

The Treatment of Mild Endometriosis With Laser Laparoscopy: a Two-step Treatment Analysis of Patients Whose Primary Therapy Was Successful

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ABSTRACT

Objectives: The most advantageous treatment for pelvic endometriosis that is not extensive has long been the subject of debate. In recent years, the ability to detect atypical presentations has allowed the gynecological surgeon to treat this entity more readily. The treatment in the past has been concerned with the singular treatment being applied at the time, not on the prior treatment effects on current therapy. The purpose of the current study was to see whether previous successful treatment modalities affected the success of subsequent laparoscopic laser fulguration treatment of endometriosis.

Methods: Patients who were previously treated for their endometriosis (minimal and mild) and had success in achieving pregnancy were treated for their disease after failing to become pregnant after delivery. They were treated with laparoscopic laser fulguration of the disease and the results were examined by chi-square (χ^2) analysis.

Results: There appears to be no difference in current pregnancy rates in patients who were successfully treated in the original treatment for endometriosis, no matter which of the therapies had been used.

Conclusion: If endometriosis is diagnosed at the time of laparoscopy and is easily amenable to treatment, it should be treated at the time of surgery regardless of prior treatment and results.

Key Words: Endometriosis, Infertility, Laparoscopy, CO₂ laser.

INTRODUCTION

Endometriosis is a common, chronic, progressive, and enigmatic disease involving women in their reproductive years. Since endometriosis was first described, its pathogenesis and treatment options had been debated.¹⁻⁶ Endometriosis is characterized by the occurrence of endometrial glands and stroma outside the uterine cavity. The development of endometriosis is multi-factorial, and regardless of the mechanism, some believe that adhesion formation is an important step in establishment of this disorder leading to fertility problems.⁷

A patient with this disease may have no symptoms, infertility, severe pelvic pain, dysmenorrhea, chronic pelvic pain, dyspareunia, dyschezia, or dysuria. For a long time, understanding and practicing the ideal treatment for a patient with endometriosis has been difficult, as there have been many conflicting ideas expressed in the literature. Since the early part of the twentieth century, diagnosis and treatment have changed dramatically. For many years, diagnosis was based on findings at laparotomy secondary to surgery for marked symptomatology of the disease or an ancillary finding during surgery necessitated by other unrelated problems. With the advent and popularization of laparoscopy, the diagnosis of endometriosis has been simplified for both patients with infertility and the diagnosis and symptomatology secondary to the disease. The ability to detect atypical presentations of endometriosis has allowed the gynecological surgeon to treat even subtle degrees of this entity more successfully. For the patient with uncomfortable symptomatology, recent advances have allowed expectant, medical, and surgical treatment of this problem.⁸⁻³²

For patients who are desirous of enhancing their fertility potential, many different treatments are available. However, the optimal treatment to be performed by the gynecologist has remained a perplexing question whose answer has not become evident. Numerous studies in the literature have looked at different treatment modes involving treatment of infertility related to endometriosis. These include expectant management,⁸⁻¹³ medical therapy,^{11,13-15} surgical extirpation^{9-10,16-32} and newer treatments including utilizing immuno-modulators and aromatase inhibitors.³³ The best primary treatment of minimal

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and mild endometriosis in individuals attempting to achieve a pregnancy remains controversial, but surgical treatment is advocated by some.^{34,35} It has been demonstrated that surgical treatment of endometriosis appears superior to other treatment forms,^{29-32,35} and the use of laser ablation may provide a higher pregnancy success rate than laparoscopic cauterization. Therefore, the use of laser laparoscopy for treatment of infertile women with endometriosis was used as the standard treatment for this series. This study looked into previous treatment modalities that were successful after the diagnosis and treatment of endometriosis but, after delivery and then desiring another pregnancy, these patients were not able to become pregnant because of recurrent endometriosis. The success and failures of these individuals were explored to see whether the factors of previous treatment, although successful, contributed to changing or predicting the outcome of these patients desiring pregnancy.

METHODS

Patient Population

The patients were from the group of subjects from the previously reported study involving a singular treatment regimen,³² which had reported patients treated for endometriosis for their infertility with no other known predisposing factors to cause their inability to become pregnant. Three study populations were included in the study. The first comprised 142 patients who had previously become pregnant after treatment of their endometriosis (treated by expectant management, medical treatment, laparoscopic cauterization of the endometriosis, laparotomy with excision of the endometriosis, and laparoscopic laser fulguration of the endometriotic lesions), but subsequently were unable to become pregnant and were found to have recurrent endometriosis. They were then treated by laparoscopic laser fulguration of the disease. The second comprised 215 patients who had previously been treated for their endometriosis (previously treated by expectant management, medical treatment, laparoscopic cauterization of the endometriosis, laparotomy with excision of the endometriosis and laparoscopic laser fulguration of the endometriotic lesions) and had failed to achieve a pregnancy then had a laparoscopy and the endometriosis that was found was treated with laparoscopic laser fulguration of the lesions. The third comprised 120 patients with endometriosis as the only predisposing factor for their inability to achieve a pregnancy who were treated with laparoscopic laser fulguration of the endometriosis.

