

Role of Laparoscopy in Diagnosis and Treatment of Endometriosis Associated with Infertility: A Prospective Analysis

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ABSTRACT

Objective: Endometriosis is often considered as an enigma due to its varied clinical presentation and challenges in diagnosis. The objective of this study is to evaluate the role of laparoscopy in diagnosis and treatment of endometriosis associated with infertility.

Materials and Methods: Infertile females diagnosed to have endometriosis during or before undergoing laparoscopic surgery from August 2018 to February 2020 were followed up for spontaneous conception for 6 months following laparoscopy. Revised American Fertility Society (r-AFS) scoring system was used to score endometriosis and stage the disease (stage I-IV). Surgical interventions were done on individual case basis following ESHRE guidelines.

Results: Fifty infertile females diagnosed with endometriosis during or before laparoscopy were recruited for the study. Mean age of patients was 28.58 (± 4.21) years. Thirty-four (68%) patients had primary infertility and 16 (32%) has secondary infertility. Mean duration infertility was 3.33 (± 1.43) years. Only 37 patients (74%) had evidence of endometriosis in pre-operative ultrasonography. During the follow up period of first 6 months after surgery 34 (68%) patients conceived spontaneously. Lower mean endometriosis score ($p=0.00$) and early stages of endometriosis ($p=0.00$) were associated with higher chances of conception. But, female age, duration and type infertility, USG findings and type of surgical interventions did not affect pregnancy rate.

Conclusion: Laparoscopy helps in diagnosis of endometriosis. Laparoscopic therapeutic interventions for endometriosis increase the probability of spontaneous conception in infertile females. Lower surgical score and early stages of endometriosis are associated with higher chance of conception.

Keyword: Laparoscopy; endometriosis; infertility; diagnosis (Siriraj Med J 2021; 73: 772-776)

INTRODUCTION

Endometriosis is the cause of infertility in 5-15% of women in reproductive age group.¹ It is diagnosed in 35 to 50 % of women with chronic pelvic pain, infertility or both.² But diagnosis is often postponed for several

years after symptoms onset.³ There is no definitive imaging modality or serum marker for the diagnosis of endometriosis. While transvaginal scan (TVS) has recently gained popularity as a first-line imaging modality for non-invasive diagnosis of endometriosis,⁴ diagnostic

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laparoscopy is required for confirmation of diagnosis and staging of the disease.⁵ A systematic review and meta-analysis of 13 studies on pelvic endometriosis also revealed non-invasive imaging modalities particularly transvaginal ultrasonography to be of lesser accuracy compared to laparoscopy.⁶

Excision and ablation of endometriotic lesions in mild to severe disease using laparoscopic surgery enhances fertility.⁷ Surgery improves the probability of conception by restoring the anatomical distortion caused by the disease and removing the endometriotic implants, thereby reducing the inflammatory peritoneal response. Existing literature shows diversities regarding the beneficial effect of therapeutic laparoscopy in infertile females with different stages of the disease. In a retrospective cohort study, patients with severe endometriosis were followed up for natural as well as assisted conceptions.⁸ Reproductive outcomes in infertile women with advanced endometriosis and repeated IVF failures were also observed.^{9,10} In a retrospective study by Ekine et al. infertility patients with all stages of endometriosis were followed up for pregnancy following surgery.¹¹ But the pregnancies resulted from IUI and ART were also included. The current study was intended to determine the efficacy of laparoscopic surgery for diagnosis as well as treatment of pelvic endometriosis in infertile females. It observes the chances of spontaneous conception for all stages of endometriosis.

MATERIALS AND METHODS

This prospective study was carried out in a teaching hospital of Odisha, India. Institutional Ethical Committee approval was obtained for the study. For all the patients attending infertility clinic, detail history taking and relevant clinical examinations were performed. As a part of routine infertility evaluation, baseline transvaginal ultrasonography, thyroid function test and male partner's semen analysis were done. Patients with clinical and/or ultrasonographic features of endometriosis without previous history of surgery for endometriosis were planned for laparoscopy. Dysmenorrhoea, dyspareunia and chronic pelvic pain were considered as relevant symptoms for diagnosis of endometriosis. Similarly, presence of endometriotic cyst in one or both ovaries or features suggestive of utero-ovarian adhesions in transvaginal ultrasonography were presumed to be features of endometriosis. Revised AFS scoring system was used for scoring and staging endometriosis during surgery. Chromopertubation was done for all the patients. Therapeutic interventions were done as per ESHRE guidelines for endometriosis management. Complete cystectomy was preferred to partial cystectomy

or cyst drainage for ovarian endometriomas. Superficial endometriotic lesions were fulgurated. Adhesiolysis was done for pelvic adhesions for restoration of tubo-ovarian relationship. Surgical specimens were sent for histopathological confirmation of endometriosis.

