



## Outcome of Laparoscopic Treatment in Patients with Endometriosis

Authors

**Rameshwari Nisty<sup>1</sup>, Shrutika Gobbur<sup>2</sup>, Gangambika Nisty<sup>3</sup>**

Department of Obstetrics and Gynaecology ESIC Medical College Kalaburgi

### Introduction

The purpose of this study was to evaluate the feasibility clinical and fertility outcome in patients with endometriosis after laproscopic surgery

### Aims and Objectives

- 1) To study the effect of laparoscopic surgery on pain symptoms of endometriosis
- 2) To study the effect of laparoscopic surgery on the fertility outcome in patients of endometriosis
- 3) To analyze the correlation between laparoscopic findings and histopathology diagnosis
- 4) To find out the recurrence rate of endometriosis after laparoscopic surgery

### Materials and Methods

This is a prospective analysis of patients who underwent surgery for endometriosis at tertiary hospital from July 2016 to July 2017. Out of a total of 108 cases, patients with open surgery, TVS guided aspiration of cyst and those without visual evidence of endometriosis at diagnostic laparoscopy were excluded. All the patients who had undergone laparoscopic surgery with documented evidence of endometriosis intra-operatively were included in this study. A total of 100 patients met the study criteria.

Data was collected during surgery and from in-patient records and discharge records of the patients. Follow up of the patient was taken in outpatient department during their postoperative visit to the hospital or by contacting them via telephone.

Age of patient, marital status, presenting symptoms, gynecological history, significant past history, their desire to conceive, previous ART history, relevant investigations, type of surgery performed, intraoperative details including the endometriosis stage, complications, blood loss during surgery, duration of stay in the hospital in the post operative period, histopathology diagnosis, pre-operative and postoperative hormone therapy, postoperative pain relief, fertility and recurrence were taken into account. The severity of pain was assessed by pain scale (0-10) where 10 being most painful and 0 being no pain.

Two laparoscopic surgeons with adequate experience in laparoscopic surgeries performed all the surgeries. Standard multiple-port laparoscopic technique was used. Combination of excision, cyst drainage and ablative therapy depending on the location of the lesion was given. Endometriosis staging was determined from operative reports and by using the revised American Society for Reproductive Medicine classification of

endometriosis.

### Observations and Results

A total of 100 patients who underwent laparoscopic surgery for endometriosis from July 2016 July 2017 were included in this study. The maximum number of cases were seen in the age group of 25 to 34 years (57%) with a mean age of 32 years at the time of surgery. We did not see any adolescents with endometriosis in our study period, the youngest patient in our study was 20 years old. Ninety-six patients were married.

Patients presented with complains like dysmenorrhea, abdominal pain, groin pain, backache, infertility, dyspareunia, abnormal uterine bleeding, mass per abdomen, urinary complains or dyschezia. Among these, dysmenorrhea (56.38 %) and infertility (54.44%) were the most common symptoms. Five of the 100 patients (5%) did not have any symptom related to endometriosis (Table 1). Twelve patients (12%) had recurrent endometriosis at the time of presentation. Interestingly, 11 of 12 patients with recurrent endometriosis had undergone cystectomy for ovarian endometrioma in the past and only one patient had a previous history of cystostomy (Table 2). None of the patients had a family history of endometriosis.

Apart from endometriosis other co-existing conditions were also seen. Leiomyomas (14%) were the most common among other gynecological disorders. Other gynecologic conditions seen were adenomyosis (7%), polycystic ovaries (10%) and dermoid cyst (1%). Hypothyroidism (12%) was most common among medical conditions, others being diabetes mellitus (4%) and hypertension (4%) (Table 3).

