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Role of Laparoscopy in Infertile Women with Endometriosis

Aswathy N U[1], Chandana Ray Das[2], Pranoy Nath[3]

ABSTRACT

Background: Infertility is defined as failure to conceive during one year of frequent unprotected intercourse.[1] World wide more than 70 million couples suffer from infertility. WHO has recognized it as a major public health issue. 10-15% couples are infertile in India. About 25-50% of infertile women have endometriosis.

Aims and Objectives: To study the prevalence of endometriosis among infertile women undergoing laparoscopy and to study the role of laparoscopy in diagnosis, staging and treatment of endometriosis in infertility.

Method: A total of 72 patients with primary and secondary infertility who were taken for laparoscopy during one year study period were studied. Those with Endometriosis, staging was done using the Revised American Fertility Society (R-AFS) classification and EFI score also were calculated. Laparoscopic procedures done for each case noted. Patients were followed up and successful pregnancies recorded.

Results: The prevalence of endometriosis in infertile women included in this study was 25% (18) and it was more in the age group between 26-30 years. 83.3% patients had primary infertility. Most common affected site was found to be ovary (72%). Bilateral tubal patency was seen in 72% cases. Stage 3(38.9%) was seen more commonly followed by stage 4(27.8%) cystectomy and adhesiolysis were the most commonly employed laparoscopic procedures. out of 18 patients with endometriosis, 7 patients conceived either spontaneously or with ovulation induction and 6 patients completed their pregnancies successfully.

Conclusion: Laparoscopy remains the gold standard for diagnosing, staging and surgically managing endometriosis. conception rate is good after laparoscopic surgery, if the patients are in early stage of disease and EFI score is high.

Key words: Infertility, Endometriosis, Laparoscopy.

1. Junior Resident, Department of Obstetrics and Gynaecology, Silchar Medical College
2. Associate Professor, Department of Obstetrics and Gynaecology, Silchar Medical College
3. Professor and HOD, Departmemt of Obstetrics and Gynaecology, Silchar Medical College

Corresponding author: Aswathy N U

Introduction

Endometriosis is characterised by the presence of endometrial glands and stroma outside the uterus, which results in a persistent inflammatory response. The most commonly affected areas are the ovaries followed by the pouch of Douglas, uterosacral ligament (especially its insertion into back side of uterus), vesicouterine pouch, serosal surface of uterus, fallopian tubes, round ligaments and rectovaginal septum. Depending on its location, patient may present with dysmenorrhea, infertility, irregular menstrual bleeding, generalised low back pain, dyspareunia, abdominal pain, and urinary complaints.[2]

Endometriosis-related subfertility has been linked to altered pelvic anatomy, molecular changes, hormonal imbalances, compromised folliculogenesis, compromised endometrial receptivity, and changed local environments.[3]

Laparoscopy, though invasive it is considered as gold standard for the definitive diagnosis and management of infertility associated with endometriosis because it will further help in management of endometriosis since macroscopic endometriosis can be removed by surgical intervention. More recently the trend is shifting towards laparoscopic evaluation of these patients and laparoscopic interventions are being preferred over laparotomy because of the obvious advantage of minimal damage to the healthy tissue, quick recovery, high magnification of lesions, early mobilization and comparatively less hospital stay.[4]

Various surgical techniques used in laparoscopy include laser vaporization, drainage and bipolar coagulation of cyst wall, endometrioma stripping, CO2 laser etc. Researchers still do not know which one is most effective at avoiding ovarian damage and gives better fertility outcome. Surgery can lead to reduction in ovarian reserve due to excessive stripping, coagulation and surgery induced inflammation.[5] So management of each case should be individualised and should be handled by skilled surgeons. Surgery should focus on two key areas: avoiding damage to the follicular tissue and avoiding postoperative adhesion formation.[6]

This study was done to find out the prevalence of endometriosis in infertile patients and to know the outcome after laparoscopic surgery.

Method

The study was conducted at department of obstetrics and gynaecology, silchar medical college between 01/06/2021 to 31/05/2022. The patients included in the age group 21- 40 years with primary and secondary infertility. History noted, pelvic examination done and clinical findings of fixed retroverted uterus with adnexal mass, deviation of uterus, restricted mobility, nodularity of POD etc were noted after taking informed consent. The cases were subjected for pelvic ultrasound to look for altered anatomy and associated lesions like endometrioma, uterine fibroid, adenomyosis etc.

