

IMPACT OF LAPAROSCOPIC OVARIAN ELECTROCAUTERY ON DOPPLER INDICES WOMEN STROMAL BLOOD FLOW IN WOMEN WITH POLYCYSTIC OVARY SYNDROME

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Abstract- Polycystic ovary syndrom (PCOS) is characterized by infertility, oligomenorrhea, and hyperandrogenism. Clomiphene citrate (CC), an antiestrogen, is first-line treatment for PCOS, if CC fails to induce ovulation, laparoscopic electrocautery of the ovaries is offered. In this prospective controlled study, 52 women with clomiphene-resistant PCOS (group 1) and 46 women with regular menstrual cycles as a control group (group 2) were included. Hormonal profile and doppler blood flow changes within the ovarian stroma before and after laparoscopic ovarian electrocautery (LOE) in women with clomiphene-resistant polycystic ovary syndrome assessed and compared between groups. The doppler indices (pulsatility index and resistance index) of ovarian stromal blood flow were significantly lower in group 1 before LOE than in group 2. The serum levels of testosterone (T) and LH were significantly reduced in group 1 after LOE compared with in group 1 before LOE ($P < 0.05$). Doppler indices (pulsatility index and resistance index) of ovarian stromal blood flow were significantly increased after LOE. Laparoscopic electrocautery reduced serum T and LH and reduced ovarian blood flow velocities, which may explain the reduction of ovarian hyperstimulation syndrome in women with PCOS after LOE. Laparoscopic electrocautery of the ovaries is now accepted as the preferred first-line treatment of women with PCOS who are resistant to clomiphene citrate. All affected women could be considered for this treatment.

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is the commonest endocrine disorder in women of reproductive age (1). It is characterized by infertility, oligomenorrhea, and hyperandrogenism (2). The ovaries are bilaterally enlarged and contain numerous subcapsular follicles (3).

Approximately 4-6% of unselected women of reproductive age suffer from the PCOS (4, 5). The first line of treatment for PCOS is clomiphene citrate, but up to one fourth of treated women fail to ovulate (6). Induction with gonadotropins is an option in clomiphene citrate-resistant women but is costly, requires extensive monitoring, and entails a risk of multiple pregnancy and may be involved in the increased predilection to ovarian hyperstimulation syndrome (OHSS). Another option, laparoscopic electrocautery of the ovaries (LEO), causes minimal morbidity, precludes the need to monitor cycles, and has a low risk of multiple pregnancy (7). A reduction

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has been observed in incidence of OHSS after laparoscopic electrocautery (8). This may be an advantage for women with PCOS, who will receive gonadotropin for IVF. The present study aims to determine the hormonal profil and doppler blood flow indices in women with clomiphen citrate-resistant PCOS befor and after LOE.

MATERIALS AND METHODS

The study included 52 infertile patients with clomiphene-resistant PCOS (Group 1) (they had failed to ovulate after being given 150 mg/d during six consecutive cycles, for 5 days each). Diagnosis of PCOS was based on clinical manifestations (oligomenorrhea, hirsutism, and obesity) and standard ultrasound criteria (9). Forty-Six fertile women with ovulatory cycles and normal ovaries (by ultrasound examination) were used as a control group (Group 2). Laparoscopic electrocautery was carried out in the early follicular phase of menstrual cycle.

Each ovary was cauterized at five points, for 5 second, using 40 w of power with a high-frequency monopolar microneedle, regardless of the size of the ovary. The whole length of the needle (10 mm) was inserted into the ovary to ensure stromal damage.

Ultrasound examination was done using an ultrasound duplex system (Acuson). Doppler examination was done using a 5-MHz transvaginal probe with pulsed and color doppler facilities. Examinations were performed at the beginning of a menstrual cycle befor laparoscopic ovarian electrocautery (LOE) and in the early follicular phase of the first postoperative cycle. Area of maximum color intensity, representing the greatest doppler frequency shifts, were selected for pulsed doppler examinations. The resistance index (RI) and pulsatility index (PI) were used as measures of blood

flow impedance distal to the point of sampling. Befor LOE, a blood sample was taken from each patient, and the second sample was taken in the early follicular phase of the first postoperative cycle after LOE. Serum LH, FSH and testosterone were assayed by using an ELISA kit. Estradiol was also measured using solid-phase RIA with a sensitivity of 6 pg/ml (Shariati Hospital laboratory).

Comparison of the measured parameters between groups were carried out by Student's *t* test. Comparison befor and after LOE was done using paired *t* test. Linear regression analysis was done to assess any correlation between the different variables.