**Table 1:** Symptomatology

| Symptoms       | No. of patients (n=100) | Percentage (%) |
|----------------|-------------------------|----------------|
| Dysmenorrhoea  | 59 (n=94)*              | 62.7%          |
| Abdominal Pain | 26                      | 26%            |
| Backache       | 4                       | 4%             |
| Groin Pain     | 1                       | 1%             |
| Infertility    | 49 (n = 90)*            | 54.44%         |
| • Primary      | 35                      |                |
| • Seconda      | 14                      |                |
| Dyspareunia    | 3                       | 3%             |
| Menorrhagia    | 22(n=94)*               | 23.4%          |
| Polymenorrhoea | 2(n=94)*                | 2.12%          |

|                  |            |        |
|------------------|------------|--------|
| Irregular cycles | 14 (n=94)* | 14.89% |
| Mass per abdomen | 2          | 2%     |
| Urinary symptom  | 2          | 2%     |
| Dyschezia        | 2          | 2%     |
| Incidental       | 5          | 5%     |

\*4 patients % were unmarried and 6 had attained surgical menopause.

**Table 2:** Patients with recurrent endometriosis

| Type of previous surgery                           | No. of patients | Percentage    |
|----------------------------------------------------|-----------------|---------------|
| Total no. of patients with recurrent endometriosis | 12              | 12 % (n=100)  |
| • Cystectomy                                       | 11              | 91.66% (n=12) |
| • Cystostomy                                       | 11              | 8.33%(n=12)   |

**Table 3:** Coexisting conditions

| Co-existing conditions | Number of patients |
|------------------------|--------------------|
| Fibroid uterus         | 14                 |
| Polycystic ovaries     | 10                 |
| Adenomyosis            | 7                  |
| Dermoid cyst           | 1                  |
| Hypothyroidism         | 12                 |
| Diabetes Mellitus      | 4                  |
| Hypertension           | 4                  |

Majority of the patients (94%) had undergone preoperative ultrasound and ovarian cyst (58%) was the most common finding. CT scan (5%) and MRI (7%) were done for only a few patients. CA 125 levels were available for only 30% of cases. High CA 125 (>35 J/ml) levels were seen in 18 patients (60%) and levels more than 100 U/ml were seen in 8 patients (28.66%). Post operative CA 125 level was repeated in only 1 patient in whom the levels were significantly reduced (156 U/ml to 48 U/ml). Other relevant investigations were done on case to cases basis. Pre-operative hormone therapy was given in 2 patients. Intra-operatively, ovaries were most commonly involved (86%) and 56% of endometrial lesions were noted on the left side (Table 4b). Grade IV endometriosis was the most common finding (48%). (Table 4a)

**Table-4a:** Endometriosis severity

| Grade | Number of Patients |
|-------|--------------------|
| I     | 23                 |
| II    | 5                  |
| III   | 24                 |
| IV    | 48                 |

**Table 4b:** Intraoperative findings

| Lesion                 | No. of cases | Percentage |
|------------------------|--------------|------------|
| <b>Ovary</b>           |              |            |
| Left                   | 34           | 34%        |
| 1. Superficial         | 6            |            |
| 2. Endometrioma        | 28           |            |
| Right                  | 39           | 39%        |
| 1. Superficial         | 9            |            |
| 2. Endometrioma        | 30           |            |
| Bilateral              | 13           | 13%        |
| TO mass                | 4            | 4%         |
| Left                   | 3            |            |
| Right                  | 1            |            |
| POD                    | 50           | 50%        |
| Spots                  | 10           |            |
| Obliteration           | 40           |            |
| Uterosacral ligament   | 25           | 25%        |
| Left                   | 17           |            |
| Right                  | 8            |            |
| Tubal block            | 10           | 10%        |
| Left                   | 8            |            |
| Right                  | 2            |            |
| Tubal lesions          | 3            | 3%         |
| Left                   | 2            |            |
| Right                  | 1            |            |
| Uterus                 | 8            | 8%         |
| Rectum                 | 3            | 3%         |
| Bladder/ UV fold spots | 3            | 3%         |
| Lateral pelvic wall    | 3            | 3%         |

