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Original Research Article

## Effectiveness of Laparoscopic Ovarian Drilling (LOD) on restoration of menstrual cycles, ovulation and pregnancy in clomiphene citrate resistant women with PCOS

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### ABSTRACT

**Background:** Anovulatory infertility is present in 75% of patients with polycystic ovarian syndrome (PCOS), in addition to oligomenorrhoea and signs and symptoms of hyperandrogenism. This study was performed to evaluate the role of laparoscopic ovarian drilling (LOD) on ovulation, restoring menstrual cycles and pregnancy in clomiphene resistant women with PCOS.

**Methods:** This prospective cohort study included 50 women who were diagnosed with PCOS and anovulatory infertility. These patients had already tried Clomiphene citrate for conception and did not ovulate, underwent LOD between 1<sup>st</sup> September 2009 until February 2011 in the Department of Gynecology and Obstetrics, at the Panna Dhay Mahila Chikitasalya, Udaipur. The major outcome measures include spontaneous ovulation, menstrual regularity after LOD and pregnancy rates.

**Results:** Among 50 patients 33 (66%) started to menstruate regularly and 60% ovulated spontaneously, of them 24 (48%) conceived.

**Conclusions:** Women with PCOS respond favourably to LOD.

**Keywords:** LOD, PCOS

### INTRODUCTION

Polycystic ovarian syndrome is the most common cause of anovulatory infertility. According to the Rotterdam criteria, PCOS is characterised by a combination of oligo/amenorrhoea, clinical or endocrine signs of hyperandrogenism and polycystic ovaries.<sup>1</sup>

There are several treatment options for PCOS related anovulatory infertility. First line of treatment is usually clomiphene citrate, but when it fails to result in conception, gonadotrophins or laparoscopic ovarian drilling (LOD) may be used as a second line treatment. Gonadotrophin use requires extensive monitoring

because of high sensitivity of polycystic ovaries to exogenous gonadotrophins, with the risk of multiple follicle development leading to termination of cycle, ovarian hyperstimulation syndrome or multiple pregnancies.<sup>2</sup> Laparoscopic ovarian drilling, on the other hand, involves a single procedure that has minimal morbidity and can lead to consecutive ovulations with minimal risks of multiple pregnancies.<sup>3</sup> Sensitivity to clomiphene citrate increases after this treatment.<sup>4</sup> Adnexal adhesions and reduced ovarian reserve are considered two probable hazards of LOD. The clinical response to LOD seems to be thermal energy dose dependent. LOD with four punctures delivers 640 joules/ovary widely accepted by many investigators. However, the optimal amount of electro-surgical energy

needed during LOD to achieve maximum reproductive outcome without risks is uncertain.<sup>5</sup>

The aim of this study was to evaluate the efficacy of LOD in the treatment of anovulatory infertility in PCOS.

**METHODS**

During the period from September 2009 through February 2011, fifty patients of PCOS who under-went LOD using diathermy were included in this study.

**Inclusion criteria**

Women between 20-40 years age and BMI between 20-32, treated with clomiphene citrate but failed to ovulate or get pregnant, were included in this study.

**Exclusion criteria**

The following patients were excluded:

Associated infertility factors such as bilateral tubal block, male factor, hyperprolactinemia, thyroid disease, diabetes.

The diagnosis of PCOS was based on the Rotterdam criteria which necessitate two of the following three features to be present for diagnosis:

- Oligomenorrhea and / or anovulation;
- Clinical and / or biochemical signs of hyperandrogenism; and
- Ultrasonic confirmation of polycystic ovaries

The hormonal profile including FSH, LH, prolactin, thyroid levels were carried out in the MB Hospital laboratory on 3<sup>rd</sup> day of menses or any indexed day in amenorrhoeic patients. In obese patients fasting serum insulin was also estimated. Abdominal/vaginal ultrasound was performed. Diagnosis was based on ultrasound evidence of stromal hypertrophy and more than 10 small follicles (2-9 mm) arranged peripherally. Ovarian volume more than 10 was considered as part of diagnosis.

Demographic features of each patient including age, BMI, duration of infertility, type of infertility (primary or secondary), and associated clinical features of hyperandrogenism such as acne and hirsutism were noticed. Diagnostic laparoscopy was performed. Whole of the pelvis, uterus and adnexal structures were evaluated. Tubal patency was confirmed by chromopertubation test and LOD was done only when tubes were patent. The technique of LOD used in this hospital is three puncture approach Laparoscopy. Electrosurgical units set at monopolar coagulation current at 40 watts was used. A laparoscopic ovarian diathermy needle made of stainless steel and measuring 8 mm in length and 2 mm in diameter. Duration of each

penetration was 5 seconds. About 3-5 punctures, 2 mm in diameter and 7-8 mm in depth, were made.

**Post-operative monitoring**

Following ovarian drilling women were asked to keep a record of their menstrual cycle. If she started to menstruate regularly serial ultrasound was performed to confirm the ovulation. If ovulation was not confirmed, clomiphene citrate was started as an adjuvant at 6-8 weeks after surgery. If ovulation was achieved either spontaneously or with the help of clomiphene citrate, patients were followed up until they conceived or until 12 months after LOD.

