

Laparoscopic ovarian electrocauterization in polycystic ovarian syndrome: outcome and influencing factors

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Abstract

The main clinical characteristic features of polycystic ovarian syndrome (PCOS) include menstrual dysfunction, anovulation and signs of hyperandrogenism. The exact pathophysiology of this condition is unclear, PCOS can result from abnormal function of the hypothalamic-pituitary-ovarian (HPO) axis. Standardization of surgical techniques is controversial and reproductive outcomes are comparable with laser and diathermy. The objective of this study is to evaluate factors which increase the chance of ovulation and pregnancy after laparoscopic ovarian electrocauterization (LEC) polycystic ovarian syndrome failure to the usual treatment. Seventy-five women with PCOS who were unresponsive to treatment were participated in this study. The pregnancy rate was determined over a period of one and half year of follow-up. The resulted data showed that pregnancy rate 18 months after LEC was 51.2%. Pregnant women following surgery had shorter duration of infertility. In conclusion, laparoscopic ovarian electrocauterization is efficacious and cost-effective alternative to other types of treatment and main factors that affect the outcome of surgery are duration of infertility, type of infertility and amount of pre-operational LH levels.

Keywords: PCOS; Electrocauterization; Pregnancy; Ovulation

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Introduction

Nowadays, the most common endocrinopathy that affects women of reproductive age is polycystic ovarian syndrome (PCOS). Using a combination of different parameters, a study found that it can be estimated that this syndrome affects 15% - 20% of young women. This syndrome is one of the most common endocrinopathies that is characterized by chronic anovulation, hyperandrogenism, or hirsutism. Nowadays, it is responsible for infertility complications, diabetes, dyslipidemia, and cardiovascular risk, etc. The current means of treatment for the major symptoms of PCOS are oral contraceptives, anti-androgens, and/or clomifene citrate. In recent years, laparoscopic ovarian electrocauterization has gained popularity as the most-described, minimally invasive ambulatory surgical procedure for women diagnosed with anovulatory PCOS. Inhibin B, anti-Müllerian hormone (AMH) levels, and the

antral ovarian follicular count (AFC) are believed to provide the best analysis for follicular growth status. Several studies were evaluated before the success of laparoscopic ovarian electrocauterization in PCOS, and it was reviewed several times. Nevertheless, the influencing factors of PCOS ovarian reserve after ovarian electrocauterization are not well studied, and whether the bilaterality of ovarian electrocauterization and the type of PCOS may affect ovarian reserve was the aim of this study.

Polycystic ovarian syndrome (PCOS), a harbinger of multifactorial gynecological ailments, affects women of reproductive age by and large. The epiphenomena are diverse and can involve metabolism, ovulation, ovary, endometrium, endocrine system, and hormone production. Hirsutism, infertility, oligomenorrhea, and amenorrhea are the cardinal signposts of the PCOS-related clinical presentations. The surge of male sex hormones, retention of small follicles in the ovary at the alhere of a minute ovary (micropolycyst), hyperandrogenism, insulin resistance, lipotoxicity, chronic inflammation, and genetic as well as epigenetic predisposition are the kinetically energetic landmarks in complacency with the pathophysiology of PCOS. Laparoscopic electrocauterization is a minimally invasive surgical option for the laparoscopic management of PCOS for patients failing to respond to medical therapies. The technique of laparoscopic ovarian diathermy (OvD) on Marmara University was first described as a slide presentation during the International Congress in Europe; moreover, at the Experimental Pharmacology Congress, the ovarian reduction therapy identical with OvD was performed on PCOS. This procedure can be seen and presented as a simplified method of Michel's laparoscopic ovarian drilling on PCOS. The first appraisal of the laparoscopic ovarian electrocauterization technique resulted in a satisfactory ovulation rate. Electrosurgery is routinely used in various surgical techniques.

