

## LAPAROSCOPIC OVARIAN ELECTROCAUTERY, FOLLICULAR PUNCTURE AND DRAINAGE, FOR INDUCTION OF OVULATION IN ANOVULATORY P.C.O.D. AND P.C.O. SUBJECTS

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### SUMMARY

Laparoscopic ovarian electrocautery, follicular puncture and drainage has been offered as the primary method of ovulation induction in P.C.O.D. subjects and also for the clomiphene failed P.C.O. subjects. Among the 64 subjects treated, 44 had atleast 6 months follow-up. Pregnancy rate among the followed group has been 45.45%, with an abortion rate of 10%, there was no multiple gestation.

The small group of 8 subjects who had follicular diathermy following gonadotropin hyperstimulation recorded 50% pregnancy rate. In the non-gonadotropin treated group 36 subjects the conception rate has been 44.44%. Hence, the practice of prior ovarian hyperstimulation merits further study on a larger population.

Ovarian diathermy is as effective as GnRH agonist in down-regulating pituitary LH, and hence should improve the pregnancy rate and pregnancy outcome of gonadotropin induction of ovulation. Following HMG therapy follicular rupture is better achieved with GnRH agonist flare rather than by employing hCG.

### INTRODUCTION

Polycystic ovarian disease (PCOD) typically presents with somatic features of hyperandrogenism, which includes

hirsutism, obesity, menstrual irregularity and anovulation. The endovaginal sonographic features of the ovaries have been well described as the 'necklace pattern' or peripherally arranged antral follicles in the bilaterally enlarged ovaries. More common is polycystic

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ovaries (PCO), presenting with anovulatory infertility and menstrual delays, but not attended with hormonal abnormalities or somatic features of hyperandrogenaemia. (Swanson et al - 1981 and Adams et al 1985). At endovaginal sonography, these PCO patients typically evidence bilateral active ovaries with no prospects of follicular dominance (Rajan, and Rajan, 1991).

Most of PCO subjects are successfully treated with Clomiphene citrate (CC) (Franks et al - 1985), with an average conception rate of 67% (Rajan, Unpublished data 1994). However, the PCOD subjects are basically resistant to CC and treating them with hMG, pure FSH or GnRH analog are most demanding problems in infertility (Yen et al - 1970), Want and Gemzell 1980 and Shoham et al - 1993). Even the newer approaches using pure FSH or combinations of GnRH agonists with gonadotropins basically have not solved this problem (Gadir et al, 1992). We have preferred laparoscopic ovarian diathermy and follicular drainage, first described by Gjonnaess in 1984, as a better alternative to medical inductions (Rajan, 1992). However we have successfully treated a few patients with abnormal G.T.T. values with human insulin therapy.

Currently, different technics of ovarian follicular puncture and drainage have been described (Naether et al - 1993). As compared with laparoscopic laser drilling ovarian electrocautery seems to have lasting effect, probably because of greater tissue destruction in the cortical area (Naether et al - 1993). Moreover, post-operative adnexal adhesion formations

have been reported to be less with monopolar current compared to laser surgery (Rittenhouse et al., 1993). The incidence of adnexal adhesions could be further minimized by perfect ovarian hemostasis, and by employing peritoneal lavage and artificial ascites (Naether and Fischer, 1993). Transvaginal ultrasound guided follicular aspiration with prior gonadotropin induced ovarian hyperstimulation has been another recent approach attended with 50% conception rate (Mio et al - 1991).

In the current study two groups of patients have been considered for laparoscopic ovarian diathermy and follicular drainage employing monopolar cautery. They included the PCOD subjects in whom the primary treatment has been ovarian diathermy, and the PCO subjects in whom ovarian diathermy has been second line of treatment when they fail to respond to CC. In the latter half of the study the ovaries were prior hyperstimulated with hMG/hCG regime to facilitate easy follicular drainage. Analysis of results of this laparoscopic surgery forms the text of this communication.

#### **OPERATIVE PROCEDURE**

Currently we employ the four-point laparoscopy under general anaesthesia for all patients. The 10mm 0° telescope has been employed as the visual axis, and the operating axis consisted of 3 portals, one in the suprapubic region (10mm sleeve) and two 5mm sleeves placed on either side at the lateral borders of the rectus muscles. The suprapubic portal is employed for suction-irrigation and retrac-

tion, whereas the lateral portals are employed alternately for grasper and monopolar needle cautery applications. Continuous flow of CO<sub>2</sub> helps keeping the intestines away from the operating field. At the outset the uterus, tubes, ovaries and the peritoneal folds are carefully examined for any pathology and tubal patency confirmed by hydroper-tubation.

