

## Fertility and Pregnancy Following Surgical Management of Endometriosis

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### Abstract:

**Background:** Endometriosis is common in infertile women (35 – 50%) Vs (5%) in fertile women. Fertility is increased in surgically treated endometriosis patients.

Aim of the study is to follow up the patients after surgery for fertility outcomes.

**Methodology:** It was a retrospective study done at RMC LLP, over a period of 5 years (2013 to 2017). 578 patients underwent laparoscopy for infertility. 168 patients had endometriosis (29%). 154 patients met with the inclusion criteria. Fertility and pregnancy outcome were studied.

**Following parameters were analyzed:** Age, stage, mode of treatments, follow up and outcome were studied. Incidence of abortion, ectopic pregnancy, PTL, placenta previa, PIH, GDM, IUGR, mode of delivery, PPH and neonatal outcome were analyzed.

**Results:** Among 154 patients, majority were ranging from 20 years to 35 years. These patients were staged as minimal & mild endometriosis 63/154, moderate endometriosis 43/154 and severe stages of endometriosis 48/154, according to r ASRM classification.

Among 125 patients who delivered, only 10 were pre term. 42 patients delivered vaginally and 83 patients by LSCS. Common complications were PIH, GDM, Placenta previa, PPH and IUGR and no abortion or ectopic pregnancy. Of the 11 patients who underwent IVF 10 conceived by self-stimulation and 1 patient conceived with donor egg.

**Conclusion:** Following surgery, there was increased pregnancy rate in stage I and II Vs stage III and IV. 80% conceived spontaneously and 20% needed either OI, OI with IUI and ART. The complications during pregnancy were similar to non-endometriotic patients. Monitoring helps to overcome the complications and achieve a good materno-fetal outcome.

**Keywords:** Endometriosis surgery, fertility treatment, pregnancy and materno-fetal outcome.

### Introduction:

Endometriosis is an enigmatic disease which occurs in 6 to 10% of the general female population<sup>1</sup>. It is more common among infertile women 35 – 50% Vs 5% in fertile women. 25 – 50% of endometriotic women are infertile<sup>2</sup>. In a study by V.V. Mishra in the year 2015, among women with chronic pelvic pain 83% have endometriosis<sup>3</sup>. According to the study by P. Das Mahapatra of Endometriosis Society India (ESI) 2007, at least 26 million women of age between 18 – 35 are affected by endometriosis in India<sup>4</sup>. In 2017,

ESI claims 33% of women of reproductive age group are affected by endometriosis. 5% of girls less than 18 years who complained of dysmenorrhea are affected by endometriosis.

There are various theories suggested for the origin of endometriosis. They are retrograde spill theory of Sampson (1925), Ivan off Meyer's metaplastic theory (1924), hormonal theory of Novak 1931 (Estrogen dependent & progesterone resistant theory), inflammatory and oxidative stress theory of Murphy (1998), immunological theory by Semino (1995),

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Suppression of apoptosis by Ferryman 1994 & Taniguchi 2011, genetic theory by Hadfield 1994 & Albentsen 2013 and stem cell theory by Kato 2012 & Deane 2013.

Other factors are environmental pollutants causing endocrine disruption. They are PCBs, TCDD, Cadmium and Dioxin. Mullerian anomalies with or without obstruction can also cause endometriosis.

Incidence of endometriosis among infertile women by a study from our institute published in 2016 shows 34.2% Vs 54.98% by Dr. Vineet Mishra's study in 2015<sup>3</sup>. Our study showed 40% of minimal and mild endometriosis and 60% of moderate and severe endometriosis, whereas Dr. Vineet's study showed 66% of minimal to mild endometriosis and 34% of moderate to severe endometriosis<sup>3,5</sup>.

Symptoms of endometriosis are grouped as 7D's namely dysmenorrhea, dyspareunia, dysuria, dyschezia, dysfunctional uterine bleeding (D/AUB), difficulty in conception and diffuse abdominal pain.

Laparoscopy is the gold standard in diagnosis and treatment of endometriosis. Senior surgeons can pick up even the early lesions and if proper treatment is given it can improve fertility, reduce pain and prevent recurrence.

Monthly fecundity rate in normal couple is 15 – 20% Vs 3 – 5% in untreated endometriosis depending upon the age and stage of the disease. 30 - 40% of women with endometriosis conceive spontaneously. Many conceive following treatment by Medically Assisted Reproduction (MAR) or Assisted Reproductive Technology (ART).<sup>6</sup>

### **Aim of the study:**

Aim of the study is to analyze the outcome of varying methods of surgical treatment of endometriosis like cauterization, excision, adhesiolysis and cystectomy, depending upon the stages of the endometriosis. These patients are followed after surgery for infertility management. They were advised to plan spontaneous

conception and some patients needed Ovulation Induction (OI), OI with Intra Uterine Insemination (IUI) and Assisted Reproduction Technology (ART), depending upon the age, stage, years of marital life, male factor and tubal factor. Fertility is enhanced following surgery either spontaneously or augmented with OI alone or OI and IUI or ART. These patients were followed up during subsequent pregnancy and maternofetal outcome were studied.