Among the surgical procedures performed, adhesiolysis (48%) and cystectomy (34%) were most common. Other procedures included cystostomy (30%), fulguration of endometriotic lesions (30%), partial cystectomy (8%), adnexectomy (9%), resection of rectal nodule (1%) and uterosacral resection (1%). Radical procedures like TLH (2%) or LAVH with BSO (2%) were done for the who had completed their families and were more than 40 years of age at the time of presentation. Cystoscopy was performed after all the procedures where anatomy was distorted and extensive adhesiolysis was done around bladder and ureters. There were 2 conversions to open abdominal surgery. Both were grade IV endometriosis with associated leiomyoma uterus and dense omen bowel adhesions. In both cases open abdominal hysterectomy was performed. One of the patients had a history of laparotomy endometriosis. (Table 5)

**Table 5:** Procedures performed

| Procedure                                            | Number of cases |
|------------------------------------------------------|-----------------|
| Fulguration                                          | 30              |
| Cystectomy                                           | 34              |
| Partial cystectomy                                   | 8               |
| Cystostomy                                           | 30              |
| Adhesiolysis                                         | 48              |
| TLH with BSO                                         | 1               |
| TLH with RSO                                         | 1               |
| LAVH with RSO                                        | 2               |
| Laparoscopy converted to open abdominal hysterectomy | 2               |
| LSO                                                  | 5               |
| RSO                                                  | 2               |
| BSO                                                  | 2               |
| Resection of nodule                                  | 1               |
| Utero-sacral transection                             | 1               |
| No intervention                                      | 8               |

Additional pathology encountered included polycystic ovaries (22%), leiomyoma (14%), adenomyoma (7%), hemorrhagic cyst (4%), hydrosalpinx (5%), fimbrial cysts (5%), paraovarian cyst (1%). Endometriat polyps (3%), dermoid cyst (1 %) and scar endometrio (1%).

Concurrent procedures carried out along with endometriosis surgery included ovarian drilling for polycystic ovaries (22%), myomectomy (4%), adenomyomectomy (1%), salpingectomy (4%), polypectomy (3%), fimbriolysis (2%), laparoscopic sterilization (1%), cystoscopy (3%), neurofibroma excision (1%). excision of scar. endometriosis (1 %), dermoid cyst excision (1 %), fimbrial cyst cision (5%), paraovarian cystectomy (1 %) and RYGB (196). (Table 6).

There were no reported complications and blood loss was also minimal (80%), except in cases of TLH, LAVH and concurrent myomectomy. None of the patients required post-operative blood transfusion. Majority of the patients were discharged in 24 hours surgery (90%, <1 or 1 day). Only a few patients (10%) stayed longer (2-4 days) as they had undergone hysterectomy with extensive adhesiolysis or concurrent procedures like myomectomy and RYGB (Table 7).

**Table 6:** Concurrent procedures

| Additional Procedure           | Number of cases |
|--------------------------------|-----------------|
| Myomectomy                     | 4               |
| Adenomyomectomy                | 1               |
| Ovarian drilling               | 22              |
| Polypectomy                    | 3               |
| Dermoid cyst excision          | 1               |
| Excision of scar endometriosis | 1               |
| Fimbrial cyst excision         | 5               |
| Paraovarian cystectomy         | 1               |
| Cryocauterisation of cervix    | 1               |
| Salpingectomy                  | 4               |
| Neurofibroma excision          | 1               |
| Roux En Y Gastric Bypass       | 1               |
| Axillary Lymph node excision   | 1               |

**Table 7:** Duration of stay in the hospital

| Duration of stay in days | Number of Patients |
|--------------------------|--------------------|
| <1                       | 35                 |
| 1                        | 55                 |
| 2                        | 6                  |
| 3                        | 2                  |
| 4                        | 2                  |

Post-operative GnRH analogues were given in (46%) of which; Leuprolide was commonly used (34%). Dienogest and continuous

medroxyprogesterone acetate were given following GnRH analogues in 3 patients.

