What is the impact of endometrioma on IVF/ICSI outcomes in patients with endometriosis: A retrospective study

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Research Article

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Abstract

Background

Does endometrioma per se, different from endometriosis, have specific impacts on IVF/ICSI outcomes? Dose cystectomy of the endometrioma improve IVF/ICSI outcomes?

Methods

We retrospectively analyzed 2153 IVF/ICSI cases treated during Jan/01/2014 to Dec/31/2020 in VGHTC. Two-hundred-and-eight women receiving IVF/ICSI treatment due to endometriosis. The control group consisted of 624 infertile women without endometriosis. First, we divided 208 patients into those with endometrioma (89) and those only with endometriosis (119). Second, we divided patients into primary endometrioma, recurrent endometrioma and those having received cystectomy for endometrioma before IVF/ICSI. Reproductive outcomes were compared.

Results

We found in the endometrioma subgroup (B), the usage gonadotropin dose was significantly higher, and the blastocyst formation rate was significantly lower compared with endometriosis (A) and control group (C). The CLBR (60.5% versus 49.4% versus 56.9%, p = 0.194 in A versus B, p = 0.406 in A versus C, p = 0.878 in B versus C) were comparable. From the second analysis, the blastocyst formation rate was significantly higher in the s/p cystectomy group. The CLBR were comparable (47.1%, 60% and 57.9% p = 0.194 in D versus E, p = 0.406 in D versus F, p = 0.878 in E versus F, in primary endometrioma (D), s/p cystectomy (E) and recurrent endometrioma group (F)).

Conclusions

Although the blastocyst formation rate was lower, and the usage gonadotropin dose was higher in the endometrioma group, CLBR was not worse than those with endometriosis or control. Cystectomy for endometrioma did not alter IVF/ICSI outcomes if ovarian reserve is comparable. Recurrent endometrioma did not worsen ART outcome than primary endometrioma.

Introduction

Endometriosis is a chronic disease and is known to be detrimental to fertility [1]. Around 25–50% of women with infertility may be affected by endometriosis, and 30–50% of women with endometriosis have infertility [2]. A significant number of women with endometriosis eventually seek IVF with or without ICSI for conception. An endometrioma is the formation of a cyst within the ovary with ectopic endometrial tissue lining [3]. It is found in 17–44% of patients with endometriosis [4]. The exact mechanism by whichendometrioma causes infertility remains uncertain. Several proposed mechanisms include distorting tubo-ovarian anatomy [5], reduction in the quality and quantity of developing follicles by anatomical proximity of the ovarian cyst to the nearby follicular

pool [6, 7], and reduced ovarian reserve and embryo quality by local inflammation milieu, toxic content and oxidative damage [8, 9].

Although with a higher cancel rate and lower oocyte retrieval, current evidence is that women with endometrioma have similar IVF/ICSI outcome in terms of live birth rate compared with those without endometriosis [10]. However, there were few studies comparing IVF/ICSI outcomes between women with endometrioma and women with endometriosis. Current molecular, histological and morphological evidence suggested that endometrioma is detrimental to the ovaries [6, 11]. The endometrioma, different from endometriosis, likely has specific impact on IVF/ICSI outcomes. Therefore, the first part of this study was aimed to compare IVF/ICSI outcomes between women with endometrioma and women with endometriosis.

In the second part of our study, we aimed todetermine the impact of cystectomy on IVF/ICSI outcomes. Current guidelines are unclear regarding surgical removal of endometrioma prior to IVF/ICIS [12]. Surgical treatment of endometrioma has been shown to increase natural fecundity [13]. And endometrioma left*in situ* during IVF/ICSI may cause technical difficulties during oocyte retrieval, progression of the endometrioma after ART,and higher risks of infection [14–16]. Evidence showed surgical treatment on endometrioma could be detrimental to ovarian reserve [17, 18], subsequently adversely affecting reproductive outcomes of IVF/ICSI [19]. Therefore, the second part of our study was aimed todetermine the impact of cystectomy of endometrioma on the IVF/ICSI outcomes.

Materials And Methods

We retrospectively analyzed patients (n = 2,153) who had IVF/ICSI between January 2014 and December 2018, at Center for Reproductive Medicine, Division of Reproductive Endocrinology and Infertility, Department of Obstetrics, Gynecology and Women's Health, Taichung Veterans General Hospital, Taichung, Taiwan. We included those cycles with patients' major reason for IVF/ICSI is endometriosis. Endometriosis was confirmed by laparoscopic surgery, presence of endometrioma or pelvic examination revealed cul-de-sac nodularity with dysmenorrhea. Endometrioma was defined by visualizing, on two or more separate examinations done at intervals of at least one month apart, an ovarian cyst with regular margins and ground-glass echogenicity on transvaginal ultrasonography (TVUS) [20]. The endometrioma was measured along three dimensions, and the average diameter was calculated during a baseline ultrasonography on D2/D3 in the month of controlled ovarian stimulation (COS). We excluded those cycles with patients aged > 40 years, or < 20 years, simulation duration < 5 days, with severe male factor, uterine factor (including adenomyosis, defined by TVUS) or immunological factors. Patients whose embryos were not completely transferred back, or received embryo transfer from different OPU cycles were also excluded.