### **Materials and Methods**

This was a retrospective study done at Ramakrishna Medical Centre LLP, a 40 bedded hospital. The records of the hospital were used to retrieve case details over a duration of 5 years (January 2013 to December 2017). 578 patients underwent diagnostic hystero laparoscopy for infertility.

#### **Inclusion Criteria:**

Patients coming for fertility treatment with endometriosis.

Both primary and secondary infertile patients were included.

Patients not conceived earlier with unprotected intercourse or fertility treatment.

#### **Exclusion Criteria:**

Non-compliant patient

Not keen on conception

Unmarried

168 patients who had endometriosis were included in the study (29%). 154 out of 168 patients were included in the study and fertility treatment was provided either in our place or outside. Following parameters were analyzed: Age, staging of disease, mode of surgical treatment, fertility treatment offered (Spontaneous, OI, OI with IUI and ART). Incidence of ectopic, miscarriage, pregnancy associated complications like Pregnancy induced Hypertension (PIH), Gestational Diabetes Mellitus (GDM), placenta previa, Intrauterine growth restriction (IUGR), gestational age at the time

of delivery, route of delivery, Post-partum hemorrhage (PPH) and neonatal outcome were studied.

Most patients had treatment and follow up in our set up and few were treated outside, whose details were obtained over the telephone. SPSS (IBM SPSS Statistics for Windows, Version 20.0) was used to analyze data.

### **Surgical techniques used in our patients:**

Surgery was done in all patients by the same surgeon and the same technique was followed. Stage I and II patients underwent laparoscopic cauterization of the lesions using bipolar cautery or excision. In stage III and IV patients underwent laparoscopic adhesiolysis to regain the anatomy of the pelvis and Pouch of Douglas. Ovarian cystectomy or cyst aspiration and cauterization was done depending upon the size of endometrioma. Cystectomy was done in all endometriomas except smaller ones as there is risk of losing ovarian tissue in the smaller ones. In patients with larger endometrioma and normal Anti-mullerian hormone (AMH) levels cystectomy was done. In patients with smaller endometrioma and low AMH levels cyst aspiration and minimal cauterisation was done. Use of bipolar cautery was minimized. Following cystectomy ovary was reconstructed by approximating the ovarian walls. Suturing was hardly done (ESHRE guidelines 2014). In few cases whenever there was presence of hydro-salpinx cornual clipping was done. Adhesion preventing barriers were used whenever necessary<sup>7</sup>. Excision of pelvic implants, resection of recto vaginal endometriosis, myomectomy and adeno myomectomy were done whenever necessary<sup>7</sup>. Whenever tissue samples were available, they were sent for biopsy and diagnosis confirmed by histopathology.

Patients on stage I and stage II who were young with good AMH, normal tubal factor and normal male factor were advised to plan spontaneous pregnancy. Few patients were treated with dydrogesterone post operatively. 12% of the patients in stage I and II conceived with this modality of treatment. This drug

being a retro progesterone will not inhibit ovulation, normalises the endometrial milieu by the virtue of its immune modulatory effect, promotes fertility and prevents recurrence of pain and the lesion. This drug also helps to overcome miscarriage rate when they conceive<sup>8,9,10</sup>.

In young patients with moderate male factor, in all stages of endometriosis, controlled Ovarian Hyperstimulation (COH) with IUI was advised as it promotes fecundity to near normal. IUI was tried for three cycles. If there was no conception, they were suggested ART.

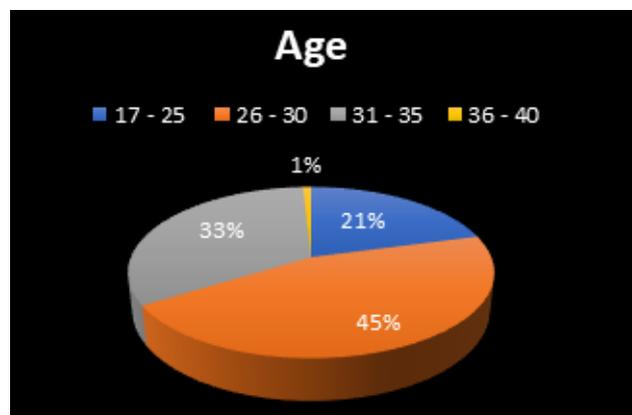
Elderly patients with low AMH levels, severe endometriosis, tubal factor and male factor were advised early ART. Pregnancy rates, mode of conception and pregnancy outcome were studied.

### **Results:**

Out of the 578 patients who underwent diagnostic hystero laparoscopy for infertility, 168 patients had endometriosis. Out of 168 patients operated for infertility and endometriosis we have included 154 patients as per the inclusion criteria.

### **Demographic data:**

Among the 154 patients, majority belonged to the second and third decade of life (ranging from 20 years to 35 years) (Fig: 1).