Informed consent of the patients was taken.

**RESULTS**

A group of 50 women with the diagnosis of PCOS underwent laparoscopic ovarian drilling during the study period. Demographic features of the 50 patients are presented in the Table 1. Mean age of the patients was 27.2±3.4 and BMI was 27.76±3.5 kg/m<sup>2</sup> (SD 3.5) that ranged between 23.5 to 31.2 kg/m<sup>2</sup>. Mean LH level was 11.2 IU/L (range 3.8-15.9). Forty-four (88%) patients had ultrasound features typical of PCOS.

**Table 1: The characteristics of 50 PCOS women who had LOD for anovulatory infertility.**

Characteristic	N	Mean	Range
Age (years)	50	27.2	20-34
BMI	50	27.76	23.7-32
Duration of Infertility (years)	50	3.32	3-9
Serum LH (IU/L)	50	11.48	5.2-15.9
Serum FSH (IU/l)	50	5.2	1.2-8.2
<b>Menstrual cycle pattern</b>	N	%	
Regular	3	6	
Oligomenorrhoea	32	64	
Amenorrhoea	15	30	
<b>Hirsutism</b>			
Yes	37	74	
No	13	26	
<b>Acne</b>			
Yes	16	32	
No	33	66	
<b>Infertility</b>			
Primary	43	87.8	
Secondary	6	12.2	
<b>Ultrasound evidence of PCO</b>			
Atypical of PCOS	5	10	
Typical of PCOS	45	90	

FSH: Follicular stimulating hormone; LH: Luteinizing hormone

Clinical features of hyperandrogenism i.e., hirsutism and acne were present in 37 (74%) and 16 (32%) respectively. Degree of hirsutism was only assessed as mild / moderate or severe. Most of these patients had either

oligomenorrhoea (64%) or amenorrhoea (30%). Only 6% patients had regular menstrual cycle.

The Table 2 depicts the outcome in terms of cycle regularity, ovulation and pregnancy. Thirty-three patients (66%) resumed regular menstruation after LOD whereas 17 (34%) patients failed to do so. After LOD spontaneous ovulation occurred in 60% patients; whereas 40% did so after supplemental CC. Total pregnancies achieved after LOD were 24 (48%), out of these 3 resulted in miscarriage. One patient opted for MTP as she was being divorced. One patient had molar pregnancy. The patients were followed up for 1 year only and pregnancies achieved in second year or after were not included, although 2 additional pregnancies did occur between 12 to 24 months.

**Table 2: Outcome measures of LOD.**

	N	%
<b>Menstrual cycle pattern</b>		
Regular	33	66
Irregular	17	34
<b>Ovulation</b>		
Spontaneous	30	60
CC	20	40
<b>Pregnancy</b>		
Take home baby	21	42
Miscarriage	3	6
<b>Ectopic</b>	0	
Unsuccessful	26	52

CC: Clomiphene citrate

## DISCUSSION

The most plausible mechanisms of action of LOD are the destruction of ovarian follicles and a part of the ovarian stroma, inducing a reduction of serum androgens and inhibin levels, which results in an increase of FSH and restores the ovulation function.<sup>6</sup> LOD may also increase ovarian blood flow, allowing a high delivery of gonadotrophins and post-surgical local growth factors. An improvement of insulin sensitivity after LOD has also been suggested.<sup>6,7</sup> In the present study 66% of the patients achieved a regular menstrual cycle whereas for rest 34% menses remained irregular. We achieved a spontaneous ovulation rate of 60% and rest 40% ovulated after adding CC i.e. all of the patients who were resistant to CC defined as those who failed to ovulate after 150 mg of CC, ovulated after LOD.

Some studies have quoted higher ovulation rates i.e. around 80%. Difference in response may be attributed to the use of other forms of energy modalities such as CO2 laser and Argon laser. Hassan E conducted a similar study of 181 CC resistant PCOS patients in which 88% obtained a regular menses, spontaneous ovulation of 70% and pregnancy rate of 83%. A much higher pregnancy rate in his study may be attributed to a longer period of follow up i.e. 2 years in his study. In this study follow up

was only for one year and pregnancies obtained in second year were not included, although 2 additional pregnancies did occur between 12 to 24 months. Moreover, we did not use gonadotropin for ovulation stimulation which was used by Eftekhar. The same was the reason for multiple pregnancy in his study.<sup>9</sup>

About 20- 30% of the patients do not respond to LOD. It may be due to insufficient dose of thermal energy, but studies reveal that LOD increase the amount of FSH and only minimal amount of thermal energy is required so dose of thermal energy has to be optimized in accordance with the ovarian volume. Another possible explanation is inherent resistance of ovaries to the effects of LOD. Another cause may be hyperprolactenemia observed in some patient after LOD.<sup>10</sup>

## CONCLUSION

LOD is effective in restoring menstrual cycles and spontaneous ovulation in PCOS patients. It also renders ovaries sensitive to CC and can be used as an alternative to gonadotrophins in CC resistant PCOS patients with advantages of inducing monofollicular stimulation avoiding the risk of multiple pregnancy and OHSS and cost effective as intensive monitoring is not required.

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