The control group included women who underwent IVF/ICSI for non-endometriosis-related infertility during the same study period. Endometriosis was ruled out in a pre-ART work-up assessment, including clinical examination, questioning (regarding the extent of pelvic pain and a prior history of surgery) and TVUS. The control group was matched in age and AMH level in 1 to 3 subjects ratio. Blind matching to the results was performed.

In the first analysis, we compared reproductive outcomes among patients with endometrioma present during the IVF/ICSI treatment, those with only endometriosis, and the control group. In the second analysis, we

compared outcomes between patients with “Recurrent endometrioma group” defined as patients with endometrioma during IVF/ICSI, and history of cystectomy for endometrioma before, “Primary endometrioma group”, defined as who did not have cystectomy before and with endometrioma during IVF/ICSI, and “status post (s/p) cystectomy group” defined as patients received cystectomy for endometrioma before IVF/ICSI treatment and no presence with endometrioma during IVF/ICSI. This study was approved by the Institutional Review Board of the Taichung Veterans General Hospital (IRB No. CE21306B)

Patients underwent COS, oocyte retrieval and embryo transfer according to procedures as previously described [21]. Which protocol (either agonist or antagonist protocol) to use for the patient was a discretion of the caring physician. Stimulation was monitored by transvaginal ultrasound. Ovulation triggering was induced by injecting the recombinant hCG (Ovidrel, Merck Serono) and or GnRH agonist. Ultrasound-guided transvaginal oocyte retrieval was carried out around 36 hours post-triggering. Oocytes were either inseminated or underwent ICSI approximately 4 hours after collection. For the fresh group, cleavage stage embryos or blastocysts were transferred. The surplus embryos were cryopreserved through vitrification. The endometrial preparations in the following FET cycles were programmed by either hormone replacement cycles or modified natural cycles, depending on individual conditions of patients. Details of the endometrium priming and luteal phase support have been reported earlier [21].

Outcomes and statistical analyses

We followed up patients through June 2021. Our primary outcome was cumulative live birth rate (CLBR), determined in those achieved through fresh and/or vitrified embryos obtained from the same oocyte retrieval cycle. Clinical pregnancy was defined as the presence of at least one embryo with cardiac activity. Live birth was defined as the delivery of a live infant after at least 24 weeks of gestation. LBRs were calculated individually in the fresh ET cycle and in the first FET cycle if no fresh ET had been performed. Blastocyst formation rate only included those patients intended to receive blastocyst transfer.

Data were presented as mean ± standard deviation (SD), or as percentage. Group comparisons were performed using Mann-Whitney and Pearson’s Chi square tests in SPSS (Version 18). Differences were considered significant at $p < 0.05$.

Results

We analyzed a total of 208 IVF/ICSI cycles with indications of endometriosis. These cycles consisted of 119 with endometriosis, and 89 with endometrioma. The flow chart of these cyclesare shown in Fig. 1. In 89 cycles with endometrioma, 19 hadreceived cystectomy for endometrioma before IVF/ICSI,and were included in “recurrent endometrioma group”. Theremaining 64 cycles were included in “primary endometrioma group”. In 119 cycles with no endometrioma during IVF/ICSI, 40had received cystectomy for endometrioma before,and they were included in “s/p cystectomy group”. After matching,we had 624 cycles without endometriosis during IVF/ICSI, as control group.

First analysis of the baseline characteristics and outcomes are presented in Table 1. Comparable characteristics in the endometriosis (A), endometrioma (B) and control (C) groups included the female age, serum AMH and stimulation protocol. Patients in the control group had a significantly higher BMI (20.9 ± 2.5

versus 21.3 ± 3.0 versus 22.3 ± 3.6; p = 0.351n in A versus B, p< 0.001 in A versus C, p= 0.019 in B versus C). Significantly more patients in the control group received ICSI (27.2% versus 33.7% versus 46.4%; p = 0.353n in A versus B, p < 0.001 in A versus C, p = 0.022 in B versus C). In the endometrioma group, the mean size of endometrioma was 3.9 cm (range 1 to 9 cm).