After pre-operative investigations and pre-anaesthetic check up, patients were taken for laparoscopy under GA. Endometriosis staging was done using Revised-American Fertility Society (R-AFS) classification score. Scores 1 to 5 were classified as stage 1 (minimal), scores from 6 to 15 were stage 2 (mild), scores 16 to 40 with mild adhesions were classified as stage 3(moderate) and scores above 40 classified as stage 4 (severe). EFI score also calculated and chromopertubation done in all cases to know the tubal patency.

During laparoscopy, removal of endometriotic lesions were done by cystectomy, adhesiolysis, drainage and fulguration etc. All the specimens retrieved were sent for histopathological confirmation. Patients were followed up for confirmation. Ovulation induction given for stages 2,3 & 4. Those with severe disease were referred to higher centre for better options like IVF.

Results

Most affected age group was between 26-30 years (44%) followed by 21-25 years (27%). Frequency is comparatively less above 35 years.

Table 1: Showing distribution of patients according to age

Age (years)	Frequency (n)	Percentage (%)
21-25	5	27.8
26-30	8	44.4
31-35	4	22.2
36-40	1	5.6

Among 18 patients with infertility (25%) in our study, 33% had dysmenorrhea followed by chronic pelvic pain in 27.8%.

Table 2: Showing other symptoms in infertile patients with endometriosis

Symptoms	Frequency	Percentage (%)
Dysmenorrhea	6	33.3
Dyspareunia	1	5.6
Chronic Pelvic Pain	5	27.8

During laparoscopy, ovarian involvement was seen in 72% population. Left side was more involved than right side and bilateral involvement was seen in 4 patients. Peritoneal adhesions were seen in 88.8% of patients with endometriosis and POD involvement was seen in 61% cases. Uterine wall and uterine ligaments were involved in 38% and 33 % cases respectively.

Table 3: Showing sites of involvement of endometriosis

Site of Endometriosis	Frequency	Percentage (%)
Ovarian endometriosis	13	72
Right	7	53
Left	10	76
Bilateral	4	30
Uterine Wall	7	38
Uterine ligaments	6	33
Pouch of Douglas	11	61
Bowel involvement	2	11
Rectovaginal septum	2	11
Adhesions Peri-tubal Peri-ovarian	 8 12	 22 66

Haemorrhagic cyst was seen in 11.1% cases of endometriosis and PCOD was associated with 22% cases of endometriosis and fibroid was seen in 3 patients with endometriosis (16.7%).

Table 4: Showing associated lesions in patients with endometriosis

Endometriosis	Frequency	Percentage(%)
Haemorrhagic cyst of ovary	2	11.1
Fibroid	3	16.7
Polycystic ovarian disease	4	22.2
Hydrosalpinx	5	27

Bilateral tube was patent in 72% cases of endometriosis and unilateral patency was seen in 16.7% cases. Bilateral tubal blockage was seen in 2 cases out of 18 patients with endometriosis.

Table 5: Showing tubal patency in infertile patients with endometriosis

Tubal Patency	Frequency	Percentage (%)
Unilateral	3	16.7
Bilateral	13	72.2
Bilateral Blockage	2	11.1

Stage 3 endometriosis was seen in maximum number of cases comprising 38 %. second most common finding was stage 4 comprising 27 %. Third most common finding was Stage 2 endometriosis with 25% and least common was stage 1endometriosis comprising 2 cases only.

Table 6: Showing distribution of patients according to ASRM staging

Stage of endometriosis	Frequency	Percentage (%)
I	2	11.1
II	4	22.2
III	7	38.9
IV	5	27.8
Total	18	100

Out of 18 patients with endometriosis, endometrioma removal by cystectomy done in 61% cases and drainage and fulguration was done in 11% cases. Endometriotic deposits removed by excision using bipolar coagulation or deep cauterisation. Salpingectomy was done in 11% cases. Most of the cases had either peri-tubal or periovarian adhesions, adhesiolysis done in such cases (88%) and tried to preserve normal tubo-ovarian relationship.