**Table 8:** Adjuvant therapy

| GnRH analogue                        | Number of Patients |
|--------------------------------------|--------------------|
| Pre-op GnRH                          | 2                  |
| Post op GnRH                         | 46                 |
| • Leuprolide (3.75m g)               | 34                 |
| • Goserelin (3.6 mg)                 | 11                 |
| • Triptorelin                        | 2                  |
| Continuous progesterone for 3 months | 2                  |
| Dienogest for 3 months               | 2                  |

Out of 55 samples sent for histopathology examination 44 came out to be positive (78.1%).

Out of 100 patients enrolled in this study, 15 patients lost follow up. Among patients presenting with dysmenorrhea, 87.7% had complete or some pain relief. In patients with abdominal pain, 90.9% showed complete or some pain relief and 100% pain relief was shown in patients with groin pain or backache (Table 9).

**Table 9:** Reduction in pain symptoms

| Symptoms       | Total | Complete Relief | Some relief | No relief | Recurred | Lost F/up |
|----------------|-------|-----------------|-------------|-----------|----------|-----------|
| Pain symptoms  | 78    | 41 (61.2%)      | 19(28.36%)  | 4(5.97%)  | 3(4.48%) | 11        |
| Dysmenorrhoea  | 59    | 27(55.1 %)      | 16(33%)     | 3(6.1%)   | 3(6.1%)  | 10        |
| Abdominal pain | 26    | 16(73%)         | 4(18.1%)    | 2(9.1%)   | 0        | 4         |
| Backache       | 4     | 3 (75%)         | 1 (25%)     | 0         | 0        | 0         |
| Groin pain     | 1     | 1 (100%)        | 0           | 0         | 0        | 0         |

Nineteen of 38 patients (50%) trying for pregnancy conceived after surgery. with an average time to conception being 3.5 month: Among these, 8 patients (42.1 %) conceived spontaneously and 11 patients (57.8%) conceived after ovulation induction with or without assisted

reproductive techniques (Table 10a). Highest pregnancy rates were seen in stage III endometriodsis (66.6%) (Table 10b) Both cystectomy and cystostomy group were associated with highest pregnancy rate (26.3%) (Table 10c).

**Table 10a:** Outcome of surgery in Infertility group

| Pregnancy   | No. of patients | Abortion | Avg. time/ cycles to conception | Post Op GnRH |
|-------------|-----------------|----------|---------------------------------|--------------|
| Conceived   | 19/38           | 3        | 3.5                             | 9            |
| Without ART | 8               | 2        | 4                               | 4            |
| With ART    | 11              | 1        | 3.2                             | 5            |
| IUI         | 2               | 0        | --                              | --           |
| IVF         | 1               | 0        | --                              | --           |
| ICSI        | 1               | 0        | -                               | --           |

**Table 10b:** Grade and fertility

| Grade | Total | Lost F/ Up or interest | Conceived  | Spontaneous; {n}=Patient in spontaneous group] | with ART; [(n)=Patient in ART group} |
|-------|-------|------------------------|------------|------------------------------------------------|--------------------------------------|
| I     | 15    | 3                      | 3 (25%)    | 1 (1/6) (16.67%)                               | 2 (2/5) (40%)                        |
| II    | 4     | 1                      | 1 (33.33%) | 0 (0/0)                                        | 1 (1/3) (33.33%)                     |
| III   | 11    | 2                      | 6 (66.6%)  | 3 (3/4) (75%)                                  | 3 (3/5) (60%)                        |
| IV    | 19    | 5                      | 6 (42.85%) | 3 (3/8) (37.5%)                                | 3 (3/6) (50%)                        |