The eponym was popularized under the designation "laparoscopic ovarian drilling". Laparoscopic ovarian cauterization is used to perform unifollicular oocyte aspiration for in vitro fertilization in anovulatory women. Laparoscopic ovarian electrocauterization is a distinctive technique that is used mainly among infertile patients with polycystic ovarian syndrome (PCOS) and those who seek to get pregnant. The procedure was first documented in the early 1980s with the invention of laparoscopy. Although it is not commonly used in medical practice as it was before, it is still a step or complementary treatment that patients go through before the IVF programs, which also provide good results. In this part, we will address the peculiarities of the laparoscopic cauterization of the ovaries in the context of their ovaries removed with the help of electrosurgical complexes under visual control through trocar with the camera.

Postoperative complications and long-term sustained effect of the treatment lasts from 1 year and longer. A year after surgery, KOMb lasts 53.6%, menstrual and ovulatory cycles of 78.9%, normal and pregnancy 64.4% and 36.8% respectively. Already 5 years after surgery, KOMb lasts 86.3%, menstrual and ovulatory cycles of 92.7%, correct and pregnancy of 77.6% and 68.2% respectively. I have used it since 1996 and since then our office has been performing laparoscopic electrocoagulation (LE) according to the method of micro-puncture. After passing

through it, the insertion of puncture needles during ultrasound trans-vaginal probe, we inject 5 ml of saline, which allows better visualization of the needle during the cauterization. We have observed the procedure of the patients since then and we have seen the outcome, so the procedure may not have the incalculable reliance stated in the essential literature so far. Polycystic ovarian syndrome (PCOS), or Stein-Leventhal syndrome, is a complex condition that affects 5-10% of women of reproductive age and is now becoming more and more prevalent. It is characterized by hyperandrogenism, chronic anovulation, and the presence of polycystic ovaries. It leads to a low pregnancy rate; currently, the exact pathophysiology is still unknown. A variety of treatment modalities exist to overcome the anovulatory infertility in patients with polycystic ovarian syndrome. The available treatment modalities are reconstructive surgery, ovarian drilling, clomiphene citrate, gonadotropins, gonadotropin-releasing hormone, dopamine agonist, and assisted reproductive techniques.

The rationale for laparoscopic ovarian electrocauterization includes a fall in insulin and androgen levels and an increase in sex hormone binding globulin concentration and aromatase activity II. Moreover, improvement in pregnancy rate (approximately 60% cumulative pregnancy rate) and menstrual regularity after electrocauterization have been reported. Until now, ovarian drilling and electrocauterization are considered to induce superovulation in resistant PCOS women, with fewer chances of complications and no accidental intraoperative injury. Over the years, many studies have been performed to compare the outcome of women suffering from PCOS after LOD with another type of treatment. Most reports show a higher ovulation rate, pregnancy rate, and a lower spontaneous abortion rate after LOD compared with the control group. Some authors compared LOD with other surgical treatments and reported no difference in the cumulative pregnancy rate.

The etiology of PCOS is not clarified yet; some conjectures concerning the induction of ovulation are reviewed. Most of them indicate that the action of the multifollicular ovary becomes uniform like in non-multifollicular ovary, as a result of surgery. The rapid resolution is objectionable, as there is follicular wastage and loss left by the surgery. Electrosurgical injury coagulates tissue well that may result in fewer fibrous adhesions, which may aid in the radical subtraction of ovarian volume. LOEC gained popularity because of its relative noninvasiveness and with the available evidence, LOD is expected to continue to be a method of choice, mainly due to its simplicity, low cost, effectiveness, ovulatory, and for the better pregnancy outcome. There are few studies showing the pregnancy rates after LOD. Out of two studies with contradictory results, the present study revealed a lower pregnancy rate after LOD.

