Basal E2, FSH, and AFC of Endometrioma Patients Undergoing In Vitro Fertilization (IVF)

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Abstract

Background: Endometriosis is a common disease among women of reproductive age and often associated with infertility. Endometrioma is one of the most common manifestations in endometriosis patient. In Vitro Fertilization is one of the methods used as infertility management in endometriosis women. There are some basal parameters that could affect the IVF result, such as basal E2, FSH and AFC. This study aim is to analyze the basal E2, FSH and AFC of women with endometrioma patients compared to non-endometriosis patients.
Methods: This is an analytical observational study with case-control method using medical record data at the Fertility Polyclinic of Graha Amerta Dr. Soetomo General Hospital Surabaya, Indonesia in period of 2018-2020.
Result: There was a significant difference in basal E2 levels, the group of women with endometrioma had lower basal E2 levels than non-endometriosis (mean 22.52±10.58 vs 31.49±11.41; p=0.001). There were no significant differences in basal E2, FSH and AFC in post endometrioma cystectomy group compared to endometrioma with conservative treatment.
Conclusion: Endometrioma patients had lower basal E2 level compared to non-endometriosis patient. Consideration of endometrioma cystectomy prior to IVF should be done wisely.

Keywords: Endometriosis, Endometrioma, In Vitro Fertilization, Infertility

1. INTRODUCTION

Endometriosis is a common disease among women of reproductive age with a prevalence of 6-10% and is often associated with infertility. As many as 35-50% of endometriosis patients experience infertility and 25-50% of infertile women experience endometriosis[1,2,3]. Endometrioma is one of the most common manifestations in endometriosis cases, about 17-44% of patients with endometriosis have endometrioma manifestations[4,5]. In Vitro Fertilization (IVF) is one of the Assisted Reproductive Technology (ART) methods that are used as infertility management in endometriosis women.

There are several basal parameters that can affect the level of fertility and the success of ovarian stimulation during ovum pick up (OPU) in IVF method, including estradiol (E2), Follicle Stimulating Hormone (FSH), Anti-Mullerian Hormone (AMH), and Antral Follicle Count (AFC)[6,7]. Women with endometriomas experience disturbances in these basal parameters, resulting in impaired folliculogenesis and oocyte function and decreased ovarian reserve which can affect the ovarian response during stimulation[8,9 ,10].

Cystectomy surgery is one of the treatments for endometriomas that still controversial. Several studies have shown that this procedure can decrease ovarian reserve, which can lead to disturbances in the basal parameter such as Estradiol, FSH and AFC[11,12], while other studies showed no significant changes in those parameters

after surgery[13,14]. This study was conducted to analyze the ovarian stimulation response of women with endometriomas compared to non-endometriosis women in the IVF method, so it can be an aspect of consideration in determining management in patients with endometriomas and infertility.

2. METHOD

This study is an analytic observational study with a case control method to analyze the basal E2, FSH and AFC in women with endometriomas compared to non-endometriosis women using medical record data at Fertility Polyclinic of Graha Amerta Dr. Soetomo General Hospital Surabaya for the period of 2018-2020. The inclusion criteria for the case group in this study were the medical records of women diagnosed with endometriosis with endometrioma manifestations at the Fertility Polyclinic of Graha Amerta Dr. Soetomo General Hospital Surabaya and had regular menstrual cycles, while the control group was the medical records of women diagnosed with one benign gynecologic abnormality at the Fertility Polyclinic of Graha Amerta Dr. Soetomo General Hospital Surabaya and had regular menstrual cycles. Exclusion criteria were incomplete medical record data, PCOS, and hyperprolactinemia.

The case group (endometrioma women) later devided into post endometrioma cystectomy and conservative treatment. The post endometrioma cystectomy group was the medical record of women with cystectomy history that diagnosed endometrioma from histologic examination result. The endometrioma conservative treatment was the medical record of women underwent IVF with endometrioma diagnosis from laparoscopic or transvaginal sonography examination.

The basal E2, FSH and number of AFC data was collected on day 3 of menstrual cycle before the ovarian stimulation start. Statistical analysis was performed using SPSS ver. 26.0. Measurement values for the descriptive data were compared using a t-test and the results expressed as mean ± standard deviation with significance set at $p<0.05$.

3. RESULT

During the period of 2018-2020, there were 518 total infertility cases undergoing IVF, 40 of them (7.5%) with a diagnosis of endometriosis. From a total of 40 cases with endometriosis, 34 cases (85%) found with endometrioma manifestation (16 cases of endometrioma with conservative treatment and 18 cases of post-cystectomy endometrioma). 34 cases were taken consecutively (16 cases with unexplained infertility, 15 cases with tubal factor disorders, and 3 cases with uterine factor disorders) with the same age range for the control group (non-endometriosis group).