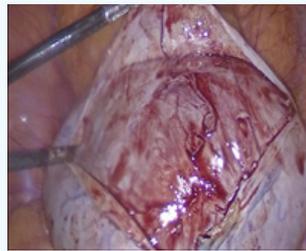


**Fig: 1 – Age of the patients**

The patients were grouped in this study under three categories early (minimal and mild), moderate and severe endometriosis (Fig: 2 – 4).



**Fig: 2 – Early endometriosis cauterization**

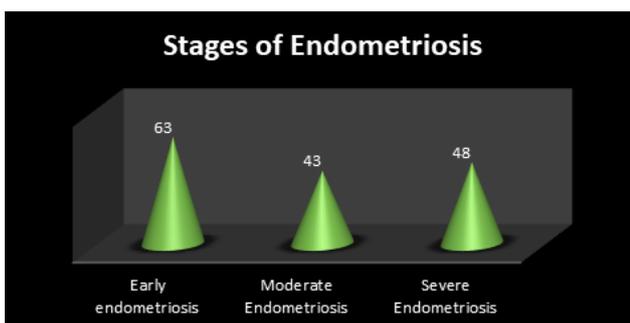


**Fig: 3 - Cystectomy**



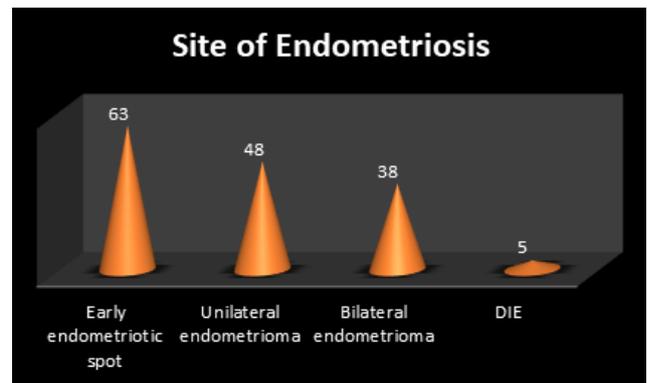
**Fig: 4 - Severe Endometriosis**

No particular stage showed significant predominance over the others. Early endometriosis – 63 (40.9%), Moderate endometriosis – 43 (27.9%) and Severe endometriosis – 48 (31.2%) (Fig. 5).



**Fig: 5 – Staging of study participants**

Pelvic endometriosis was seen in 63 cases, 48 patients had unilateral endometrioma and 38 patients had bilateral endometrioma, 5 patients had deeply infiltrating lesions. Peritoneal endometriosis was seen along with endometrioma and DIE (Fig: 6).



**Fig: 6 – Site of endometriosis**

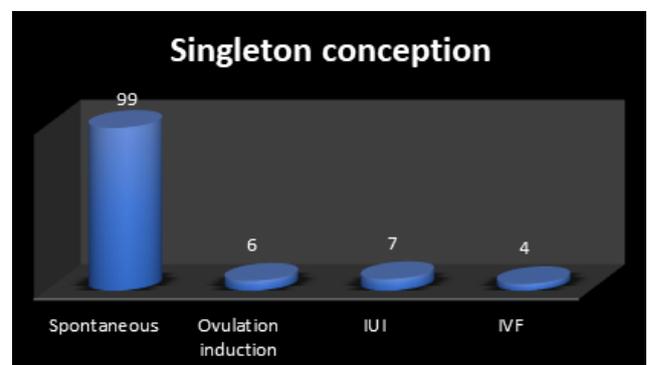
On follow up of 154 patients 125 conceived and delivered.

Mode of conception: Spontaneous – 100, Ovulation induction – 6, OI with IUI -8, ART – 11.

ART was indicated straight away in 8 patients due to severe male factor and tubal factor. 3 patients underwent ART following failed IUI. Conception rates were high soon after the surgical management and majority of them conceived within the first 2 years. Rate of conception reduces as years goes on.

### Singleton conception:

116 patients had singleton babies. Among the singleton conceptions 99 were spontaneous, 6 patients conceived through OI, another 7 patients conceived through OI and IUI. 4 patients had been treated with ART (Fig: 7).



**Fig: 7 – Modes of conception in singleton birth**

### Twin conception:

Twin conception was seen in 9 babies. Of which, 1 was spontaneous, 1 was IUI and 7 were ART (Fig: 8).