Patients with laparoscopic features suggestive of endometriosis were considered for the study. Females aged more than 37 years, with polycystic ovarian syndrome (PCOS) or decreased ovarian reserve were excluded. Similarly, patients with abnormal male factors and bilateral tubal block as observed during laparoscopy were also excluded from the study. Diagnosis of PCOS was done as per Rotterdam criteria. Similarly, decreased ovarian reserve was defined as antral follicle count (AFC) < 7 combined in both ovaries or anti-Mullerian hormone (AMH) < 1.1 ng/ml. Abnormal semen parameters were defined by sperm concentration < 10 million/ml and/or progressive motility < 10%.

The study subjects were followed up for 6 months post-intervention for spontaneous conception. Clinical pregnancy was considered as the outcome measure of the study. It was defined by the presence of ultrasonographic evidence of gestational sac with or without fetal pole at 7th week of amenorrhoea.

Considering the total number of patients attending infertility clinic in our hospital and the prevalence of endometriosis in infertile females, the sample size was decided to be at least 50 as this is a part of post-graduate level dissertation with a fixed duration for the study.

Data analysis

The data obtained were tabulated in Microsoft Excel. Statistical analysis was carried out with the aid of statistical programme SPSS 20.0. Quantitative data were expressed in mean and standard deviation. The percentages and proportions were used to express the categorical results. A Chi-square test was performed to compare the proportion in two groups for a categorical variable. An independent t-test was performed to look for the difference in the means of two groups with a quantitative variable, *p*-value of 0.05 was considered to be the degree of statistical significance.

RESULTS

During the study period, fifty infertile patients with endometriosis were followed up for spontaneous conception after laparoscopy. Mean age of participants was 28.5 (±4.21) years. Mean duration of infertility was 3.33 (±1.43) years. Majority of them had primary infertility (68%). Pre-Operative ultrasonography showed evidence of endometriosis only in 37 (74%) patients. Among the

patients who had ultrasonographic abnormalities, the most common finding was a right ovarian chocolate cyst (26%) followed by bilateral chocolate cysts (24%).

Intraoperatively, the minimum r-AFS score was 2 and the maximum score was 88 with mean (\pm SD) score of 23.76 (\pm 19.9). Stage III endometriosis was observed in majority of these patients followed by stage I endometriosis (20%). Unilateral cystectomy was the most common intervention done in 48% of the patients, followed by bilateral cystectomy (24%) and adhesiolysis alone (12%). Other interventions were fulguration of endometriotic spots (8%), myomectomy (6%), and oophorectomy (2%).

Thirty-four patients (68%) conceived spontaneously at the end of 6 months and 16(32%) patients failed to conceive. General characteristics of these patients are compared and represented (Table 1). The mean age of patients with successful pregnancies was similar to those who failed to conceive (27.82 ± 4.71 vs 30.18 ± 3.35 , $p=0.06$). Similarly, there was no difference in duration of infertility in these patients (Mean \pm SD 3.35 ± 1.45 vs 3.28 ± 1.46 , $p=0.88$). Among 34 patients with primary infertility, 24 (70.5%) conceived and 10 (62.5%) patients with secondary infertility conceived in the predefined postoperative period. There was, however, no statistically significant association of infertility type with the status of conception within 6 months ($p=0.56$).

Ultrasonographic and operative characteristics of the patients were compared and represented (Table 2). Ultrasonography findings did not affect the chances of conception ($p=0.86$). Majority of patients in both categories had unilateral endometriomas (15/34 vs 15/16) followed by bilateral endometriomas (9/34 vs 3/16). The mean score of endometriosis in the conceived patients was significantly lower compared to the patients who failed

to conceive spontaneously (16.94 ± 10.58 vs 38.25 ± 26.93 , $p=0.00$). A similar observation was also noted for stage of endometriosis. The proportion of study participants getting pregnant at the end of 6 months was higher in patients with lower stages of endometriosis than those with the higher stage ($p=0.00$). All the participants with stage-II endometriosis conceived and 80% with stage-I endometriosis conceived at the end of 6 months. Similarly, 76.7% of patients with stage-III endometriosis conceived but, none with stage-IV endometriosis. Out of 24 patients undergoing unilateral cystectomy, 15 (62.5%) patients conceived. Five out of 6 patients conceived where adhesiolysis was done. Successful conception was observed in all four patients after fulguration of endometriotic spots. However, there was no statistically significant association between the type of intervention done and the conception status of the study subjects ($p=0.35$).