Table 1
showed baseline characteristics and results of the first anlalysis

	A.Endometriosis (n = 119)	B.Endometrioma (n = 89)	C. Control (n = 624)	A vs. B P value	A vs. C P value	B vs. C P value
Female age (y; mean ± SD)	34.1 ± 3.1	34.4 ± 3.5	34.3 ± 3.1	0.564	0.523	0.884
BMI	20.9 ± 2.5	21.3 ± 3.0	22.3 ± 3.6	0.351	**< 0.001***	**0.019***
AMH (ng/ml)	3.6 ± 2.9	3.1 ± 2.5	3.5 ± 3.1	0.155	0.449	0.334
Stimulation protocol:						
Agonist protocol	33/119 (27.7%)	26/89 (29.2%)	158/624 (25.3%)	0.814	0.581	0.432
Antagonist protocol	86/119 (72.3%)	63/89 (70.8%)	466/624 (74.4%)			
Fertilization method:						
ICSI	33/199 (27.7%)	30/89(33.7%)	291/624 (46.4%)	0.353	**< 0.001***	**0.022***
IVF	86/199(72.3%)	59/89(66.3%)	333/624 (53.4%)			
Total FSH dosage (IU)	3047.3 ± 1037.9	3619.4 ± 1223	3130 ± 1065.5	**0.001***	0.400	**0.001**
Total LH dosage (IU)	941.0 ± 573.9	1224.4 ± 721.5	963 ± 601.2	**0.009***	0.823	**0.003***
Stimulation days	9.9 ± 1.6	10.3 ± 2.3	10.1 ± 1.5	0.326	0.188	0.912
Endometrium(mm), trigger day	11.2 ± 2.8	11.9 ± 3.4	11.0 ± 3.3	**0.028***	0.699	**0.004***
Total ≥ 14mm follicle number	8.5 ± 4.7	7.6 ± 4.8	9.1 ± 5.7	0.147	0.595	**0.028***
E2 on trigger day (pg/ml)	2779.3 ± 1753.7	2602.1 ± 2151.9	2799.6 ± 1993.9	0.168	0.659	0.172
P4 on trigger day (ng/ml)	0.9 ± 0.4	1.0 ± 0.7	1.0 ± 0.6	0.801	0.668	1.000
EMT: endometrial thickness						
*with statistical significance						

	A.Endometriosis (n = 119)	B.Endometrioma (n = 89)	C. Control (n = 624)	A vs. B P value	A vs. C P value	B vs. C P value
Number of oocyte retrieval	12.4 ± 8.4	10.3 ± 6.7	12.7 ± 8.5	0.131	0.624	**0.017***
Number of mature oocytes	9.6 ± 6.6	8.0 ± 5.8	10.0 ± 7.1	0.121	0.552	**0.013***
Fertilization rate	74.2%	73.8%	69.3%	0.219	0.613	0.28
Good embryos rate at D3	32.0%	31.4%	34.7%	0.780	0.100	0.098
BC formation rate	57.7%	49.4%	56%	**0.005***	0.376	**0.008***
D2/D3 embryo transfer rate	58.9%	71.1%	69.1%	0.181	0.088	0.783
EMT: endometrial thickness						
*with statistical significance						

Table 2
baseline characteristics and results of the second analysis

	D. Primary Endometrioma (n = 70)	E. s/p Cystectomy (n = 40)	F. Recurrent endometrioma (n = 19)	D vs.E P value	D vs. F P value	E vs. F P value
Female age (mean ± SD)	34.6 ± 3.6	32.8 ± 3.4	33.4 ± 2.8	**0.007***	0.057	0.744
BMI	21 ± 2.6	20.7 ± 2.1	22.4 ± 4	0.598	0.196	0.164
AMH (ng/ml)	3.2 ± 2.5	3.4 ± 2.8	2.7 ± 2.5	0.828	0.277	0.239
Stimulation protocol:						
Agonist protocol	22/70 (31.4%)	8/40 (20.0%)	4/19 (21.1%)	0.195	0.378	0.925
Antagonist protocol	48/70 (68.6%)	32/40(80.0%)	15/19 (787.9%)			
Fertilization method						
ICSI	26/70 (37.1%)	10/40 (25%)	4/19 (21.1%)	0.192	0.188	0.793
IVF	44/70 (62.9%)	30/40 (75%)	15/19 (78.9%)			
Total dose of FSH (IU)	3561.9 ± 1211.4	2844.0 ± 1109.2	3820.8 ± 1277.3	**0.001***	0.47	**0.004***
Total dose of LH (IU)	1207.5 ± 718.8	915 ± 642.8	1286.8 ± 747.6	**0.03***	0.722	0.090
Stimulation days	10.5 ± 2.4	9.3 ± 1.5	9.8 ± 1.7	**0.012***	0.33	0.421
EMT (mm) on trigger day	11.9 ± 3.6	11.2 ± 2.6	12 ± 2.7	0.091	0.798	0.303
No. of follicle ≥ 14mm on trigger day	8.0 ± 4.8	7.5 ± 4.5	5.9 ± 4.9	0.575	**0.045***	0.154
E2 on trigger day (pg/ml)	2771 ± 2146.4	2677.8 ± 1831.5	1976.5 ± 2110.4	0.744	0.298	**0.043***
P4 on trigger day (ng/ml)	1.0 ± 0.7	0.8 ± 0.4	0.9 ± 0.4	0.4	0.814	0.709
No. of oocyte retrieval	10.6 ± 6.6	11 ± 8.5	8.9 ± 7.4	0.592	0.191	0.342
No. of mature oocyte	8.3 ± 5.7	8.6 ± 6.6	6.7 ± 6.3	0.753	0.112	0.272