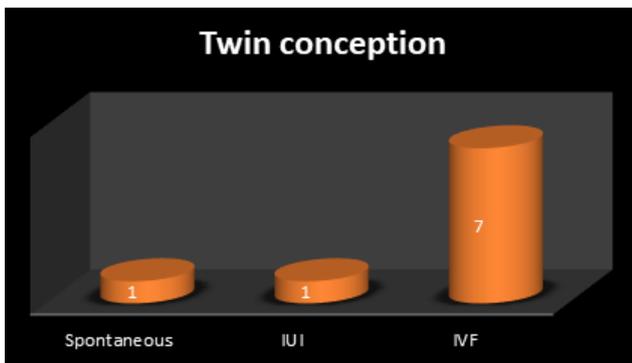


Fig: 8 – Modes of conception in twin birth

### Conception rates based on endometriotic staging was:

Minimal & Mild endometriosis - 59/63 = 93%

Moderate endometriosis - 38/43 = 88%

Severe endometriosis - 28/48 = 58% (Fig. 9 & 10)

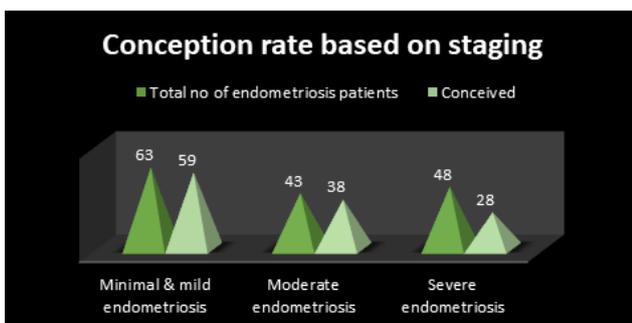


Fig: 9 – Conception rate based on staging

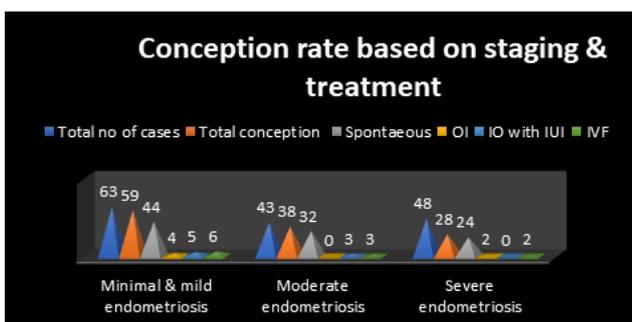


Fig: 10 – Conception rate based on staging and treatment

### Mode of delivery:

Of the 125 patients who delivered, 10 were pre term, rest delivered beyond 37 weeks.

42 patients delivered vaginally (singleton-41, twins-1) and 83 patients delivered by LSCS (singleton – 75, twins - 8).

Mode of delivery (Singleton): (Fig. 11)

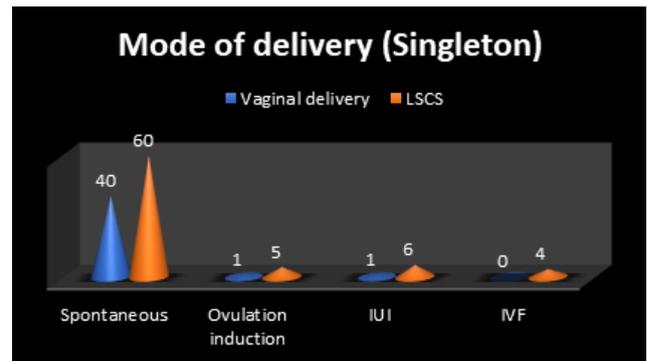


Fig: 11 – Comparison of mode of conception and mode of delivery in singleton births

Mode of delivery (Twins): (Fig. 12)

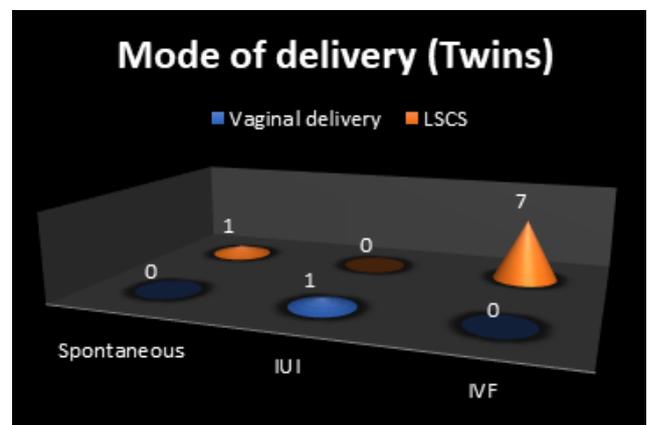


Fig: 12 – Comparison of mode of conception and mode of delivery in twin births

### Complications:

No patient had miscarriage following treatment though there was history of miscarriage among 61/154 patients, IUD in 3/154, still birth in 1/154 prior to treatment. 65 patients were treated for secondary infertility while the remaining had primary infertility.

There is no incidence of abortion or ectopic pregnancy after surgical correction.

Common complications observed in this study were PIH, GDM, placenta previa, IUGR and PPH. No patient needed blood transfusion.

Twinning incidence was seen in 9/ 125(7.2 %), incidence of HT disorder was 8/125(6.4%), GDM 29 / 125 (23.2%), preterm labour 10/125 (8%), placenta previa – 2/125 (1.6%), mode of delivery vaginal 42/125 (33.6%) and LSCS 83/125 (66.4 %) and PPH

– 3/125 (2.4%) (Fig: 13). The incidence of GDM was slightly higher in our study, while other complications were comparable to the general incidence. Few patients who had hypothyroidism were supplemented with thyroxine.