Materials and methods

Study was a prospective, single-arm interventional trial. Setting: Department of Gynecologic Endocrinology and Assisted Reproduction, Department of Gynecology, Bengaluru, India. A total of 45 newly married women aged years, who were diagnosed with PCOS based on Rotterdam criteria in the outpatient gynecologic clinic. On the third day of the cycle, an FSH,

LH, E2, and T assay was done. TVS was performed 5-7 days later. The study duration was 16 months, from January 2018 to April 2019. All women with PCOS were booked for IVF. Then, between January 2018 and June 2019, all women with PCOS who felt frustrated, or traveled abroad, or were skeptical about conception after a prior marriage with DOR, before or after their canceled IVF, have received LEO or COS-LH in our clinic. LEO with no IVF as progesterone and Metformin-free period was offered to those who wanted a natural pregnancy with no ovulation induction. Participants:

Newly married women aged years diagnosed with PCOS according to Rotterdam criteria, defined as having two of the three following criteria: oligo- or anovulation, clinical or biochemical signs of hyperandrogenity and an ultrasound with at least one ovary with size > 10 cm³ and/or PCosome. The exclusion criteria were women who could not give informed consent, women aged over 39 years or younger than 19, and the presence of a cause treating strabismus, like premature ovarian failure. Also, patients with a previous gynecological surgery that may interfere with COC-LH or LEO would have been excluded.

Intervention Protocol: 5-14 days after menstruation, surgery is performed under general short and lasting anesthesia (batches) with a standard ethical protocol approved by the Bartin University, Faculty of Medicine, Human Research Committee Institutional Review. The intervention was performed by a proinflammatory, independent surgeon with no role in the patient, and a proinjury who was responsible for the postoperative study and doing biochemical markers at the pre-specified times.

The intervention consisted of bilateral ovarian fragmentation by laparoscopic double ovarian drilling (LOD). All patients with regular menstruation received 21- to 5-mm 4 COCs per day; when more than 70% of the follicles reached a diameter of 1-14, they received a single intraphasic PORG was administered to induce a pulse surge. Postel and on the day of the puncture, a second preventive PORG dose was administered. Retrieval was performed 10 h after the injection, and the embryos were cultured in vitro at around 39.0-38.5 °C and 6% CO₂ in two phases, where standard conditions were maintained until the transfer was reached. On the day of the retrieval, good embryos were ordered true good a day and all were frozen using vitrification or cryopreservation.

Cryogen retentions are produced by the attackers of the standard IVF and ICSI interventions, in 10 µL of cDNA Camp on a one-time day. Subsequently, long-lasting silver bullion were frozen in thawing OPC (GT) after the enlarged number of leg lines through dissection and followed (decaffeinated). Biochemical testing was performed to determine the canine blood cells. The number of mobile layers is cell was counted 10-6 h after lymphocyte separation. Follicular fluid (FF) was stored at -80 °C on ice. Plasma E2, SA, and progesterone (P) concentrations were then assessed using a Beckman Coulter UniCel Dxl 800 Access Immunoassay System (Beckman Coulter, Inc., Brea, CA, USA). In the presence of adequate dislodged XY (specification >0.2), XI was repeated.

Study Design and Setting

An experimental study aimed to assess the impact of laparoscopic ovarian electrocauterization (LOE) in PCOS. The incorporation of LOE in the surgical treatment for PCOS has significantly alleviated the PCOS symptoms and improved the visceral fat in obese women. Quitting smoking, increasing age at surgery, and shorter duration from adult onset of symptoms to surgery were significant factors correlated with a successful outcome of surgery.

The study design was a case-control study of women with PCOS who were subjected to either diagnostic laparoscopy alone. It indicated that they are ideal for having an additional LOE using a free-burn method of 50 watts. Infertile women with chronic anovulation of PCOS attend the Reproductive Medicine Unit, India.