* With statistical significance

	D. Primary Endometrioma (n = 70)	E. s/p Cystectomy (n = 40)	F. Recurrent endometrioma (n = 19)	D vs.E P value	D vs. F P value	E vs. F P value
Fertilization rate	73.4%	78.2%	73%	0.64	0.155	0.286
Good embryos rate on D3	31.2%	35%	32.4%	0.268	0.823	0.630
BC formation rate	49.7%	61.5%	47.8%	**0.004***	0.690	**0.042***
D2/D3 embryo transfer rate	69.4%	69.6%	77.8%	1.00	1.00	1.00
* With statistical significance						

The used gonadotropin dose was significantly higher in the endometrioma group compared with other groups (FSH dosage 3047 ± 1037.9 IU versus 3619IU ± 1223 versus 3130 ± 1065.5 IU, p = 0.001 in A versus B, p= 0.4 in A versus C, p= 0.001 in B versus C; LH dosage 941 ± 573.9 IU versus 1224 ± 721.5 IU versus 963 ± 601.2 IU, p = 0.009 in A versus B, p = 0.823 in A versus C, p = 0.003 in B versus C). The number of follicles≥14 mm on the day of triggering, number of oocytes retrieved, and number of mature oocytes were lower in the endometrioma group than control. The blastocyst formation rate was significantly lower in the endometrioma group compared with other two groups (57.7% versus 49.4% versus 56% p = 0.005 in A versus B, p = 0.376 in A versus C, p = 0.008 in B versus C).

CPR in fresh ET, LBR in fresh ET, and CLBR were comparable in the three groups. LBR in first FET in freeze-all cycle was significantly lower in the endometrioma group compared with the control group (53.8% versus 36.8% versus 59.2% p = 0.134 in A versus B, p = 0.536 in A versus C, p = 0.011 in B versus C) (Fig. 2).

In the second analysis, the baseline characteristics and clinical outcomes of primary endometrioma (D), s/p cystectomy (E) and recurrent endometrioma (F) are shown in Table 3. The female age was lower in the s/p cystectomy group than endometrioma group (34.6 ± 3.6 versus 32.8 ± 3.4, p = 0.007). Serum AMH, BMI, stimulation protocol and fertilization method were similar in each groups.

Total usage gonadotropin dose and length of COS were lower in the s/p cystectomy group (FHS dose 3561.9 ± 1211.4 IU versus 2844 IU ± 1109.2 versus 3820.8 ± 1277.3 IU in group D, E, F, p = 0.001 in D versus E, p = 0.47 in D versus F, p= 0.004 in E versus F; LH dose 1207.5 ± 718.8 versus 915 ± 642.8 versus 1286.8 ± 747.6, p = 0.03 in D versus E, p = 0.722 in D versus F, p = 0.09 in E versus F; length of stimulation 10.5 ± 2.4 versus 9.3 ± 1.5 versus 9.8 ± 1.7, p = 0.012 in D versus E, p = 0.33 in D versus F, p= 0.421 in E versus F). The number of follicles measuring ≥14 mm on the day of triggering and estradiol level were lower in the recurrent endometrioma group. The blastocyst formation rate was highest in the s/p cystectomy group (49.7% versus 61.5% versus 47.8%, p = 0.004 in D versus E, p = 0.69 in D versus F, p= 0.042 in E versus F).

CPR in fresh ET, LBR in fresh ET, LBR in first FTE in freeze-all cycle and CLBR were similar in primary endometrioma, s/p cystectomy and recurrent endometrioma groups (Fig. 3).