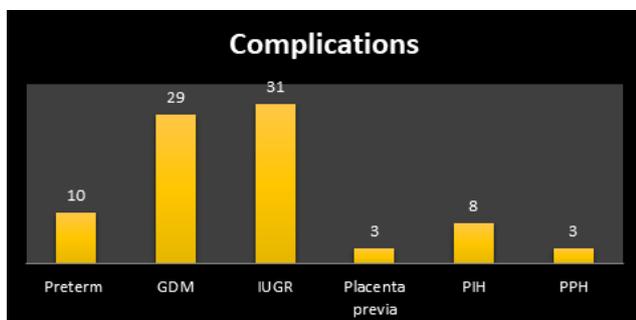


Fig: 13 – Complications observed in surgically managed endometriosis patients in the study

### Perinatal complications:

Baby weight less than 2.5 kg (IUGR) was seen in 31 /125 (24.8%) (Fig: 14). Rest of the babies were ranging between 2.6 to 4.5kgs. 8 babies weighing less than 2 kg needed NICU care. IUGR incidence was higher than the normal population.

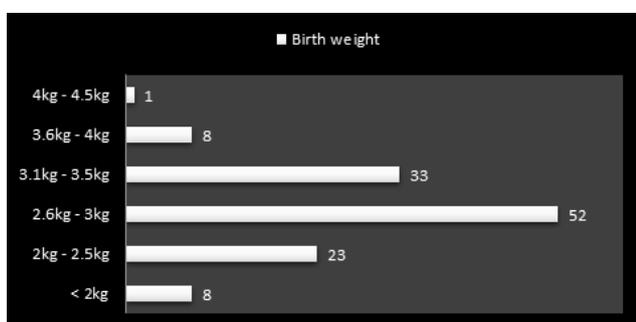


Fig: 14 – Comparison of birth weight of the babies

## Discussion:

### Mechanism of infertility in endometriosis:

There are several mechanisms causing infertility

1. Anatomical
2. Peritoneal factors
3. Implantation abnormality
4. Abnormal oocyte quality and embryo quality

### Anatomical factors:

There is severe dyspareunia which reduces the incidence of coitus. There is alteration of tubo-ovarian relationship, associated tubal pathology, interference with oocyte pickup and transport of oocyte and altered sperm motility. Ovarian endometrioma may destroy the ovarian cortex and lead to oligo or anovulation. Regarding the oocyte there is abnormal folliculogenesis, luteinized unruptured follicles, fewer oocytes, poor oocyte quality and reduced fertilization and cleavage rate<sup>10, 11</sup>.

The sperms and oocyte are exposed to the hostile environment of the peritoneal cavity. The macrophages, T. Lymphocytes, cytokines and vasoactive substances promote pro inflammatory environment which persists in all stages of endometriosis<sup>12-14</sup>. They destroy the sperm and oocyte and impair fertilization. Implantation of the embryo is also affected due to progesterone resistance in the eutopic endometrium. There is decreased expression of integrins and HOXA genes.<sup>15, 16, 17</sup>

The embryo quality is poor with low number of blastomeres which gets arrested by 72 hours<sup>18</sup>. Donor oocytes implant well and at the same time, oocytes from endometriosis patient fails to implant in healthy women<sup>19</sup>.

In the follicular fluid of endometriosis, there is increase in VEGF. Interleukin 1, pro inflammatory cytokines, NK cells, B lymphocytes and monocytes are also increased. There is also increased peritoneal prostaglandins concentration which interferes with ovulation, tubal peristalsis, reduced sperm motility and increased uterine contractility which interferes with implantation.

Treatment of infertility in patients with endometriosis depends upon the age of the patient, severity and duration of symptoms, stage of the disease, previous treatment taken, years of marital life, ovarian reserve and the male factors. Current options available for management of infertility in endometriosis are expectant, medical management, surgery, ART and

combination of all these treatments.

Phenotypes of endometriosis are superficial peritoneal endometriosis and ovarian surface endometriosis which are classified as minimal and mild stages of endometriosis. Ovarian endometrioma and DIE constitute the moderate and severe stages of endometriosis, which can lead to frozen pelvis. Adenomyosis forms a special category.

In minimal to mild endometriosis there are not much of anatomical abnormalities, still infertility occurs due to abnormal immunological factors and elevated pro inflammatory substances. In moderate to severe endometriosis all the probable reasons for infertility occurs such as anatomical and immunological factors. Invariably tubal patency is maintained. The mild and moderate lesions can be treated more successfully than the severe forms.

### **Management:**

Expectant and medical management gives poor results (ESHRE guidelines). Minimal and mild endometriosis are often treated as unexplained infertility. OI and OI with IUI can improve the pregnancy rate marginally.

Expectant management can be considered in young women, up to 2 years of marital life.