**Table 10c:** Procedure Related Pregnancy Rate

| Procedure                                                 | No. of patients conceived | Percentage |
|-----------------------------------------------------------|---------------------------|------------|
| Cystectomy                                                | 5                         | 26.3%      |
| Cystectomy + partial cystectomy + fulguration of cyst bed | 1                         | 5.26%      |
| Pbrtial oysteotomy + Fulcturation of cyst bed             | 2                         | 10.52%     |
| Partial ooteotomy                                         | 1                         | 5.26%      |
| Cysto tomy                                                | 5                         | 26.3%      |
| Cyst drainage + Fulcturation                              | 1                         | 5.26%      |
| Fulguration of peritoneal lesions                         | 2                         | 10.52%     |
| No intervention                                           | 2                         | 10.52%     |

Pain recurrence was seen in 3 patients (4.48%), all of these had undergone cystostomy at the time of primary surgery, and 2 these had also received

post-operative GnRH analogue therapy. (Table 11a)

**Table 11a-** Procedure related Pain Recurrence

| Procedure               | No. of cases | Recurrence of disease | Post of GnRH               | Intervention         |
|-------------------------|--------------|-----------------------|----------------------------|----------------------|
| Cyst drainage           | 1 (3.3%)     | 1                     | 1 (Leuprolide x 6 months)  | Dienogest x 3 months |
| Cystectomy + cystostomy | 2            | 0                     | 1 (Triptorelin x 3 months) | Dienogest x 3 months |

Disease recurrence was seen in 5 patients (5.88%), out of which 4 patients (80%) had undergone cystostomy. Three patients in the recurrence group underwent repeat surgery and 2 patients were given medical therapy. (Table 11b)

**Table 11b:** Procedure related recurrence of disease

| Recurrence | No. of patients | Percentage | Reoperation |
|------------|-----------------|------------|-------------|
| Total      | 5 (n=85)        | 5.88%      | 3           |
| Cystostomy | 4 (n=5)         | 80%        | 2           |
| Cystectomy | 1 (n=5)         | 20%        | 1           |

Both pain recurrence and disease recurrence were more commonly seen in rASRM stage III/IV endometriosis. (Table 11c)

**Table 11c-** Recurrence and surgical grading

| Grade     | Ovarian endometrioma | Pain |
|-----------|----------------------|------|
| Grade I   | 0                    | 0    |
| Grade II  | 1                    | 0    |
| Grade III | 2                    | 1    |
| Grade IV  | 2                    | 2    |

### Discussion

Endometriosis is a chronic inflammatory condition with estrogen dependence. Laparoscopy is the gold standard method to diagnose as well as treat endometriosis because of the low morbidity, high tolerance, and overall low costs. The aim of this study is to find out the outcome of laparoscopic surgery in patients with endometriosis. Out of 100 patients included in this study, 15 patients lost follow up.

Pain was the most common presenting symptom (78%), of which dysmenorrhea was seen in 62.7% of patients. Left sided lesions are more common than right, and ovary is the most common site involved in endometriosis<sup>[1]</sup>. In this study, ovaries were involved; % of cases and 56% of endometrial lesions were noted on the left side.

Overall, pain reduction after surgery was noted in 89.5%, of which, 61.5% patients had complete relief and the severity was reduced for 28.3% of patients. Porpora et al. (2010) in their study showed an improvement in pain in 84.5% of

cases. Dysmenorrhea, dyspareunia, and chronic pelvic pain recurred in 14.5%, 6%, and 5.4% of women, respectively in their study<sup>[2]</sup>. In this study, dysmenorrhea recurred in 6.1 % (3 patients) of women. None of the other pain symptoms recurred in present study. Overall pain recurrence was seen in only 3 patients (4.48%) and all of them belonged to Stage III/IV endometriosis group according to rASRM classification and had undergone cyst drainage at the time of index

surgery.