Discussion

Our results showed that in patients with endometriosis being the major indication for IVF/ICSI, the CLBR were similar to controls (non-endometriosis). Although the presence of endometriomahad comparable CLRB, the used gonadotropin dose was significantly higher, and the blastocyst formation ratewas significantly lower compared with those patientswith only endometriosis. In the second analysis, CLBR were comparableacross primary endometrioma, s/p cystectomy and recurrent endometrioma groups. The blastocyst formation rate was significantly higher in the s/p cystectomy group compared with the other two groups.

A number of studies investigated effects of endometriosis on ART outcomes.In general, women with endometriosis have similar ART outcomes to those of controls in terms of LBR [22–24].Our results are compatible with these.Regarding the relationship between the presence of endometrioma and ART outcomes,findings are less consistent. A recent systematic review found women with endometrioma only have fewer oocytes and MII oocytes retrieved when compared tothose without endometriosis, but no such differences in CPR, IR and LBR [25]. Our result is similar to theirs, showing that endometrioma was associated with higher gonadotropin consumption, lower number of oocytes retrieved, and lower blastocyst formation rate, when compared with controls. The final outcome, CLBR, wasthe same as the control group.

When comparing between patients with endometrioma and with endometriosis, our results on outcomes revealed the similarities of LBR and CLBR in patients with endometrioma or with endometriosis. These findings are consistent with previous studies showing similarity in delivery rates and pregnancy rates in patients with unoperated endometrioma and with only endometriosis [26.27]. These studies were however conducted in 2000s, and CLBR was not analyzed.

In comparing primary endometriomaand cystectomy before IVF/ICSI,wefound that although the s/p cystectomy group were younger in age,their ovarian reserves were similar,likely due to surgical excision of endometrioma lowering the ovarian reserve [17]. In our center, our policy is to choose younger patients with moderate ovarian reserve to receive cystectomy for endometrioma for fertility reason.We had encouraged these patients to undergo IVF/ICSI ifnot get pregnancy after trail of one year after operation.Despite concerns of reduced ovarian reserve, surgical removal of endometrioma may improve chances of spontaneous pregnancy by restoring the ovarian functional anatomy.This approach has been considered a primary treatment for infertility in the case of endometrioma [12]. Alsosuch operation improves pain symptoms [28].Regarding the impact of excised endometrioma on ART outcomes, we found similarities between the primary endometrioma and s/p cystectomy groups interms of the number of oocyte retrieval, number of mature oocytes, LBR and CLBR.Our findings are consistent with most reports in the literature, including a recent meta-analysis [29].Other studies reported differentresults that endometrioma surgery diminishing ovarian reserve, leading to lower pregnancy rates in IVF [30.31]. However, these studies were conducted on limited numbers of patients, with differences surgical procedure and surgeon's expertise. Our results including CLBR per oocyte retrieval further confirmed thatwith comparable ovarian reserves, cystectomy before operationproduced similar IVF/ICSI outcomes compared with endometrioma *in situ*.

In comparing primary and recurrent endometriomas, our results showedweaker ovarian responses to COS in the recurrent endometrioma group. This finding is inconsistent with a previous study, whichreported patients with recurrent endometriomas have the same ovarian response [32]. Incontrast, the outcomes of IVF/ICSI

including LBR and CLBR in our study were compatible between these two groups, and was consistent with this study [32].There were study histologically confirmed surgery for recurrent endometrioma is associated with greater loss of ovarian tissue, which is more harmful to ovarian reserve compared with endometriomas operated for the first time [33]. *Park et al*., also reported that second-line surgery for recurrent endometrioma have deleterious effects on IVF outcomes, including ovarian response, and CPR compared with *in situ* recurrent endometrioma [34]. It wasalso reported that spontaneous cumulative pregnancy rate is almost half after second-line surgery for endometrioma comparing with those obtained after primary surgery [35]. Therefore, a conservative management for recurrent endometrioma is more suitable for women with fertility desire.

Our study showed presence of endometrioma was associated withfewer blastocyst formations, compared with the endometriosis or control group.Such effects seemed to disappear after cystectomy of endometrioma. The poorer ovarian response and lower blastocyst formation rate wereunlikely consequences of deleterious effects of surgery on the endometriomas, but more likely due to endometrioma *per se*. There are growing studies showed ovarian quality may be deteriorated by endometrioma [36]. One recent study using scRNA-seq compared oocytes from patients with endometrioma and healthy oocytes revealed a differential transcriptomic profile indicating lower oocyte quality in endometrioma [37]. These mechanisms may explain how blastocyst formation rate we found was lower in the endometrioma group.