Table7: Showing therapeutic procedures done during laparoscopy

Procedure	Number of cases	Percentage (%)
Cystectomy	11	61
Excision	6	33
Adhesiolysis	16	88
Drainage and Fulguration	2	11
Salpingectomy	2	11

Table 8: Showing EFI score of patients with endometriosis

EFI	No of patients	Percentage (%)	conception
0-2	0	0	0
3-4	8	44.4	0
5-6	5	27.8	2
7-8	4	22.2	4
9-10	1	5.6	1

44% of patients with endometriosis had an EFI score of 3-4, out of which none conceived within one year follow up. 27 % patients had an EFI score of 5-6 and 22% had an EFI score of 7-8. High conception seen among infertile patients with high EFI score.

Table 9: Showing conception rate in relation to ASRM stage of endometriosis

Stages of Endometriosis	1	2	3	4
Number of patients	2	4	7	5
Number of patients Conceived	2	3	2	nil
Ovulation Induction Given	nil	4	6	4
Percentage (%)	100	75	28	nil

All patients with stage 1 endometriosis conceived spontaneously following laparoscopic surgery and none conceived following surgery in case of stage 4 endometriosis. 28% of patients with stage 3 conceived following surgery and 75% of patients with stage 2 endometriosis conceived after surgery.

Ovulation Induction was given for patients with stage 2 endometriosis and above. All patients with stage 1 endometriosis conceived spontaneously within one year following surgery. Out of 4 patients with stage 2 endometriosis, 75% conceived within one year following surgery. 6 out of 7 patients with stage 3 endometriosis received ovulation induction with clomiphene citrate, of which 40% got conceived within one year follow up period. 80% patients with stage 4 disease received ovulation induction, but none got conceived neither with ovulation induction nor with laparoscopic surgery. This indicates that, rate of conception is low when the severity of endometriosis advances.

Discussion

In a study by New York Academy of sciences on endometriosis and infertility, the prevalence of endometriosis in infertility was about 25-40% (1989).[7] In a study by Meuleman C et al in 1991, prevalence of infertility in women with endometriosis is high as 30%.[8] According to a Hospital based retrospective study by VV Mishra et al in 2015, prevalence of endometriosis was found to be 48.38%.[9] The prevalence of endometriosis in the present study was 25%.

Table 10: Showing prevalence of endometriosis in different studies

Study	Prevalence (%)
Wheeler JM et al (1989)	40
Meuleman C et al (1991)	30
Mishra et al (2015)	48.38
Present study	25

Moradi M et al in 2014, conducted a qualitative descriptive study using semi-structured focus group discussions with 35 Australian women with endometriosis, noted 26-35 years age group is most commonly affected with endometriosis.[10] Rajeswari et al in 2016 noted 26-35 years is the most common age group affected by endometriosis.[11] Latika S et al in 2016, noted 69.3% of women with endometriosis belongs to 25-35 years.[12] In this study majority of the patients (44%) belonged to the age group of 26-30 years of the age. Many of the studies have reported similar age at which women are affected by endometriosis.

Giudice LC et al in 2010, stated that most common symptom of endometriosis is pain just before and during periods.[13] In another study by Swain S et al noted that 67.7% patients reported with dysmenorrhea followed by infertility.[14] In this study, 33% patients had dysmenorrhea and 27% had chronic pain followed by dyspareunia. So, dysmenorrhea is the most common presenting symptom in endometriosis.

In a study by Haider G et al (2010), 55% patients had primary infertility and 30% had secondary infertility.[15] In our study 83% patients were primarily infertile and 16% secondarily infertile. So, primary infertility is more in endometriosis than secondary infertility.