Statistical Analysis

A Fisher-Irwin Exact Test (Fisher χ^2 test) at the 5% significance level was utilized for the comparison between the groups for statistical purposes. The work was divided into 3 distinct studies.

Study I.

This study used a Fisher-Irwin exact test between treatment groups. These groups had originally been successful in a therapy (either expectant, medical, laparoscopic cauterization, laparotomy, or laparoscopic laser fulguration of the endometriosis), and after delivery of a baby the couples attempted pregnancy for at least 18 months (18 to 36 months). They were not successful in achieving a pregnancy and subsequently had a laparoscopy with CO₂ laser fulguration performed for treatment of their endometriosis. The groups consisted of: 1.) **S_e** - patients who had succeeded expectantly but after delivery of that baby failed to become pregnant again; they were then treated with laparoscopic laser fulguration of the endometriosis; 2.) **S_m** - patients who had succeeded in becoming pregnant after medical treatment but after delivery failed to become pregnant and were then treated with laparoscopic laser fulguration of the endometriosis; 3.) **S_c** - patients who had become pregnant after cauterization treatment and delivered a baby but were unable to subsequently achieve a pregnancy afterwards and were then treated with laparoscopic laser fulguration of endometriosis; 4.) **S_p** - patients who had become pregnant after treatment of their endometriosis with laparotomy but failed to become pregnant again and were then treated with laser laparoscopy; and 5.) **S_l** - patients who had been successful with laparoscopic laser fulguration as the treatment of their endometriosis originally but after delivery they failed to achieve a pregnancy and were then treated with laparoscopic laser fulguration. The comparisons between the groups were:

- 1.1 **S_e** vs. **S_m** 1.5 **S_m** vs. **S_c** 1.8 **S_c** vs. **S_p** 1.10 **S_p** vs. **S_l**
- 1.2 **S_e** vs. **S_c** 1.6 **S_m** vs. **S_p** 1.9 **S_c** vs. **S_l**
- 1.3 **S_e** vs. **S_p** 1.7 **S_m** vs. **S_l**
- 1.4 **S_e** vs. **S_l**

Study II.

This study used the Fisher-Irwin exact test to compare the following 2 groups: 1.) **L_e - L_l** - the first groups consisted of individuals that failed in one treatment (**L_e** [expectant], **L_m** [medical therapy], **L_p** [laparotomy], **L_l** [laparoscopy])

and were then treated with laparoscopic laser fulguration; 2.) $S_e - S_1$ - the second group consisted of those in the same groups of patients who had become pregnant with those treatment modalities, but who, after delivery and failure to achieve a pregnancy by 18 months (18 to 36 months), had laparoscopic laser fulguration performed to ablate the endometriosis.

Comparisons between 2 treatment conditions as follows:

2.1 L_e vs. S_e 2.2 L_m vs. S_m

2.3 L_e vs. S_c 2.4 L_p vs. S_p

2.5 L_1 vs. S_1

Study III.

This group of patients involved 2 classes of individuals with endometriosis: (1) patients who were previously successful in one therapy and after delivery were unable to become pregnant a second time (18 to 36 months). They then required treatment by laparoscopic laser fulguration. S_e -patients treated successfully expectantly but failed to become pregnant again and were then treated with laparoscopic laser fulguration of the endometriosis; S_m -patients successfully treated medically but after delivery they failed to become pregnant again and were then treated with laparoscopic laser fulguration; S_c -patients who became pregnant after treatment with laparoscopic cautery and after delivery of a baby subsequently failed to become pregnant again, and they were then treated with laparoscopic laser fulguration of endometriosis; S_p -patients who had been successful at achieving pregnancy with treatment during laparotomy but failed to become pregnant again after deliver and were then treated laparoscopically with laser fulguration; and (2) patients treated laparoscopically with laser fulguration only - **L**. A Fisher-Irwin exact test was used. The comparisons between the 2 treatment conditions were:

3.1 S_e vs. **L** 3.2 S_m vs. **L**

3.3 S_c vs. **L** 3.4 S_p vs. **L**.

RESULTS

Study I.