Our study has some strengths. First, our primary outcome is CLBR per oocyte retrieval which was seldom mentioned in previous studies, and was a better indicator of quality and success in IVF/ICSI, as cryopreservation is an integral part of IVF [38]. Second, all our patients had undergone ovarian stimulation and IVF performed at a single medical center. In this regard, all measurements (AMH and TVUS) were performed consistently. Third, we had compared presence of endometrioma with endometriosis. This issue is not commonly addressed, but has practical implications. Our results showed for the first time, that the presence of endometrioma negatively influenced ovarian responsiveness and blastocyst formation rate. The main limitation of this work is its retrospective design nature. In addition, the endometriosis group is heterogeneous, including patients with peritoneal endometriosis or DIE, and some of them have no pathological diagnosis. Nevertheless, it is nowadays well accepted that the TVUS is a highly accurate and reproducible method for non-invasive diagnosis of DIE and ovarian lesions [39]. Another limitation is that we did not stratified patients according to their endometriosis stages, and only stratified those with endometrioma or endometriosis. As increasing number of patients are receiving conservative treatment before IVF/ICSI, the presence or absence of endometrioma is a more useful characteristic in daily practice.

In conclusion,we showed the IVF/ICSI outcomesare comparable in those with endometriomaand in controls. Although blastocyst formation rate was lower and gonadotropin consumption was higher in thosewith endometrioma, IVF/ICSI outcomes of patients with endometriomawere no worse than those with endometriosis. Cystectomy for endometrioma did not alter the IVF/ICSI outcomes if the ovarian reserve was comparable. Recurrent endometrioma did notshow worse impacts on the IVF/ICSI outcomecompared with primary endometrioma.

Declarations

Ethics approval and consent to participate: Institutional Review Board, TCVGH, No. CE21306B Date of approval: August 30, 2021

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Availability of data and materials: All data generated or analysed during this study are included in this published article [and its supplementary information files.

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Authors' contributions: Jui-Chun Chang and Ming-Jer Chen wrote the main manuscript text

Hsiao-Fan Kung. and Yu-Chiao Yi. prepared figures and tables.

Hwa-Fen Guu and Li-Yu Chen collect the data

Ya-Fang Chen and Shih-Ting Chuan do the statistics

All authors reviewed the manuscript."