Staging of the disease was done based on Revised American Fertility Society criteria.[14] In the present Study, 38% infertile patients had stage 3 (moderate) endometriosis, 27% had stage 4 (severe) disease, 22% had stage 2 (mild) disease and 11% had stage 1 (minimal) disease. Rajeswari M et al also noticed high prevalence of stage 3 in their study and least was stage 4.[11] In another study by Swain S et al, stage 2 endometriosis was seen in maximum number of cases in the study group (46%) and least was stage 4.[14]

Table 11: Showing most commonly affected stage in endometriosis

Study	Stage of Endometriosis
Rajeswari M et al (2016)	Stage 3
Swain S et al (2018)	Stage 2
Present Study	Stage 3

Ovary is the most common site involved in this study comprising 77% followed by POD (61%) cases. Chocolate cyst was seen in 78% cases and bilateral involvement seen in 28% cases and ovarian endometriotic deposits were seen in 14 % cases. Latika S et al in 2016 and Swain S et al in 2018, stated that ovary is most commonly involved in endometriosis.[12,14] Similiar studies conducted by Macer M et al (2012), Valson H et al (2016), Prescott J et al (2016), Sharfuddin S et al (2020) showed ovaries to be one of the common sites for endometriosis.[16,17,18,19]

The associated conditions seen in this study during laparoscopy include hydrosalpinx (27.8%), PCOD (22%), fibroids (16%) and haemorrhagic cyst (11%). Latika S et al noticed fibroids in 27% cases followed by hydrosalpinx.[12] Swain S et al noticed Hydrosalpinx in 11.6% cases followed by fibroid in 5.8% cases.[14] In another study by Swapna Y et al in 2019, PCOD, genital koch's and fibroids were seen associated with endometriosis.[20]

Table 12: Showing associated lesions in endometriosis in different studies

Study	Associated Lesions
Latika S et al (2016)	Fibroid
Swain S et al (2018)	Hydrosalpinx
Swapna Y et al (2019)	PCOD
Present study	Hydrosalpinx

In this Study, Patients with EFI score 5-10 has good conception rate (70%) compared to lower EFI score of 0-4. Vesali et al in 2020, found that non ART pregnancy rates in patients with EFI score 0-2 to be 16%, 2-4 to be 18%, 5-6 to be 44% and 7-8 to be 55%.[21] According to a study by Kavya VK et al in 20,[22] percentage of spontaneous conception was zero for EFI score 0-2,20% for score 3-4, 54% for score 5-6, 93.3% for score 7-8 and 100% for score 9-1022.

Table 13: Showing conception rate based on EFI score in different studies

EFI Score	0-2	3-4	5-6	7-8	9-10
Vesali et al (2020)	16%	18%	44%	55%	100%
Kavya V K et al (2022)	Nil	20%	54%	93.3%	100%
Present study	Nil	nil	28%	57%	70%

According to a study by Valson H et al (2016) in Kerala, On chromopertubation among 33 cases of infertile patients with endometriosis, Bilateral tubes were found to be patent in 20 cases (66.6%) cases and bilateral and unilateral tubal blockage was seen in 10 (30.30%) and 3 (9.09%) cases respectively.[17] In another study by Sharfuddin S et al in 2020, bilateral fallopian tubes were found to be patent in 16 (69.5%) cases and unilateral and bilateral tubal blockage was seen in 4 (17.39) and 3 (13.04%) cases respectively.[19] In our study, bilateral tubes was found to be patent in13(72.2%) cases and U/L and B/L tubal blockage was seen in 3 (16.7%) and 2 (11.1%) cases respectively.

Various studies have confirmed that the laparoscopic interventions are helpful in diagnosing as well as treating endometriosis related infertility. Various procedures which can be undertaken for treating endometriosis include cystectomy, Adhesiolysis, drainage and fulguration, excision of endometriotic deposits, salpingectomy etc.[14] In a study by Valson H et al (2016), Cystectomy was done in 24% cases, chocolate cyst drainage and fulguration done in 8% cases, Adhesiolysis and remodelling of anatomy was done in 18% cases and 50% treated with bipolar cauterisation and scissor excision of deep lesions.[17] In a study by Latika S et al, 69.2% patients undergone endometrioma removal by cystectomy, 30.8% cases treated with drainage and fulguration and adhesiolysis was done in 84.6% cases.[12] Sharfuddin S et al subjected patients for cystectomy (30.43%), endometrioma drainage and fulguration (13.04%), adhesiolysis (34.78%) and deep cauterization (21.74%).[19] In this study, following laparoscopic procedures were done, which includes Adhesiolysis (88%), cystectomy (61%), Excision of endometriotic deposits by deep cauteriastion or bipolar coagulation (33%), salpingectomy (11%) and endometrioma drainage in 2 (11%) cases.