Medical management in the form of OCPs, danazol, GnRH analogues and dienogest will not improve pregnancy. They are used in endometriosis associated pelvic pain management. Beyond this, laparoscopy is ideal in cases of unexplained infertility. In the presence of early endometriosis, cauterization, coagulation, excision and laser vaporisation of the implants can be done<sup>20</sup>. This may reduce the disease progression. Though spontaneous pregnancy can occur, it is better to treat them with OI and OI with IUI<sup>21</sup> especially if there is moderate male factor, tubal factors and women <35 years.

In severe male factor, women with low ovarian reserve and age more than 35 years, ideal is to go for ART. ESHRE guidelines 2014 and FOGSI GCPR 2018

recommend early OI and OI with IUI in stage I and II endometriosis to improve the monthly fecundity rate and cumulative pregnancy rate. In rest of the patients early ART is advised.

Surgical management of stage I and II endometriosis improves the fecundity rate, and improves spontaneous pregnancy rate 30.7% Vs 17.7%. There is improvement of pregnancy rate according to Canadian collaborative study group (Marcoux et al) after surgical management. But the Italian group Parazzini et al says that there is no difference in surgical resection or ablation Vs diagnostic laparoscopy in treatment of stage I and II endometriosis. ESHRE recommends excision and ablation of the endometriotic lesions rather than diagnostic laparoscopy to promote fertility. CO2 laser vaporisation gives better results than coagulation.

In cases of moderate to severe endometriosis which are easily picked up by imaging modalities, ideal way is to go for operative laparoscopy done by senior consultants who are experienced in endometriosis surgery. Endometriomas which are symptomatic may need surgery. This improves fecundity by removing the endometriotic implants and the endometriotic cysts thereby restoring the pelvic anatomy which promotes fecundity. Surgery can also improve the endometriosis associated pelvic pain. Usually during laparoscopy adhesiolysis, reformation of the Pouch of Douglas and removal of the endometriotic cysts and fibrosed tissues are done. Surgeon has to be very careful not to remove the healthy ovarian cortex and the cysts are enucleated up to the base which is cut and cauterized<sup>22, 23</sup>. Minimal use of energy sources should be used, so that, there won't be reduction in ovarian cortex. Pre-operative assessment of AMH levels has to be done prior to any endometriotic surgery. In patients with good AMH levels cystectomy is ideal which will prevent recurrence. In patients with poor AMH levels, laparoscopic cyst aspiration is preferred over cystectomy.

Medical management will improve the pain but not the fecundity. ESHRE guidelines 2014 advises that there is no role for pre-operative and post-operative

medical management in treatment of infertility.

If the endometrioma is less than 3 cm, ART can straight away be done reducing the time and surgical cost. Endometriosis associated pelvic pain necessitates surgery in moderate to severe endometriosis.

At times, ART bypassing surgery may not give good results, because of anatomical abnormality like pelvic adhesion, hydro-salpinx, endometrioma pressing the ovarian cortex and having high oxidative stress levels. There may be poor response to COH, difficulty in oocyte pick up, poor oocyte quality and sub optimal endometrial receptivity. Surgical reduction of the volume of endometriosis reduces the adverse immunological impact on oocyte quality and endometrial receptivity.

### Surgery for endometriosis prior to ART:

Surgery is indicated prior to ART when endometrioma is associated with pain, difficulty in oocyte retrieval and suspicious of malignancy. This may reduce the ovarian reserve and reduce AMH level initially. Once when the endometrioma is removed, it improves the oocyte quality, but the number may be reduced. The fertilization rate, implantation rate improves after surgery. Repeat surgery for recurrent endometriosis should be done carefully as it can decrease AMH levels > 60% and lead to poor oocyte retrieval (23). In such patients ART is preferred over repeat surgery.

### Pre ART-Treatment:

As a part of pre-ART treatment GnRH Analogues are given for a period of 3 to 6 months. This will improve the outcome of ART by four-fold. But this can increase the requirement of gonadotropins during stimulation<sup>24</sup>. Hence, stimulation can be done after 1 or 2 doses of GnRH analogues and embryo freezing is advised. Embryo transfer is done following 1 or 2 doses of GnRH Analogues. Subsequent FET gives almost the same results as that of tubal infertility. GnRH Analogues are supposed to modulate the NK cell activity, decrease aromatase expression, E2

levels and reduces progesterone resistance. There are few studies where they used COCs, Dienogest<sup>25</sup> or Cabergoline<sup>26</sup> prior to ART cycles with equally good results.

In Swedish study of 1,442,675 singleton births, 8922 women with endometriosis were included. 11.9% of patients with endometriosis had conceived after ART<sup>27</sup>. In our study, 8.8 % patients conceived through ART.