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Figures

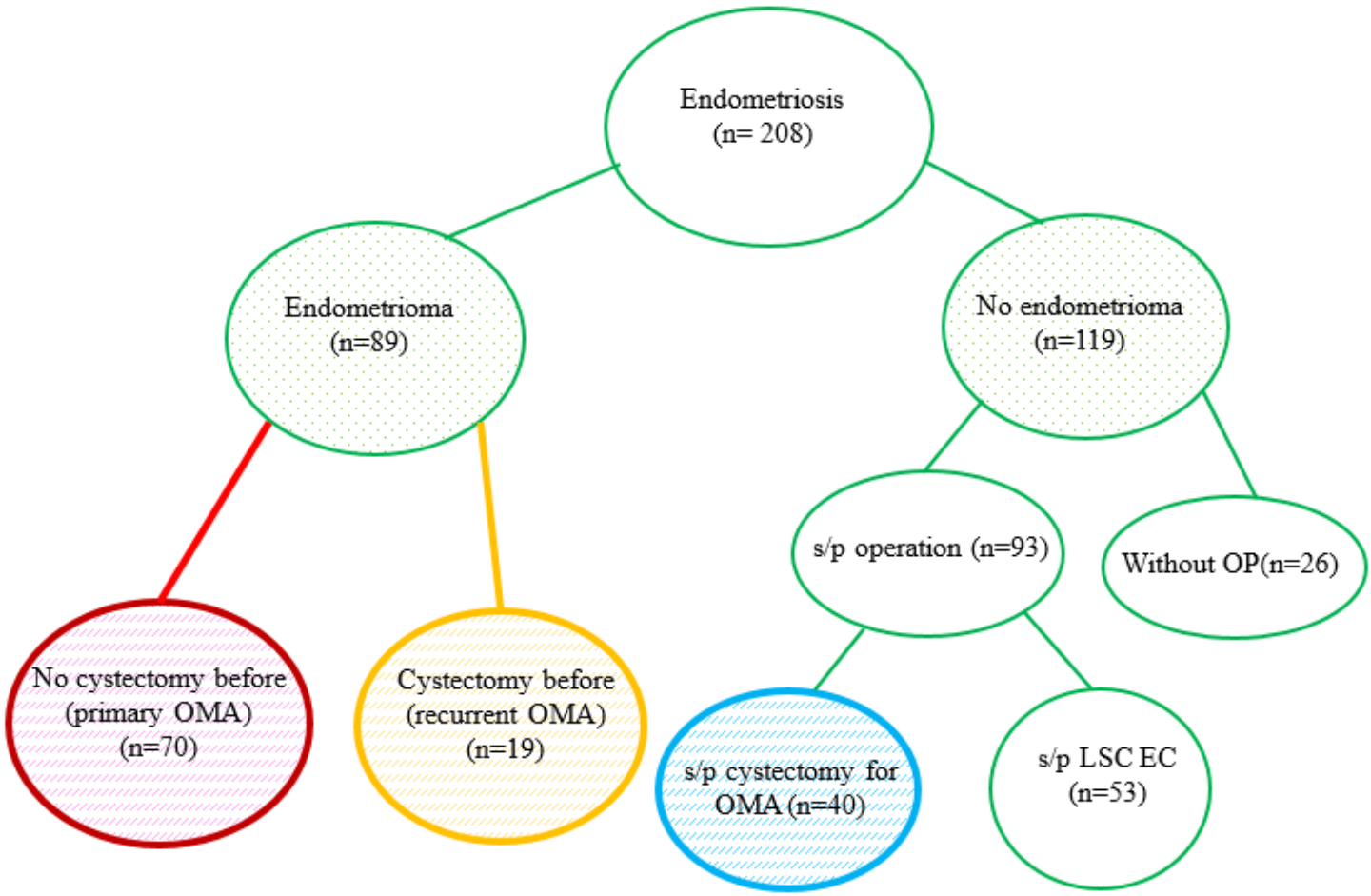

Figure 1

patient flow chart, 208 cycles had major indication for ART with endometriosis is included. 89 of them presence with endometrioma during IVF/ICSI. 119 of them with no endometrioma during treatment. In cycle presence with endometrioma, 19 of them have cystectomy for endometrioma before (as recurrent endometrioma group). The rest of 64 did not have cystectomy before as primary endometrioma group. In cycle with no endometrioma during IVF/ICSI (119), 93 of them was diagnosed by LSC. And 40 of them have received cystectomy for endometrioma during LSC (as s/p cystectomy group), another 53 only use electrocauterization (EC) for peritoneal endometriosis

