a measured spot size of 0.9 mm, peak instantaneous power densities range from 32,000 to 65,000 W/sq cm, with average pulse power densities ranging from 3,500 to 7,000 W/sq cm. These power densities were calculated by the physics engineer of Cooper Lasersonics, Inc., Santa Clara, California.

In each procedure, a miniature laparoscope-mounted videocamera with a high resolution videomonitor were employed so that the surgical procedures could be carried out in the more comfortable upright position, looking at the intraperitoneal field on the videomonitor.⁴ All procedures were vid-

eorecorded to retain a permanent record on each patient. Multiple abdominal punctures were made to carry out the delicate and complex dissection of the pelvic organs, excision of endometrioma(s), vaporization and dissection of implants and adhesions.^{4,12}

After all identifiable implants, scars, and cysts of endometriosis were removed, and if the tubes had not been proven to be patent by preoperative hysterosalpingogram, the patency of the tubes was confirmed by chromotubation with indigo carmine. To minimize postoperative adhesion formation, sutures were never used.¹³ Patients were routinely discharged within 24 hours of the operative procedure.

Patient follow-ups included office surveys, telephone follow-up, and contacting the referring physician.

To calculate the cumulative probability of pregnancy, the life-table analysis was used¹⁴ (Figure 1), and the Monthly Fecundity Rates were calculated and analyzed by the methods of Cramer et al.¹⁵ One-way analysis of variance using the Student's *t*-test was used for statistical analysis. The two-parameter exponential model was used to calculate "cure" and "monthly probability of pregnancy" rates by stages of the disease.

RESULTS

Table 1 represents the demographic characteristics of the patients by different stages. There was

Table 1 Endometriosis Patients by Stage of Disease and Pregnancy Rates

	All patients	Stage I	Stage II	Stage III	Stage IV ^a
No.	243	39	86	67	51
Age ^b	29.4 ± 4.1	26.8 ± 2.2	27.6 ± 2.4	30.5 ± 1.9	31.5 ± 4.1
Years infertile ^b	3.6 ± 1.9	3.3 ± 1.9	3.6 ± 2.1	3.8 ± 1.2	3.6 ± 2.0
Pregnant	168 (69.1%)	28 (71.8%)	60 (69.8%)	45 (67.2%)	35 (68.6%)

^a The American Fertility Society: Classification of Endometriosis.¹¹

^b 95% confidence limit.

no significant difference, at 95% confidence limit, between the four groups in the age of the patients nor the duration of infertility. Pregnancy rates for all patients was 69.1%, with a range from 67.2% for stage III disease to 71.8% for stage I disease. The monthly fecundity rates were 6.5% for stage I, 6.7% for stage II, 5.7% for stage III, and 5.6% for stage IV. The rate for all patients was 5.9%, and there was no significant difference between the stages (Figure 1).

Infertility cure rates as derived from the two-parameter model were 82.2% for stage I, 78.6% for stage II, 77.1% for stage III, and 73.7% for stage IV. This gives a cure rate for all patients of 74.7%. The monthly probability of pregnancy as derived from the two-parameter model was 12.6% for stage I, 11.9% for stage II, 11.0% for stage III, and 12.8% for stage IV. The overall rate was 14.6%. Again, there were no significant differences between the various stages of disease, which is unlike previous reports from laparotomy studies,^{16,17} but in accordance with the data reported by Olive and Martin,³ using laser laparoscopy.

DISCUSSION

During the past several years, the senior author, who performed all of the surgical procedures in the patients in this report, has acquired experience with videolaseroscopy and has developed a technique that allows him to thoroughly treat even the most advanced cases of endometriosis and other pelvic diseases. We first reported on endoscopic treatment of mild to extensive endometriosis with good results in 1986.⁴ In that report, the number of patients with severe endometriosis was too small to make definite conclusions. This report of a larger group of patients confirms and strengthens the findings of the previous one. Our results compare very favorably with previous publications on the pregnancy rates after either surgery^{16,17} or hormonal management of endometriosis¹⁸ for all stages of disease. Indeed, for severe stages of dis-

ease, our pregnancy rates appeared to be much better than those reported after laparotomy. It is possible that these better results may be attributed to the fact that our patients did not have other contributing infertility factors. However, it is quite possible that in experienced hands, laser endoscopic surgery may be precise enough to thoroughly ablate the disease and the adhesions associated with endometriosis, leaving the reproductive organs relatively intact. In all of our cases, bleeding was minimal and always well controlled without laparotomy. All visible disease and scars were thoroughly removed, restoring essentially normal anatomic relations of all pelvic organs. Laser endoscopy for the treatment of endometriosis is becoming more and more popular.^{3-10,19-21} This study demonstrates that videolaseroscopy is well suited for all stages of endometriosis. Therefore, when all identifiable endometriosis is removed with laser endoscopy, near normal reproductive functions may be expected, regardless of the stage of disease.

The results obtained from this study support previous publications by several investigators, including ourselves,^{3-10,21} that laser laparoscopy for treatment of infertility associated with endometriosis is at least as efficacious as other forms of therapy for mild to moderate disease, and appears to be much more successful for more severe stages of disease in experienced hands. As pointed out by DeCherney,²² this kind of experience is neither created nor developed overnight. Instead, it requires planning a long and slow learning process, anticipating long laparoscopies (2 to 3 hours), and using increased awareness and care. Endoscopic surgery will continue to make profound changes in the field of reproductive surgery. Indeed, if results similar to ours are obtained by other reproductive endoscopic surgeons, the obituary of laparotomy as written by DeCherney²² soon will be published.

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