Effect of endometriosis upon pregnancy (Fig: 15, 16, 17):

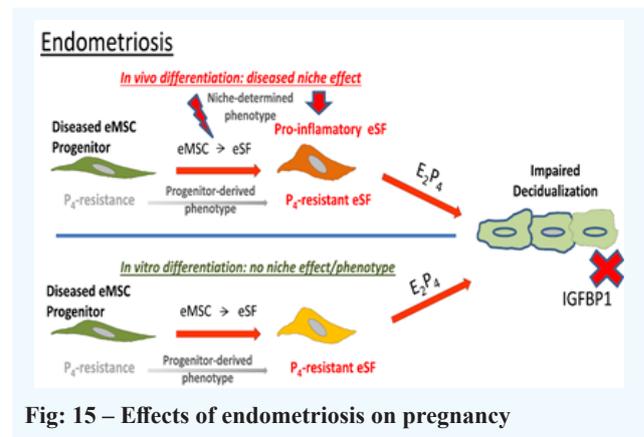


Fig: 15 – Effects of endometriosis on pregnancy

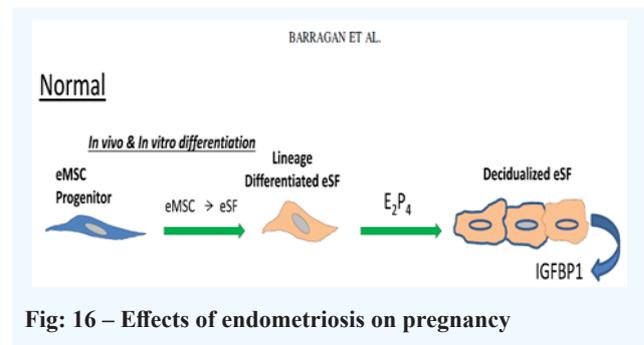


Fig: 16 – Effects of endometriosis on pregnancy

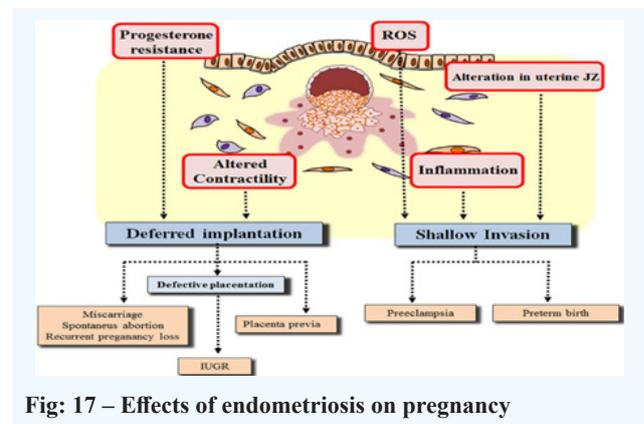


Fig: 17 – Effects of endometriosis on pregnancy

Patients who conceived following endometriosis treatment are at a slightly higher risk of developing

adverse effects than non-endometriotic patients.

In normal pregnancy, normal endometrial mesenchymal progenitors differentiate both in vivo and in vitro to endometrial stromal fibroblasts that decidualize in response to progesterone.

In endometriosis, endometrial stromal fibroblasts display progesterone resistance with impaired decidualization in vivo and in vitro. Hence, they are at a high risk of antenatal complications.

### **Endometriosis and adverse pregnancy outcomes:**

Early pregnancy complications are miscarriage and ectopic pregnancy.

Late pregnancy complications include antepartum haemorrhage, hypertension, preterm labor, increased risk of caesarean section and stillbirth. There is altered eutopic endometrium in endometriosis which could be the cause for higher miscarriage rate. Endometrial biopsies taken during the implantation window from women with subfertility and advanced (stages III and IV) endometriosis showed altered glycosylation. These findings are relevant to implantation failure as blastocyst attachment depends on interaction with the glycocalyx of the luminal epithelium.

Endometriosis and miscarriage current evidence:

Out of 14655 women followed up for 30 years between 1981 and 2010 was reported at ESHRE in Lisbon 2015, compared the reproductive and pregnancy outcomes in

5375 women with endometriosis with those of 8280 women without endometriosis pregnant at the same time. The study showed higher risk for miscarriage (Odds Ratio 1.76). Risk of miscarriage is 1 in 4 in endometriosis compared to 1 in 5 in general population<sup>28</sup>.

A study from Eastern Townships of Canada, over a 12-year period included 31068 pregnancies, of those 784 were women with endometriosis (2.5%). In 183/784 pregnancies in women with endometriosis, an adverse outcome was recorded (23.3%) The risk of miscarriage was almost twice than in women without endometriosis<sup>29</sup>. Surgical treatment reduces miscarriage rate from 63% to 0% which is similar to our study.

Miscarriage rate is high (26%) in ovarian endometriomas. Probable reason for miscarriage is oocyte genotoxic effect induced by iron loaded pseudocyst fluid, altered hormonal productivity, altered milieu of endomyometrial junction and increased aromatase action.<sup>30</sup>

Cytokine production by NK cells facilitates decidualization, controls trophoblastic invasion and promotes angiogenesis at implantation site. In women with endometriosis there is functional defect of NK cell activity, corpus luteal defect, autoimmunity, increased levels of prostaglandins, reduced endometrial expression of alpha Integrin and HOXA genes.