Nineteen out of 38 patients trying for pregnancy conceived after endometriosis surgery with live birth rate of 42.1% and an average time to conception of 3.5 months. Of these, 42.1 % conceived spontaneously with average time to conception of 4 months and 57.89% conceived with ovulation induction or ART with average time to conception being 3.2 months.

| Study                     | Pregnancy rate | Live birth rate | Average time to conception |
|---------------------------|----------------|-----------------|----------------------------|
| Cirpan et al. (2013) [9]  | 44%            | 30.77%          | 9 months                   |
| Abbott et al. (2003) [10] | 59%            | 44%             | -                          |
| Koga et al. (2006) [5]    | 22.9%          | -               | -                          |
| Present study             | 50%            | 42.1%           | 3.5 months                 |

| Study                     | Spontaneous Pregnancy rate | Average time to conception (Spontaneous) |
|---------------------------|----------------------------|------------------------------------------|
| Choi et al (1999) [11]    | 48.5%                      | 3 months                                 |
| HJ Lee et al (2013) [12]  | 41.9%                      | -                                        |
| Porpora et al.(2010) [02] | 53%                        | -                                        |
| Present Study             | 42.1 %                     | 4 months                                 |

| Study                                              | Stage I | Stage II | Stage III | Stage IV |
|----------------------------------------------------|---------|----------|-----------|----------|
| Cirpan et al (2013) [09]                           | 57%     |          | 47%       | 16%      |
| HJ Lee et al (2013) [12] (Natural conception rate) | 35.7%   | 44.4%    | 53.3%     | 0        |
| Present Study                                      | 25%     | 33.33%   | 66.6%     | 42.85%   |

The pregnancy rates were not inversely proportional to the stages, which reflected the inadequate predictive value of the ASRM staging system with regard to the pregnancy rate.

Somigliana et al. observed that delaying conception after surgery was associated with a lower pregnancy rate and a higher rate of recurrence of endometriosis<sup>[3]</sup>.

Overall, recurrence rate in this study was 5.88%. The highest recurrence was seen in the cystostomy group (80%: 4/5). 3 patient underwent reoperation (3.5%) and 2 were put on medical treatment. According to various studies, the recurrence rate of endometriosis is 2% - 47% after surgery<sup>[4]</sup>. Porpora et al. (2010) showed ovarian endometrioma recurred in 9.6% of cases with high incidence of disease recurrence in patients with prior surgery for endometriosis, ovulation induction, intra operative pelvis adhesions, and high ASRM disease scores<sup>[2]</sup>. Only 1 patient in present study had a history of ovulation induction

in pre and post operative period, 1 patient had a history of surgery for ovarian endometrioma in the past and 4 out of 5 belonged to Stage III/IV endometriosis.

Koga et al. (2006), in his study shows a recurrence rate of 30.4% in a follow up period of 2 years. They concluded that a higher rate of recurrence was seen in patients who have received previous medical treatment for endometriosis (38.2% Vs 25.5% in no treatment group, OR= 2.324) and those with larger diameter cyst (OR = 1.182). They said that previous medication might mask endometriotic lesions and allow them to escape from removal during surgery<sup>[5]</sup>. In their study, neither co-existence of deep endometriosis nor higher rASRM score was significantly associated with recurrence. They also stated that post-operative pregnancy was significantly associated with lower recurrence (12.8% vs. 34.1% in no pregnancy group: OR = 0.292; P = 0.0181). Also according to Porpora et al. (2010) postoperative

pregnancy has a significant protective effect on pain and disease recurrences)<sup>[2]</sup>. In present study, only 1 patient who conceived after endometriosis surgery had recurrence (5.2% vs. 6.06% in the no pregnancy group) but she had a missed abortion and recurrence was noted almost a year after the abortion. None of the patients with recurrence in our study had taken pre-operative medical treatment. However, 3 patients in the recurrence group had received post-operative GnRH analogues. Present study also proves that short-term post-operative medical treatment does not significantly Puce disease recurrence as demonstrated by previous studies<sup>[2,5,6]</sup>.