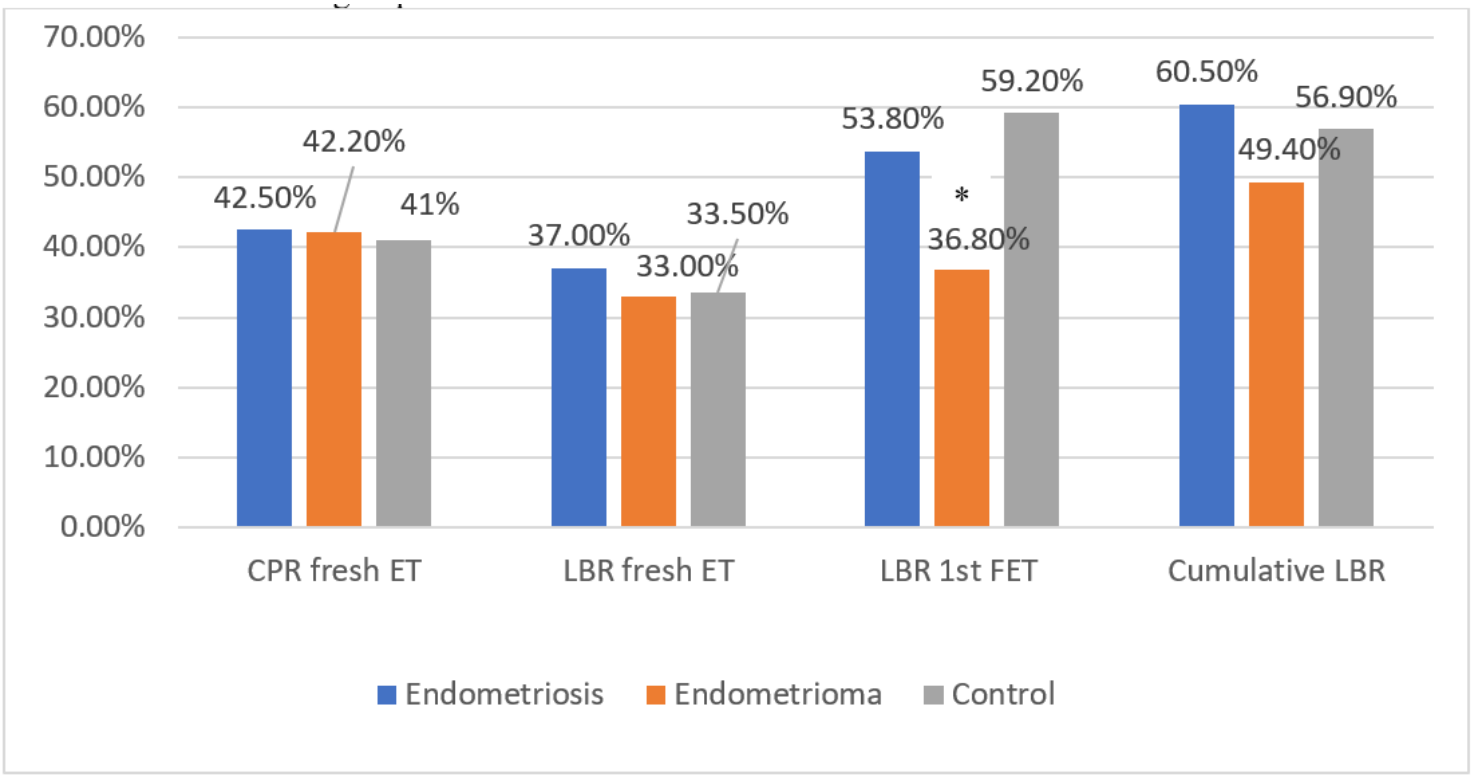

Figure 2

Outcome of IVF/ICSI in endometriosis group, endometrioma group and control group. There is no significant difference in terms of CPR in fresh ET cycle, LBR in fresh ET cycle, and cumulative LBR. The LBR of the first ET in freeze-all cycle is significantly higher in control group than in the endometrioma group.

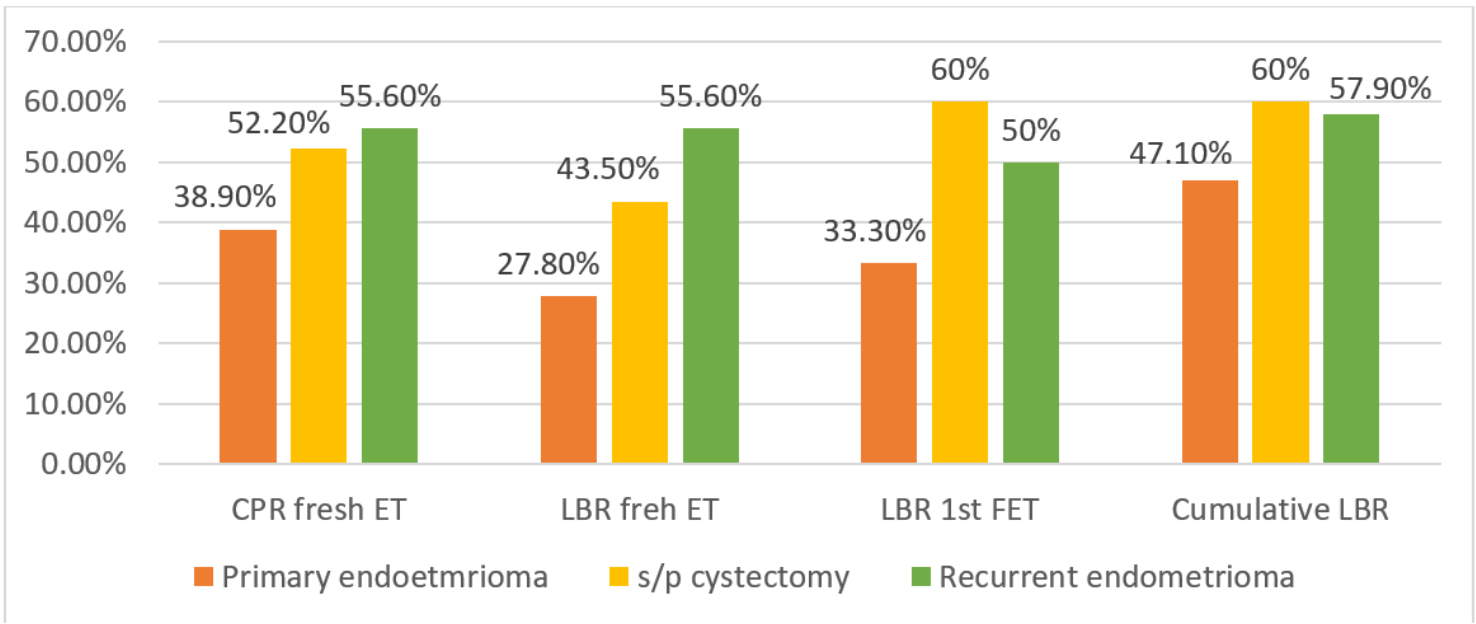

Figure 3

Outcomes of IVF/ICSI in primary endometrioma, s/p cystectomy and recurrent endometrioma group. There is no significant difference in terms of CPR, LBR and cumulative LBR