RESULTS

After LOE, the serum levels of LH, T and LH- FSH ratio were significantly lower compared to befor LOE.

There was no significant difference in serum estradiol and FSH concentration befor and after LOE. Singnificant differences ($P < 0.05$) existed in serum LH (8.61 ± 0.62 versus 13.23 ± 0.56) and testosterone concentration (2.51 ± 0.20 versus 4.62 ± 0.31) also serum LH- FSH ratio (1.15 ± 0.12 versus 2.23 ± 0.16) were achievd after LOE and befor LOE in group 1 respectively (Table 1). Ultrasonographic and power doppler signal parameters also showed statistically significant differences between the two group (Table 2).

The Resistance index (RI) and pulsatility Index (PI) were all significantly higher ($P < 0.001$) in women with normal ovaries (0.88 ± 0.08 and 2.96 ± 0.76) compared to women with PCOS befor LOE (0.76 ± 0.11 and 2.01 ± 0.64). After LOE RI and PI were significantly increased (0.84 ± 0.08 and 2.89 ± 0.57) compared to befor LOE (Table 2).

Table 1. Serume concentrations of hormones (mean \pm SD) in patients with PCOS (befor and after LOE)

Variable	PCOS		P Value
	Post- LOE	Pre- LOE	
LH (IU/L)	13.23 ± 0.56	8.61 ± 0.62	$P < 0.05$
FSH (IU/L)	6.62 ± 0.41	8.70 ± 0.52	NS
Estradiol (Pg/ml)	79.23 ± 10.60	80.68 ± 6.32	NS
Testosreron (nmol/ml)	4.62 ± 0.31	2.51 ± 0.20	$P < 0.05$
LH-FSH ratio	2.23 ± 0.16	1.15 ± 0.12	$P < 0.05$

Table 2. Doppler indices in normal ovaries and in PCOS before and after LOE

Doppler indices	Normal women (n = 46)	PCOS (n = 52)	
		Post- LOE ²	Pre- LOE ¹
RI	0.88 ± 0.08	0.76 ± 0.11 [†]	0.84 ± 0.08 [‡]
PI	2.96 ± 0.76	2.01 ± 0.64 [†]	2.89 ± 0.57 [‡]

Abbreviations: PCOS, polycystic ovary syndrome; LOE, laparoscopic ovarian electrocautery.

* Data are given as mean ± SD.

[†] P value in this column refer to comparison of pre- LOE and control group ($P < 0.001$).

[‡] P-value in this column refer to comparison of post- LOE and pre- LOE ($P < 0.01$).

DISCUSSION

The current study on ovarian stromal blood flow, had two main purposes. First, our results revealed that ovarian stromal PI and RI were significantly lower in women with PCOS compared to healthy women. These findings are consistent with results of a previous study (10). Second goal was to determine the value of electrocautery in the treatment of patients with PCOS who do not respond to an adequate trial of clomiphene citrate, and it suggests the LOE may significantly increase ovarian stromal RI and PI in women with PCOS compared with before LOE. The levels of LH, LH-FSH ratio and T in group 1 after LOE were also statistically significantly lowered by LOE. Reduction in LH and T after LOE has been reported by others (11).

However, Tulandi did not find a significant difference in hormonal profile before and after LOE. This difference may be because they applied the electric current for only 2 seconds (12) while we applied 5 second duration. The reduction in serum LH levels after LOE is reported to be the main mechanism by which reproductive outcome is improved (13). It is well documented that women with PCOS are at increased risk of developing ovarian hyperstimulation syndrome (OHSS) during ovarian stimulation for IVF (14). Early Doppler ultrasound studies have demonstrated increased stromal vascularity in polycystic ovaries (15). One hypothesis is that the increased blood flow and the increased vasculature seen in the stroma of these ovaries may be responsible for the increased risk of OHSS. We found significantly reduced ovarian stromal RI and PI after LOE in group 1. Although the implication of this finding in ovulation induction

treatment is unknown it may help to explain the reduction of OHSS after LOE.

In conclusion, laparoscopic ovarian electrocautery reduced T, LH and LH- FSH ratio, as well as ovarian blood flow velocities in PCOS. We suggest that LOE may be a first choice for treatment of a woman with clomiphene-resistant PCOS; this avoids the risk of developing OHSS if she will need gonadotropin stimulation later.

Conflict of interests

The authors declare that they have no competing interests.

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Laparoscopic ovarian electrocautery in PCOS

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