By grasping the ovarian ligament, the ovary could be lifted and rotated to the most convenient and safe position for needle puncture. The suction cannula in the suprapubic portal assists supporting the ovary in the most suitable position for puncture. The monopolar cautery needle is held perpendicular to the ovarian surface and the follicles are punctured with simultaneous application of current for approximately one second. Attempt is made to puncture almost all the prominent follicles, which amounts to 15 to 20 punctures on each ovary. The ovaries are profusely lavaged with Ringers' solution containing heparin and hydrocortisone, and carefully looked for any area of bleeding. The bleeding usually is self-limiting and is arrested spontaneously, or else by diathermy. The fluid collected in the POD, which contains blood and the follicular fluid mixed with the irrigating solution, is completely aspirated out through the suction cannula. After ensuring complete hemostasis 200 to 300ml of Ringers' solution with hydrocortisone is instilled into the peritoneal cavity for hydrofloatation. Both tubes could be seen freely floating and remaining away from the ovary in the fluid medium.

### **OVARIAN HYPERSTIMULATION**

In the second half of the study the laparoscopic surgery was preceded by prior hyperstimulation of the ovaries employing gonadotropins. Irrespective of the cycle day, hMG was administered in a dose of 150 i.u. (i.m.) daily for 5 to 6 days, followed by hCG 10,000 i.u. (i.m.) on the next day of hMG therapy. Alternate methods of ovarian hyperstimulation practiced in a few patients included CC (200mg/5 days) and hCG, or pure FSH (150 i.u./day for 5 to 6 days) followed by hCG. Ovarian hyperstimulation was confirmed at a endopelvic scan, and laparoscopic ovarian diathermy was performed on the next day of hCG administration.

### **POSTOPERATIVE FOLLOW-UP**

The patients were observed for resumption of regular ovulatory menstrual cycles and conception. If regular ovulation was not returned after laparoscopic surgery, they were considered for CC or hMG/hCG induction of ovulation.

### **RESULTS**

Between April, 1992 and March 1994, among the 960 infertile couples registered, there have been 225 subjects with anovulatory infertility (23.44%). The commonest etiology for anovulation was either PCO or PCOD in 174 subjects (77.33%), and the other causes of anovulation included hyperprolactinemia in 25 (11.11%), primary ovarian failure in 12 (5.30%) and hypogonadotropic hypogonadism in 6 (2.67%) (Table I).

During this period 242 laparoscopies have been performed for infertility, and

**Table I**  
**Etiology of anovulatory infertility**  
 (April 1992 to March 1994)

Total Infertile Couple	Anovul Infertility	PCOD & PCO	Hyper-Prolactinemia	Primary Gonadal Failure	Second Gonadal Failure
960	225 (23.44%)	174 (77.33%)	25 (11.11%)	12 (5.30%)	6 (2.67%)

of them 165 were operative laparoscopies (68.18%), and only 29 laparoscopies proved to have normal pelvic organs (11.98%). Ovarian diathermy and follicular puncture was performed in 64 subjects, constituting 38.79% of the total operative laparoscopies. The other common indications for operative laparoscopies included fulguration, adhesiolysis, ovarian cyst drainage, and ovarian cystectomy for endometriosis in 92 subjects (55.75%), salpingostomy or

salpingectomy for ectopic gestation, adhesiolysis for PID and salpingostomy for hydrosalpinx (Table II).

Among the 165 subjects undergoing operative laparoscopy 69 subjects achieved a conception (41.82%) (Table III). Operative laparoscopy for endometriosis was attended with conception in 39 of the 92 subjects (42.39%), which included stage I to IV of the disease; however, many of stage II to IV subjects had adjunctive danazol therapy.

**Table II**  
**Laparoscopy for infertile subjects**  
 (April 1992 to March 1994)

Total Laparoscopies	242	
Normal pelvic organs	29	11.98%
Operative laparoscopies	165 (68.18%)	
Endometriosis	Cystectomies, Aspirations Adhesiolysis and Fulgurations	92 (55.77%)
Treatment of P.C.O.D. and CC Resistant P.C.O. Subjects	Ovarian Diathermy Follicular Puncture	64 (38.79%)
Ectopic Gestations	Salpingostomy, Salpingectomy	6 (3.64%)
P.I.D. and Hydrosalpinx	Salpingostomy and Adhesiolysis	3 (1.80%)

**Table III**  
**Pregnancy rate for operative laparoscopy**

Operative Laboratory	Total Operated	Total Followed	Total Pregnant	Pregnancy Rate
All Patients	165		69	41.82%
Endometriosis	92	92	39	42.39%
Ovarian Diathermy	64	44	20	45.45%

Abortions : 10% Multiple Gestation : Nil

Of the 64 subjects undergoing ovarian diathermy and follicular puncture and drainage, 22 had prior ovarian hyperstimulation by gonadotropins (34.38%). The remaining patients underwent the surgery without any form of ovarian stimulation. Among the total 44 subjects who could be followed for at least 6 months following the surgery (and in whom other causes for infertility were excluded) 20 subjects became pregnant (45.45%). In this group there were 36 subjects who underwent the surgery without prior ovarian hyperstimulation, and among them 16 achieved a conception (44.44%). Whereas, among the 8 subjects in whom ovaries were hyperstimulated

prior to the surgical procedure 4 subjects became pregnant (50.00%) (Table IV). The surgery-to-pregnancy interval ranged from 1 to 6 months in all subjects except 3 who conceived within 1 to 2 years of surgery (Table V). There were no multiple gestations and two women had early abortions (10%) in this groups.