### **Endometriosis and ectopic pregnancy:**

Ectopic pregnancy though rarer 1 in 100, the risk is more than doubled in women with untreated endometriosis (Odds Ratio 2.7) was

reported by Lucky Saraswat & Andrew Horne, Aberdeen Royal Infirmary, U K ESHRE 2015 (28).

### **Endometriosis and placenta previa:**

Risk is increased due to abnormal frequency and amplitude of uterine contraction. There is an anomalous blastocyst implantation due to uterine dysperistalsis. Incidence of placenta previa is 7.6% in DIE, 2.1% in peritoneal along with ovarian endometrioma and 2.4% in peritoneal endometriosis. There was no case of placenta previa reported in ovarian endometrioma alone. The risks of preterm birth and placenta previa were significantly increased in the women with rASRM stage IV endometriosis compared to the women with rASRM stage I-III endometriosis. Increased risk of placenta previa is associated with endometriosis than tubal factor infertility in ART<sup>31,32</sup>.

### **Endometriosis and preterm birth:**

Altered eutopic endometrium due to molecular aberrations leads to preterm birth. Increased production of estrogens, cytokines, PGs and MMPs, increased expression of aromatase, COX2, PGE2 and PGF2 alpha in uterine and endometriotic tissues favors proliferative and pro-inflammatory characteristics which will increase uterine contractions and lead to preterm birth<sup>33</sup>.

The risk of preterm birth associated with endometriosis among women with ART was 1.24 and among women without ART 1.37, according to ESHRE in 2009 by Henrik Falconer of the Dept of Woman and Child Health, Karolinska Institute, Stockholm,

Sweden.

### **Data of Japan Environment and Children's study (JECS):**

Out of 9186 pregnant women with endometriosis, 4119 (44.8%) had obstetric complications like pre term, PROM, placenta previa and abruption increased regardless of ART. Uterine contractility may lead to implantation in lower uterine segment and increases the risk of placenta previa. Incidence of preeclampsia did not show an increase.

### **Endometriosis and Pre-eclampsia:**

Absence of remodeling of spiral arteriole is a typical feature of Pre-eclampsia. Partial vascular remodeling is associated with pre-term labour, PROM and IUGR without hypertension. These warrant increased monitoring of women with endometriosis by USG to identify complications such as Ante-partum hemorrhage and Pre term labour (28).

### **Endometriosis & Fetal Growth Restriction:**

No association was observed between endometriosis and risk of IUGR or stillbirth according to Stephansson O, Kieler H, Granath F, Falconer<sup>34</sup>.

### **Endometriosis & Obstetric hemorrhage:**

Increased incidence of placenta previa and postpartum hemorrhage and more cesarean sections due to placental complications were observed in pregnancy following endometriosis.

According to Keiko Mekar, Hitoshi Masamoto, Hitoshi Sugiyama, Kozue Asato, Chiaki Heshiki, Tadatsugu Kinjyo, Yoichi Aoki published online 07 November 2013<sup>35</sup> there was no significant differences in miscarriage (18.4% vs 18.6%), subchorionic hematoma (5.0% vs 2.1%), preterm birth (7.5% vs 8.3%), PIH (15.0% vs 12.5%), caesarean section (32.5% vs 22.9%), gestational age at delivery (38.9±1.5 vs 38.8±1.7 weeks), birth weight (3013.3±480 vs 2934.5±639.5g) and SGA babies (2.5% vs 2.1%) were found between the endometriosis and non-endometriosis groups. Placental abruption did not occur in either group. One neonate had trisomy 21 in the endometriosis group and one woman had gestational diabetes in the non-endometriosis group. In our study, there was no miscarriage or ectopic pregnancy. The incidence of placenta previa, PIH, PTL, PPH and IUGR in surgically treated endometriotic patients were similar to that of non-endometriotic patients. Endometriosis may not always affect pregnancy outcome, but there is a need for a large prospective study.

## Conclusion:

Surgical management of endometriosis may be the first line of treatment in patients needing pregnancy. There is significant increase in conception rate following surgery for endometriosis. There is increased pregnancy rate in stage I and II than stage III and IV. Following surgery, majority of the patients conceive spontaneously and few may need OI, IUI or ART. In our present study, 100/125 (80%) conceived spontaneously rest 25(20%) needed either OI, OI with IUI and ART. ART was required in 9.6%. Surgical management not only improves fertility but also relieves

endometriosis associated pelvic pain. It is cost – effective when compared to ART. We should shift the patient to ART at the appropriate time which will improve the pregnancy outcome. Careful follow up of the patients who became pregnant showed no increased incidence of adverse effects of pregnancy like miscarriage, ectopic pregnancy, PIH, placenta previa, PTL and IUGR. Caesarean section rate may be higher due to the various factors like age, fertility treatment, etc. Incidence of postpartum hemorrhage was not increased. Incidence of multiple pregnancy may be marginally increased due to ART. Careful monitoring is needed in pregnancies following surgical management of endometriosis to achieve a good maternal and perinatal outcome.

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