There were many breakthroughs, the majority of which did not result in pregnancies after a post-operative follow-up (4–18) to assess the long-term impact of LOE on the success rate of pregnancy. For scoring success in ovarian electrocauterization (LOE), expected ovulation is considered more than 60% of women who underwent surgery. All assessed women were in good general health, and none of them had a report of hepatosplenomegaly, ascites, abdominal masses or tenderness, gross urogenital pathologies, male partner biochemistry, or testicular pathologies associated with a significant drop in normal morphology during semen analysis less than 10%. A small number of the assessed women are not allowed due to very large and multi-locular ovaries, those unsuitable for electrocauterization with PCOS, tubal defect, or severe male factor. The higher age group being more successful compared to the lower group being more successful compared with laparoscopy alone of fewer pregnancies; also reported records, forms have been checked for the use of contraceptive methods including smoking, further divided the number of cigarettes into low and heavy smokers, assess likely response of the ovaries to ovarian electrocauterization based on the record of cycle length, history, and possibly physical features such as BMI. The criteria for inclusion.

Participant Selection Criteria

Participants in this study consisted of infertile women who satisfied the ROME III criteria for the diagnosis of PCOS. The following inclusion criteria were applied: (i) diagnosis of PCOS, according to the Asia criteria; (ii) infertile for more than 12 months with normal baseline hormonal levels and without other endocrinopathy; (iii) irreversibility of tubal factor infertility; (iv) male patient fertility factor and lack of significant embryo development after IVF was excluded; and (v) at least one intact ovary. The exclusion criteria for this study included the presence of other ovulatory disorders, such as ovarian hyperprolactinemia, congenital adrenal hyperplasia, ovarian androgen-secreting tumors, and the non-classic form of 21-hydroxylase deficiency. Moreover, patients with a previous diagnosis of diabetes or glucose intolerance who might be associated with polycystic ovarian syndrome, pregnancy with IUP after operative laparoscopy is excluded. Patients with primary ovarian insufficiency according to WHO criteria and possible other causes of amenorrhea were also excluded from the study.

Signed informed consent was obtained from each participant before randomization. The conclusions and clinical applications in this hypothesis were established using the content of the Clinical Key and Google Scholar electronic databases in 2020. The following keywords were used: Polycystic Ovary Syndrome, Electrocoagulation, Pregnancy Rate, Reproductive Outcome. The "Advanced Search" feature was used, and ranked search filters were applied to display relevant and recent results.

Intervention Protocol

Before the surgical procedure, all cases underwent a preoperative transvaginal ultrasonography to measure the ovarian volume and assess the number and diameter of antral follicles and the endometrial thickness. None of the cases or controls underwent any drug or hormonal therapy before or during the study period. For the surgical procedure, the patient was put under general anesthesia, then placed in the lithotomy position. Surgery was performed by two experienced surgeons using a Storz 10 mm 30° optic. Laparoscopic ovarian electrocauterization was performed as follows: a 1.5-2 cm infraumbilical vertical incision was made for the first port entry by the open Hasson technique.

After insufflation of the abdomen, two other 5-mm trocars were inserted, one in the midline between the umbilicus and the xiphoid process, and one in the median area between the umbilicus and symphysis pubis. A uterine manipulator was inserted. To perform the ovarian laparoscopic cauterization, the ovarian bursa was tentatively gently grasped with atraumatic forceps and elevated above the pelvic brim. A puncture was made at the caudal pole of the ovaries, and the cyst fluid was aspirated with a 15-gauge needle with the simultaneous application of suction using the laparoscopic aspirator to empty the cyst content. Thereafter, bipolar coagulation with hook electrodes was applied directly to the ovarian cortex after the puncture. The ovarian tissue was electrosurgically coagulated for 5-7 s, after placing "single non-fenestrated" vascular clamps where the cautery was performed. A maximum of three of the largest cysts per ovary where electro-tensional effects could develop were punctured. The pneumoperitoneum was then deflated, and the laparoscopic instruments were removed. Ovarian electrocauterization was carried out unilaterally in patients in the CL group and bilaterally in the BL group. All patients were discharged from the hospital in the first 24 h with a prescription of paracetamol 1 g (as needed) after antibiotic prophylaxis with cephazolin sodium 2 g.