DISCUSSION

In our study, 74% of patients with laparoscopically confirmed endometriosis had a preoperative diagnosis of endometriosis through transvaginal 2D ultrasonography indicating 74% sensitivity for detection of endometriosis. A similar observation was noted in a prospective study where transvaginal ultrasonography had a sensitivity of 75% for detection of endometrioma.¹³ About 68% of the participants conceived spontaneously following laparoscopic intervention within 6 months. A similar spontaneous pregnancy rate (65%) was also observed in a study by Fuchs F 2007, over a follow-up period of 8.5 months. In this study, assisted conceptions were also observed.¹⁴ The follow-up period also varied from one to two years in different studies.^{15,16}

TABLE 1. Comparison of general characteristics.

| Characteristics | Status of conception in 6 months | | Total (n=50) | p-value |
|--|----------------------------------|------------------------|------------------|---------|
| | Not Conceived n=16, (%) | Conceived n=34, (%) | | |
| Age (Years) (Mean \pm SD) | 30.18 ± 3.35 | 27.82 ± 4.41 | 28.58 ± 4.21 | 0.06 |
| Year of infertility (Years) (Mean \pm SD) | 3.28 ± 1.46 | 3.35 ± 1.45 | 3.33 ± 1.43 | 0.88 |
| Infertility type | Primary | 10 (29.4) | 24 (70.5) | 0.56 |
| | Secondary | 6 (37.5) | 10 (62.5) | |

TABLE 2. Comparison of USG and Operative characteristics.

| Characteristics | Category | Status of conception in 6 months | | Total n=50 | p-value |
|---|---|----------------------------------|-----------------------|---------------|---------|
| | | No Conceived n=16 (%) | Conceived n=34 (%) | | |
| USG Findings | B/L chocolate cyst | 3 (25) | 9 (75) | 12 | 0.63 |
| | Left chocolate cyst | 4 (36.4) | 7 (63.6) | 11 | |
| | Myoma | 1 (33.3) | 2 (66.7) | 3 | |
| | No abnormality | 2 (20) | 8 (80) | 10 | |
| | Right chocolate cyst | 5 (38.5) | 8 (61.5) | 13 | |
| | Right tubo-ovarian mass, | 1 (100) | 0 | 1 | |
| Score of endometrioses (Mean ± SD) | | 38.25 ± 26.93 | 16.94 ± 10.58 | 23.76 ± 19.95 | 0.00 |
| Endometriosis stage | I | 2 (20.0%) | 8 (80.0%) | 10 | 0.00 |
| | II | 0 (0.0%) | 3 (100.0%) | 3 | |
| | III | 7 (23.3%) | 23 (76.7%) | 30 | |
| | IV | 7 (100.0%) | 0 (0.0%) | 7 | |
| Interventions done | Unilateral Cystectomy | 09 (37.5%) | 15 (62.5%) | 24 | 0.35 |
| | B/LCystectomy | 5 (41.6%) | 7 (58.3%) | 12 | |
| | Adhesiolysis | 1 (16.6%) | 5 (83.3%) | 6 | |
| | Fulguration | 0 (0.0%) | 4 (100%) | 4 | |
| | Myomectomy with adhesiolysis | 1 (25%) | 2 (75%) | 3 | |
| | Right oophorectomy with adhesiolysis | 0 (0.0%) | 1 (100%) | 1 | |

Baseline characteristics of patients with and without successful spontaneous conception were similar. There was no difference in the age of females, type of infertility, duration of infertility and preoperative ultrasonographic findings making the comparison more logical and acceptable. This eliminates the probability of bias due to effect of major confounders like age on pregnancy rate.

In the present study, pregnancy rate after laparoscopy was lower in patients higher r-AFS score and advanced stages of endometriosis. This reflects the adverse effect of severity of endometriosis on the probability of spontaneous conception after therapeutic surgery. The implications of this study will help the clinicians to counsel the patients with advanced endometriosis regarding the poor prognosis for spontaneous conception following laparoscopy. It agrees with the study by Fuchs et al. 2007 where the incidence

of pregnancy was significantly higher in patients with stage I /II disease than stage III/IV (89% vs 56%). In contrast, staging and scoring of endometriosis, had no association with pregnancy rate in the study by Porpora et al. 2002.¹⁷ In that study, adnexal adhesion and tubal condition influenced the chances of conception.

The current study was undertaken at a single centre. The study followed up only cases with spontaneous conception and excluded methods of assisted reproduction as in the later cases, direct benefit of laparoscopic surgery on chances of conception would have been difficult to demonstrate. The sample size of the study was limited to only 50 patients and the follow-up duration of study participants was only 6 months which was less as compared to other studies of this nature. The limited-time period for follow-up is considered for the study as this is part

of a post-graduate dissertation that has to be completed in a limited time frame. Thus, there is a need for further studies with a larger sample size and long duration follow-up to support the observations of our study and ensure generalisability of the study for the overall population of infertile females with endometriosis.

CONCLUSION

Laparoscopy helps in the diagnosis of pelvic endometriosis especially in patients without ultrasonographic abnormalities. In infertile females with endometriosis undergoing laparoscopy, individualized surgical interventions are warranted for better fertility outcomes. Successful spontaneous conception following surgery depends on the r-AFS score, and stage of endometriosis. Lower score and early stage of endometriosis are associated with higher chances of conception.

Ethical consideration: The study was approved by the Institutional ethical committee (IEC).

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