No differences were noted in the success level among the 5 groups (expectant treatment, medical therapy, laparoscopic cautery treatment, and laparotomy for excision of endometriosis, and laparoscopic laser fulguration) unable to achieve pregnancy and subsequently treated by lapa-

roscopy with CO₂ laser fulguration to achieve a pregnancy (**Tables 1 and 2**).

Study II.

The group of patients who failed to achieve a pregnancy in 1 treatment course (expectant, medical, laparoscopic cautery and laparotomy excision) and were then successful with laparoscopic laser fulguration therapy demonstrated no difference between those patients treated by the same therapies who attempted pregnancy at least one year after delivery and after being unsuccessful, had laser fulguration by laparoscopy and subsequently became pregnant. There was, however, a significant difference in the pregnancy rate between the group that was first unsuccessful with treating the endometriosis by laparoscopy using the CO₂ laser and became pregnant after a second laser fulguration by laparoscopy compared with patients who were unable to become pregnant after delivery after successful treatment of their infertility secondary to endometriosis by laparoscopy with laser and were then treated with an additional laser fulguration via a laparoscopic procedure after 18 to 36 months of not achieving a spontaneous pregnancy secondary to endometriosis (**Tables 3 and 4**).

Table 1.

Results of Treating Mild and Moderate Endometriosis With No Other Predisposing Factors Associated With the Infertility

Conditions*	No. of Patients†	No. of Pregnancies	No. of Non-Pregnancies
S_e	23	20	3
S_m	26	22	4
S_c	32	27	5
S_p	17	13	4
S_1	44	37	7

* S_e = Patients successful expectantly but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_m = Patients successful medically but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_c = Patients successful with cautery but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_p = Patients successful with laparotomy but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_1 = Patients succeeded with laparoscopic laser fulguration, but failed to become pregnant again, and then treated with laparoscopic laser fulguration again.

†Patients successful in one therapy but failed to be pregnant again, then treated with laparoscopic laser fulguration.

Table 2.
Results of Comparisons Between Treatment Conditions by Fisher-Irwin Exact Test at 5% Level of Significance

Condition 1	Pregnancy Rate	Condition 2	Pregnancy Rate	ΣP_i	α	Difference
S _e	87%	S _m	85%	>0.311	0.05	No
S _e	87%	S _c	84%	>0.294	0.05	No
S _e	87%	S _p	76%	>0.227	0.05	No
S _e	87%	S _l	84%	>0.274	0.05	No
S _m	85%	S _c	84%	>0.283	0.05	No
S _m	85%	S _p	76%	>0.245	0.05	No
S _m	85%	S _l	84%	>0.265	0.05	No
S _c	84%	S _p	76%	>0.233	0.05	No
S _c	84%	S _l	84%	>0.248	0.05	No
S _p	76%	S _l	84%	>0.217	0.05	No

*S_e = Patients successful expectantly but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_m = Patients successful medically but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_c = Patients successful with cautery but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_p = Patients successful with laparotomy but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_l = Patients succeeded with laparoscopic laser fulguration, but failed to become pregnant again, and then treated with laparoscopic laser fulguration again.

†Patients successful in one therapy but failed to be pregnant again, then treated with laparoscopic laser fulguration.

Table 3.
Results of Treating Mild and Moderate Endometriosis With No Other Predisposing Fertility

Conditions*	No. of Patients†	No. of Pregnancies	No. of Non-Pregnancies
L _e	57	45	12
S _e	23	20	3
L _m	45	34	11
S _m	26	22	4
L _c	34	27	7
S _c	32	27	5
L _p	25	13	12
S _p	17	13	4
L _l	54	32	22
S _l	44	37	7

*L_e-L_l = Patients failed in one therapy and then treated with laser; S_e-S_l = Patients successful in one therapy but failed to become pregnant again, and then treated with laser.

Study III.

No difference was noted in the outcome between the groups that succeeded in one therapy but failed to become pregnant again and were then treated with laser fulguration by laparoscopy versus the group that was

treated with laser fulguration by laparoscopy only (**Tables 5 and 6**).