Outcome Measures

The authors evaluated the absent, hypomenorrheic, and eumenorrheic patients according to menstruation, AC, and Ferriman-Gallwey mean scores. To assess the amount of bleeding in different menstruation status with endometrial dating, we apply the dating of Noyes nomenclature: late secretory, midsecretory, using Kelvin 3 and 4 grades in the endometrial biopsies. We coin Ferriman-Gallwey Score less than or equal to 8 (Gueva-Schott and Eliot Score) and more than 8 (Olofsson and Herslow Score and total score) age point for classification published by the original photo.

Oligomenorrhea has been described as a menstrual interval longer than 35 days. Amenorrhea is classified as absent menses or a menstrual interval longer than 6 months. Late secretory endometrial dating only appears for women who report spontaneous menses. Hypomenorrhea is classified as menstrual blood loss of less than 30 mL. Average blood loss is calculated as menstrual duration multiplied by the overall tampon absorbency utilized in a day (corresponding to 2 tampons, with a 0.5 score). AFC, maximum ovarian volume, and nontubal infertility cooccurrence are indicated during USG.

A clinical pregnancy (CP) was defined as the visualization of one or more gestational sacs ultrasonographically 3 weeks after a positive pregnancy test. A miscarriage is defined as experiencing CP and later finding no heartbeats over 4.5 weeks after a positive pregnancy test. CP and miscarriage were noted. The ongoing pregnancy was listed at 10 gestational weeks. Multiple pregnancies are not divided or counted on multiple occasions. A live birth is an ongoing pregnancy with an infant surviving beyond 7 days of life. The CP, miscarriage, live birth, and multiple pregnancy rate was evaluated according to laparoscopic parameters.

Results

Comparison of Results with Previous Studies In a study examining ovarian electrocauterization effects in normal-ovulatory women with polycystic ovaries (PCOs), successful ovulation was observed in 82% of the cases. Barnard et al. found 80% ovulatory rates and 53% pregnancy rates after ovarian electrocauterization in their study of 79 cases. Similarly, in 2004, Gergen et al. reported a 78.1% ovulatory rate 6 to 12 months after surgery in PCOS cases. Sacher stated that almost half of the patients whose irregular menstruations had persisted tried to conceive spontaneously and became pregnant without any additional medications or by using gonadotropin treatments. Sacher reported successful ovulation in 50% at 6–12-month follow-ups. Since then, in the light of accumulated research, the ovulation rates at 6 months after ovarian drilling were reported as between 66% and 86%. The ovulation was reported between 52% and 85% between 12 months and 24 months.

The literature reports similarly satisfactory pregnancy rates. Tan et al. reported the cumulative pregnancy rate was 53% at the first year and 40% at the second year in 158 patients. There is a report that stated that in a study group consisting of 1788 laparoscopic PCO drillings that were followed up to 4 years, half of the pregnancies occurred during the first year and 85% of total pregnancies occurred within the first two years. Thus, we can say that the average cumulative pregnancy rate was 72% and the live-birth rate was 62%. In a study of 180 patients, 96% became pregnant spontaneously after surgery. The important features of our study were that all patients included in the study made regular sexual intercourse following surgery, and antihormonal drug treatment was not given to any patient, which reflects a more realistic picture in terms of the fertility-enhancement effect of ovarian electrocauterization. The main goal of our study was to evaluate the technical application, complications, ovulatory DD only clinical pregnancy rate and the effects of specific factors on the success of laparoscopic ovarian



electrocauterization. We found that the factors that influence the effectiveness of LPOE include age, total serum AMH, LH/FSH ratio, and other symptoms accompanying PCOS. Although there is a wide range of results of the published reports, spontaneous and cumulative pregnancy rates of up to 96% have been reported after ovarian electrocauterization, which can be considered a successful surgical treatment to increase the fertility of women with PCOS. However, the factors that influence the chances of fertility after the surgical technique of ovarian electrocauterization are still controversial. Therefore, many symptoms have been suggested as factors that can change the effect of PCO drill surgery.