Alborzi et al. (2004) conducted a prospective, randomized study comparing laparoscopic ovarian cystectomy versus fenestration and coagulation in patients with endometriosis. They concluded that laparoscopic cystectomy of endometrioma is a better choice than fenestration and coagulation because the former technique leads to a lower recurrence of signs and symptoms (15.8 % vs. 7%) and a lower rate of reoperation (5.8% vs. 22.9%) and a higher cumulative pregnancy rate than the latter (59.4% Vs. 23.3%)<sup>[58]</sup>. In current study also, both recurrence and reoperation rate were higher in the cystostomy group and pregnancy rate was similar for cystectomy and cystostomy group (26.3%)<sup>[7]</sup>

Histopathology examination confirmed endometriosis in 78.1 % patients in this study, which is comparable to study conducted by Fernando et al. Among 1439 biopsy specimens included in their study. the diagnosis of endometriosis was histologically confirmed 082 of 1439 (75.2%)<sup>[8]</sup>.

The limitations of this study were its retrospective design, small sample size and a short follow up period. Apart from that, we lost ow up with 15% patients.

### Conclusion

Laparoscopic surgery for endometriosis is associated with significant reduction in pain symptoms and improved pregnancy rate.

Cystectomy appears to be a better option than cyst drainage with or without coagulation with respect to pain relief, and it is associated with lower incidence of disease recurrence. The present study did not show any difference in fertility outcome in patients who underwent cystectomy or cystostomy: perhaps a longer follow-up may show a difference in fertility rate. Short-term postoperative hormonal therapy is not effective in preventing disease recurrence and does not improve fertility outcome.

### References

1. Te Linde, R.W., J.A. Rock, and J.D. Thompson. Te Linde's operatr; e gynecology, in Te Linde's operative gynecology. 1997, Lippincott-Raven Philadelphia.
2. Porpora, M.G., et al., Pain and ovarian endometrioma recurrence after laparoscopic treatment of endometriosis: a long-tern prospective study. *Fertil Steril*, 2010. 93(3): p. 716-21.
3. Somigliana, E., et al., Effect of delaying post-operative conception after conservative surgery for endometriosis. *Reprod Blamed Online*, 2010. 20(3): p. 410-5.
4. Nezhat, C., F. Nezhat, and C. Nezhat, Nezhat's operative gynecologic laparoscopy and hysteroscopy, 2008: Cambridge university press.
5. Koga, K., et al., Recurrence of ovarian endometrioma after laparoscopic excision. *Hum Reprod*, 2006. 21(8): p. 2171-4.
6. Busacca, M., et al., Post-operative GnRH analogue treatment after conservative surgery for symptomatic endometriosis stage III-IV. a randomized controlled trial. *Hum Reprod*, 2001. 16(11): p. 2399-402.
7. Alborzi, S., et al., A prospective, randomized study comparing laparoscopic ovarian cystectomy versus fenestration and coagulation in patients with endometriomas. *Fertil Steril*, 2004. 82(6):

p. 1633-7.

8. Fernando, S., et al., Reliability of visual diagnosis of endometriosis. *J Minim Invasive Gynecol*, 2013. 20(6): p. 783-9.
9. Cirpan, T., et al., Reproductive outcome after surgical treatment of endometriosis--retrospective analytical study. *Ginekc Pot*, 2013. 84(12): p. 1041-4.
10. Abbott, J.A., et al., The effects and effectiveness of laparoscopic excision of endometriosis: a prospective study with 2-5 yea follow-up. *Hum Reprod*, 2003. 18(9): p. 1922-7.
11. Choi, Y.M., et at., Pregnancy rate following laparoscopic surgery in infertile women with endometriosis. *Korean Journal o Obstetrics and Gynecology*, 1999. 42(11): p. 2492-2496.
12. Lee, H.J., et al. Natural conception rate following laparoscopic surgery in infertile women with endometriosis. *Clin Exp Reprod Med*, 2013. 40(1): p. 29-32.