Table 14: Showing most commonly done procedures in laparoscopy in different studies

Study	Most common procedure for endometriosis	Most common procedure for Endometrioma
Valson H et al (2016)	Bipolar cauterisation	Cystectomy
Latika S et al (2016)	Adhesiolysis	Cystectomy
Sharfuddin S et al (2020)	Adhesiolysis	Cystectomy
Present study	Adhesiolysis	Cystectomy

Retrospective analysis of 64 individuals with infertility and laparoscopic staging I to IV was done in 2007 by Fuchs F. et al. All were given laparoscopic treatment, however 20 were later cut from the trial (reason unspecified). Within 8.5 months, 22 patients (or 65%) became pregnant. Within a month of surgery, 89% of women with stage I-II disease and 56% of women with stage III-IV disease were pregnant. They recommend complete laparoscopic surgical treatment for such patients to increase their chance of pregnancy either spontaneously or with ART.[23]

In a study by Latika S et al, 76.9% patients ovulated following ovulation induction. 6 out of 10 patients conceived. IVF done for 3 patients and one of them conceived. 7 patients undergone IUI of which 5 got conceived. All of them conceived within 6 months of surgery.[10]

In a study by Valson H, 33 cases of endometriosis undergone laparoscopic surgery of which 12(36.36%) cases got conceived.7 patients got conceived naturally with ovulation induction. 2 patients got conceived by clomiphene and gonadotrophin induction with IUI. Another 3 conceived by ART in the nearby fertility centre.[17]

In a study by Sharfuddin S et al, 18 patients had successful ovulation after endometriosis surgery, out of which 12 patients completed their pregnancy successfully either spontaneously or with IVF.[19]

According to an article by Paulson J D et al in 2006, the rate of conception for minimal endometriosis was 75%, 62% for mild disease, 42.1% for moderate disease and 40-50% for severe stage of endometriosis.[24]

In a study by Swapna Y et al (2019), patients were followed for spontaneous conception 6 months following surgery, those who didn't conceive that period were given ovulation induction with clomiphene citrate and GnRH analogues and then followed up for 6 more months. The patients who did not conceive during that period were then considered for ART. The spontaneous pregnancy rates were 80%,75%,64% and 42% in minimal, mild, moderate and severe endometriosis respectively. Conception rate was 89%,80%,72% and 52% for minimal, mild, moderate and severe endometriosis respectively, following ovulation induction post laparoscopic fulguration. Following ART, conception rate was 11%,20%, 29% and 45% for stage1, stage 2, stage3 and stage 4 endometriosis respectively.[20]

In our study,100% patients with stage 1 disease conceived spontaneously following surgery, 75% of patients with stage 2 disease and 28% patients with stage 3 endometriosis conceived either spontaneously or with ovulation induction. As the severity of disease increases, conception rate reduces.

Table 14: Showing conception based on stage of endometriosis in different studies

Study	Stage 1	stage 2	stage 3	stage 4
John D Paulson (2006)	75%	62%	42.1%	40-50%
Swapna Y et al (2019)	80%	75%	64%	42%
Present Study	100%	75%	28%	nil

Conclusion

Endometriosis is the one of the common causes of infertility. Laparoscopy enables us to diagnose the disease, treating the disease, staging endometriosis, assessing the severity of disease and also helps in taking decision regarding further management. Every effort should be made to remove visible endometriotic lesions actively at first laparoscopy itself and should be done by a skilled surgeon by maximally preserving normal ovarian tissue. Adequate surgical treatment with laparoscopy improves the conception rates in endometriosis.

From this study, we can conclude that chance of infertility increases when the severity or stage of endometriosis increases. Conception rate is good after laparoscopic surgery, if the patient is in early stages of disease. Conception rate decreases when the severity of endometriosis increases. Laparoscopy helps in calculating EFI score of endometriosis and helps in planning further treatment. Conception rate was found to be high in those with high EFI score. It is better to consider artificial reproductive techniques in those with low EFI score, as the chance of spontaneous conception was found to very low in such patients. Management of infertility in endometriosis is individualized based on patients choice, financial status, availability of resources and not as per fixed protocols.

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