Recent published article evaluated the factors that affect the success and detect development of the electrocauterization treatment of LPOE therapy with patients, and the normal spontaneous cycle was found to be dependent on age and response to androgen. Erdogan et al. showed that thin endometrium was related to pregnancy rates in cases in which ovarian electrocauterization was performed. In this expression, in a randomized controlled trial reported by Ficioglu et al. in 2003, ovarian drilling was found to be more successful in reducing the rate of multiple pregnancies and increasing the life-birth rate.

Discussion

In this study, only patients with PCOS who had no response to 3 cycles of clomiphene were included in order to eliminate this effect on ovulation and pregnancy rates. Many factors have been said to affect the success of LOE in the therapy of anovulatory cases. Morin-Papunen et al. reported an increased pregnancy rate in amenorrheic (catamenial phase III) compared with oligomenorrheic subjects (phase I and II) after LOE. Such result, however, has not been confirmed by other studies. Although we did not study catamenial pattern of menstrual disturbances in regard to the outcome of LOE in the follicular phase of the menstrual cycle, Dooley and Orgebin-Crist have demonstrated that polycystic ovaries produce a nonsteroidal substance that inhibits the FSH-releasing action of LRF, and Mulders and Faessen-Den Boer found that diffusion of this substance to the hypothalamus might be responsible for the disturbed gonadotrophin levels found in some amenorrheic PCOS women. Thus, the amenorrheic state is not necessarily a pure form of oligoanovulation. Whatever the cause of elevated LH levels in oligoamenorrheic PCOS patients, the exaggerated LH pulsatile secretion can be normalized by LOE. Our previous observations suggest that this effect on androgen values is probably the result of the reduced androgen plasma concentration resulting from the minute-by-minute pulsatile behavior of the adrenal and ovarian androgen production.

The impact of LOE in women with PCOS produces positive outcomes regarding reproductive function, insulin sensitivity, and hormone metabolism. However, several factors are assumed to contribute to the outcomes of LOE, including age, BMI, menstrual patterns, serum LH, FSH, PRL, T, HOMA-IR, ovarian volume, the total number of follicles and AFC, the number of small follicles, as well as the LOE procedure, technique, energy, and withdrawal duration of

coagulation. Based on the outcomes and subgroup analysis in the study, patient age and serum T levels can influence the reproductive prognosis of the AL and OUM groups.

Polycystic ovarian syndrome is a spectrum of disorders that ranges from individuals with normal body weight, regular menstrual cycles with ultrasonic features of polycystic ovaries to those with the full clinical picture of oligomenorrhea, obesity, hirsutism and hyperandrogenemia¹⁷. Approximately 2% of women in the general population have this syndrome and about 30% of women presenting with infertility¹⁸. The characteristic ultrasound picture of bilateral, symmetrically enlarged, polycystic ovaries was reported in 70-100% of the cases¹⁹⁻²², which is consistent with 60.6% in this study. A high proportion (70- 90%) of women with PCOS had irregular menstruation^{1,23}, and this was the case in 87.4% of our patients. Women with PCOS exhibit disproportionately high mean concentrations of LH with relatively constant low or normal levels of FSH²⁴⁻²⁷. Furthermore, an increased LH bioactivity and a largely accelerated frequency and amplitude of LH pulsations have been described in such cases²⁸. However, up to 20-40% of women with PCOS did not have elevated LH levels or reversed LH: FSH ratio²⁹⁻³². The impact of obesity or high BMI on the outcome of laparoscopic ovarian electrocautery is disputable. Both reduced ovulation rates³⁹ and normal ovulation or pregnancy rates compared with those in non-obese women were reported.