DISCUSSION

Infertility related to endometriosis has been extensively researched in the literature. The literature on endometriosis relating to infertility, however, has not always been helpful in helping patients achieve a pregnancy. Several articles address this issue and demonstrate that the fecundity rate is significantly lower in patients with endometriosis,^{13,34,35} and a lower success rate exists in patients with endometriosis undergoing assisted reproductive technology compared with women without this disorder.³⁶⁻³⁸

Unfortunately, the literature addresses mainly the different aspects of pain related to endometriosis including recurrence, treatment, and pathogenesis. This study involved couples with no identifiable cause of their infertility other than mild or moderate disease whose endometriosis-based fertility problem had been treated successfully in the past, but subsequently these couples failed to become pregnant when attempting after delivery. They were then treated with laparoscopy with a CO₂ laser for fulguration of endometriosis. The data suggest that endometriosis is a progressive and recurrent disease. The more resistant a patient is to traditional treatment methods, the higher the failure rates are and better successful treatment is

Table 4.
Results of Comparisons Between Treatment Conditions by Fisher-Irwin Exact Test at 5% Level of Significance

Condition 1	Pregnancy Rate	Condition 2	Pregnancy Rate	ΣP_1	α	Difference
L _e	79%	S _e	87%	>0.189	0.05	No
L _m	76%	S _m	85%	>0.167	0.05	No
L _c	79%	S _p	84%	>0.220	0.05	No
L _p	52%	S _p	76%	>0.074	0.05	No
L _l	59%	S _l	84%	0.006	0.05	Yes

*L_c-L_l = Patients failed in one therapy and then treated with laser; S_e-S_l = Patients successful in one therapy but failed to become pregnant again, and then treated with laser.

Table 5.

Results of Treating Mild and Moderate Endometriosis With No Other Predisposing Fertility

Conditions*	No. of Patients	No. of Pregnancies	No. of Non-Pregnancies
S _e	23	20	3
S _m	26	22	4
S _c	32	27	5
S _p	17	13	4
L	120	99	21

*S_e = Patients treated successfully expectantly but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_m = Patients successful medically but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_c = Patients successful with cautery but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_p = Patients successful in laparotomy but failed to become pregnant again, and then treated with laparoscopic laser fulguration; L = Patients treated with laparoscopic laser fulguration only.

achieved with a more ablative treatment such as laser fulguration. Laser had an additive effect in treatment of endometriosis manifested by higher pregnancy rates as in study group II.

A previous study involving a 2-step analysis when the initial treatment of endometriosis by expectant, medical, cautery, laser fulguration of endometriosis by laparoscopy and laparotomy was not successful revealed that the total number of women becoming pregnant after the initial treatment plus subsequent laser fulguration by laparoscopy was equal in all patients. However, those patients previously treated with expectant, medical, and cautery treatments had better subsequent success with laparoscopic laser fulguration of their endometriosis than those originally treated with laser fulguration by laparoscopy

and laparotomy. This suggested that there might be other factors involved in achieving pregnancies in patients with endometriosis, as those originally treated with laparoscopic laser and laparotomy treatment of the endometriosis initially had a higher initial pregnancy rate, and if unsuccessful, they had a lower subsequent positive pregnancy rate compared with that in other treatments. The sum of the 2 treatments for all treatment groups, however, was the same. This suggests that laser laparoscopy and laparotomy produced the best yield of successful pregnancies from the beginning, and subsequently there were other unexplained factors in the patients who had no pregnancy.³⁹

The type of initial treatment and the success of the treatment did not affect the subsequent success of laser fulguration as a treatment. This makes laser fulguration by laparoscopy a major option for use in these patients.

Two recent prospective randomized trials addressed surgical treatment of mild and moderate endometriosis related to infertility. The Canadian collaborative effort demonstrated that laparoscopic ablation had a higher pregnancy rate than expectant management.³⁵ The Italian collaborative effort demonstrated a superior outcome for laparoscopic treatment over other treatment courses in regards to birth rate and monthly fecundity rate.³⁶ These data confirmed older retrospective trials showing that ablative surgical techniques increase the pregnancy rate.^{34,37,38,40,41}

CONCLUSION

This step-wise treatment of mild or moderate endometriosis disease provides an algorithm for treatment of the infertile patient with endometriosis, especially in those where age and time are limiting factors. Laser surgery in the hands of skilled surgeons is one of the most successful

Table 6.
Results of Comparisons Between Treatment Conditions by Fisher-Irwin Exact Test at 5% Level of Significance

Condition 1	Pregnancy Rate	Condition 2	Pregnancy Rate	ΣP_1	α	Difference
S _e	87%	L	83%	>0.224	0.05	No
S _m	85%	L	83%	>0.225	0.05	No
S _c	84%	L	83%	>0.206	0.05	No
S _p	76%	L	83%	>0.204	0.05	No

*S_e = Patients treated successfully expectantly but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_m = Patients successful medically but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_c = Patients successful with cautery but failed to become pregnant again, and then treated with laparoscopic laser fulguration; S_p = Patients successful in laparotomy but failed to become pregnant again, and then treated with laparoscopic laser fulguration; L = Patients treated with laparoscopic laser fulguration only.

and reproducible treatment modalities for this subgroup of patients.

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