Table 1. Comparison of endometrioma and non-endometrioma group

Variable	**Endometrioma (n = 34)**	**Non-endometriosis (n = 34)**	**p Value**
Age (y.o)	31.37 ± 3.77	32.09 ± 3.82	0.434
Infertile duration (years)	5.99 ± 3.84	7.11 ± 3.61	0.210
Basal E2 (pg/mL)	22.52 ± 10.58	31.49 ± 11.41	0.001
FSH (IU/L)	5.23 ± 3.24	6.04 ± 1.94	0.206
AFC	7.63 ± 3.34	8.6 ± 2.57	0.177

Table 1 shows no significant difference in age and infertile duration between both groups. There was a significant difference in basal E2 levels, where the group of women with endometriomas had lower basal E2 levels than non-endometriosis (mean 22.52±10.58 vs 31.49±11.41; p=0.001), but there was no significant difference on FSH (5.23±3.24 vs 6.04±1.94; p=0.206) and AFC (7.63±3.34 vs 8.6±2.57; p=0.177) parameter.

Comparison of post endometrioma cystectomy and non-endometriosis group (Table 2) showed similar result as table 1. There was a significant difference in basal E2 levels (21.70±9.59 vs 31.49±11.41; p=0.002) and there was no significant difference on FSH (5.05±3.28 vs 6.04±1.94; p=0.269) and AFC (7.42±3.29 vs 6.6±2.57; p=0.151).

Table 2. Comparison of post endometrioma cystectomy and non-endometriosis group

Variable	**Post endometrioma cystectomy (n = 19)**	**Non-endometriosis (n = 35)**	**p Value**
Age (y.o)	31.11 ± 3.84	32.11 ± 3.82	0.372
Infertile duration (years)	5.68 ± 4.01	7.11 ± 3.61	0.187
Basal E2 (pg/mL)	21.70 ± 9.59	31.49 ± 11.41	0.002
FSH (IU/L)	5.05 ± 3.28	6.04 ± 1.94	0.169
AFC	7.42 ± 3.29	6.6 ± 2.57	0.151

The statistical test results in Table 3 do not show significant differences in each variable. This shows that post endometriomas cystectomy did not provide a significant difference compared to the endometrioma conservative treatment group.

Table 3. Comparison based on endometrioma management

Variable	**Post endometrioma cystectomy (n = 19)**	**Endometrioma conservative management (n = 15)**	**p Value**
Age (y.o)	31.11 ± 3.84	31.69 ± 3.79	0.656
Infertile duration (years)	5.68 ± 4.01	6.34 ± 3.73	0.620
Basal E2 (pg/mL)	21.70 ± 9.59	23.49 ± 11.90	0.626
FSH (IU/L)	5.05 ± 3.28	5.43 ± 3.29	0.736
AFC	7.42 ± 3.29	7.88 ± 3.48	0.695

4. Discussion

1. Characteristic of patients

During 2018-2020 period, 34 cases of endometrioma were found undergoing IVF program at the Fertility Polyclinic of Graha Amerta Dr Soetomo General Hospital, and 34 cases of IVF patients without endometriosis were consecutively selected with the same age range as the control group. The sample characteristic in this research was similar from age and infertile duration characteristic. The infertility duration is related to the number of oocytes and the success rate of IVF. The longer infertile duration, the lower number of oocytes

retrieved and the lower of IVF success rate[15,16].

2. Basal parameters

Comparison of group with endometrioma and non-endometriosis (Table 1) and group of post endometrioma cystectomy and non-endometriosis (Table 2) showed a significant difference only in basal E2 levels. This could be due to the occurrence of apoptosis in granulosa cells which caused low E2 serum levels in the endometrioma group and in the post cystectomy group. The use of GnRH agonist in cases of endometrioma and post endometrioma cystectomy can also lead to lower basal E2 levels in the endometrioma and post endometrioma cystectomy group when compared to non-endometriosis group[17,18,19]. The comparison between the post endometrioma cystectomy and conservative endometrioma groups (Table 3) did not provide a statistically significant difference. The use of GnRH agonist in the two groups may be the cause of the no difference in basal E2 and FSH levels.

Endometrioma patients had chronic inflammatory processes or cystectomy procedures that can cause a decrease in ovarian reserve with low AMH and AFC values[20,21]. In this study, we did not compare AMH levels because the incomplete AMH data, either because of not included in the medical record or were not examined due to cost constraints for patients. The average number of AFC in the endometrioma group in this study had a lower tendency than non-endometriosis group (7.63±3.34 vs 8.6±2.57), although not statistically proven (p=0.117). Comparison of the number of AFC in the post endometrioma cystectomy group and non-endometriosis also gave a significant difference in this study (p=0.151). This is in accordance with previous studies which stated that surgical procedures for cystectomy did not provide a significant difference in the number of AFC compared to the endometriosis group[13].

3. Cystectomy management in endometrioma

Data above showed that cystectomy in endometriomas did not provide significant differences in basal parameters (E2, FSH and AFC). This shows that cystectomy in cases of endometrioma and infertility should be performed only if there are indications such as possible difficulties during OPU due to an endometrioma mass or accompanied by severe pain that interferes patient activities. Inadequate cystectomy procedures can potentially cause damage to healthy ovarian tissue and a decrease in ovarian reserve which can lead to infertility problems and a decrease in the percentage of successful ART program[18,22]

5. Conclusion

The endometrioma group had lower basal E2 levels compared to non-endometriosis group. Consideration of endometrioma cystectomy prior to IVF should be done wisely. Further research is needed to determine factors that influence the IVF success in endometriosis women.

Ethical Approval

The research was approved by the Human Research Ethics Committee, Dr. Soetomo General Teaching Hospital, with approval number 0550/LOE/301.4.2/VIII/2021.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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