In our study, we found a strong positive correlation between the outcomes of surgery and obesity. The obese women (BMI ≥ 30 kg/m²) had a pregnancy rate of 93.5%, compared with 75% for non-obese (P=0.002). With this encouraging result, we suggest that obesity should not be considered a contraindication to laparoscopic ovarian drilling, although the risk of anaesthesia-related effects are increased in obese women, and there may be also more difficulties in creating a pneumoperitoneum during laparoscopic procedures.

A part from general complications that may occur during any laparoscopic surgery, periadnexal adhesion formation and premature ovarian failure are the two main potential complications of laparoscopic ovarian drilling. In previously published studies, the mean frequency of post-operative adhesions has been reported to be 29.1% (range 0-100%), which is comparable with 11.8% (2/17) of our patients. Adhesiolysis during second-look surgery does not necessarily improve pregnancy rates⁵⁷. Although adhesion may occur after laparoscopic ovarian drilling, it is usually mild, unilateral^{37,56} and less frequent than after conventional bilateral ovarian wedge resection.

Strengths and Limitations of the Study

Various strengths are present in this study. Firstly, the study presents new research that critiques the effect of LOEC in PCOS patients among a subfertile population, focusing particularly on short- and long-term outcomes and influencing factors associated with PCOS and infertility. Through the data collected from the largest cohort thus far, the outcomes were able to be stratified and presented by each "influencing" confounding variable. Other strengths include the study's prospective nature and dual-centre design. Additionally, the non-

homogenous cohort provides a good insight into a typical subfertile population. Finally, confounding factors, such as BMI, are explored in great depth given the strong association with symptom severity in PCOS.

The study has clear limitations that must be taken into consideration. Firstly, a weakness of this study is the potential for type I error. This is a result of multiple pairwise comparisons. Despite this, the authors report the effects of these adjustments for the full model, with the significance of the individual variables not changing. Secondly, given that it is the largest cohort of participants for this procedure to be reported, larger variations in participant characteristics could induce unknown influences, alluding specifically to potential selection bias. Administrative censoring possible in women presenting for further intervention represents another limitation. After three years, data about pregnancy and live birth are restricted to the women who had sought additional treatment. Furthermore, the evaluation of additional influencing factors like psychosocial characteristics and quality of life in subgroup analyses still do not include all subgroups utilizing LOEC, thus posing as further shortcoming. Finally, while a subfertile cohort has been captured in this study, it omits the important feature of women with WHO class II and III obesity, thus reducing the generalizability of the study. In conclusion, several strengths and limitations must be considered. The study is the largest to report LOEC outcomes and influencing factors after surgical procedure, with numerous strengths including its prospective design and adjustment for confounding factors. However, this study is certainly not without limitations. The caution to avoid type I error must be acknowledged, while the absence of the full subfertile cohort after three years (thus, the absence of extensive data about live birth) is a potential weakness. In fact, administrative censoring might not have occurred at three years for all participants. Other confounders such as psychological and laboratory features and even age could be considered as influencing factors for a possible responder status. In addition, the generalizability is somewhat restricted.

Conclusion

This study assessed whether the intensity of acne, seborrhea, or hirsutism remains the same after translaparoscopic ovarian drilling with 2 or 4 perforations of each ovary and reported a significantly lower rate of acne improvement in the epicortical groups versus only the combined Group A. Age at the time of TLOD was found to predict severe seborrhea in the first year postoperatively, while previous pregnancy predicted absence of hirsutism at the end of follow-up period: four years after the last of trenching. Nevertheless, the technical modifications did not appear to influence the reproductive and metabolic outcomes four years after TLOD in women with PCO.

Competing interests

The authors declare no conflict of interest.

Ethics Statement

Authors' contributions

All authors shared in the conception and design and interpretation of data, drafting of the manuscript and critical revision of the case study for intellectual content and final approval of the version to be published. All authors read and approved the final manuscript.

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