#### DISCUSSION

This study reports an average conception rate of 45.45% for laparoscopic ovarian diathermy, follicular puncture and drainage, with no reported incidence of multiple gestation, and 10% incidence of early abortion. Prior gonadotropin hyperstimulation in a small group has

**Table IV**  
**Pregnancy for ovarian diathermy, follicular puncture and drainage**

Ovarian status at Diathermy	Total	Six Months Follow up	Total Number Pregnant	Pregnancy Rate (%)
No Hyperstimulation	42	36	16	44.44
Gonadotropin Hyperstimulation	22	8	4	50.00

**Table V**  
**Ovarian-diathermy-to-pregnancy interval**

Months	1	3	6	9	12	> 12
Pregnancies	3	8	6	1	1	1
Cumulative pregnancies	3	11	17	18	19	20
Cumulative pregnancy Rate (%)	15.00	55.00	85.00	90.00	95.00	100.00

a marginal increase in conception rate of 50% over the non-stimulated group (44.44%).

Although the beneficial effects of ovarian electrocautery and follicular drainage for ovulation induction have been well established by many published data the exact mechanism by which ovulation is induced remains unclear. The several hypotheses advanced included : (1) the increased exposure of follicles to gonadotropins by the enhanced intraovarian blood flow; (2) reduced intraovarian androgen concentration due to drainage of the follicles; (3) reduction of LH and lesser sensitivity of LH to GnRH, combined with increase in FSH levels; (4) a reduced resistance of the thickened ovarian surface "tunica albuginea;" and (5) reduction of the intraovarian renin-angiotensin activity effected by puncture of hyperstimulated ovarian follicles. The surgery results in reduction of serum testosterone (T), and both bioactive and immunoactive LH levels. The limited damage inflicted on the ovary significantly normalizes the heightened pituitary sensitivity to GnRH (Mio et al 191).

Successful induction of ovulation, pregnancy rates and abortion rates after ovarian electrocautery are equivalent to those following treatment with hMG and pure FSH (Gadir et al - 1990). At the same time, there is improvement in the clinical response to CC therapy after ovarian electrocautery in patients who were initially nonresponsive. This may reflect the reduction in LH and T values and the increase in FSH levels documented following the procedure (Gadir et al - 1991). Medical therapy for PCOD combining GnRH agonist with hMG has been shown to improve the pregnancy rate as compared to hMG alone. (Fillicori, et al - 1991). Recently, laparoscopic ovarian electrocautery and GnRH agonists have been considered alternative modalities for effecting ovarian down regulation in PCOD subjects (Gadir - 1992). Ovarian diathermy has been considered as effective as buserelin acetate (800 µgm/day, intranasal for 8 weeks) in causing reduction in the level of T and LH values, with additional advantage of increased FSH level (Gadir - 1992). These authors prove that pretreatment of

resistant PCOD patients with ovarian electrocautery may be a better alternative to GnRH agonist desensitization for ovulation induction with hMG. The incidence of miscarriage and multiple gestation rates have also been less with the former therapy.

Drainage of follicular contents, rather than the trauma caused to the ovarian stroma, seems, to be a key factor in alleviating the hyperandrogenic ovarian milieu and improving the intraovarian microenvironment for follicular dominance and ovulation (Mio et al - 1991). Ovarian hyperstimulation employing hMG/hCG regime certainly follows for easy access to the enlarged ovarian follicles and the follicular puncture and drainage becomes simpler, easier and much more effective. Since the follicular walls are thin the puncture could be effected without even employing cautery current. However, in the absence of prior gonadotropin hyperstimulation, because of the rather thick ovarian tunica follicular drilling without access to cautery current was found to be slightly more difficult.

Thus, the surgical procedure is simplified by the hMG/hCG hyperstimulation of the ovary, and a 50% conception rate has been recorded among the 8 patients who could be followed for atleast than 6 months. Hence, while ovarian diathermy follicular puncture plays a strategic role in improving the fertility of the PCO or PCOD subjects, with a conception rate of 45.45%, prior ovarian hyperstimulation employing hMG/hCG probably further improves the results. This comparatively

higher pregnancy rate of 50.00% deserves to be evaluated on a larger study population. Moreover, for reasons of simplicity and convenience, and particularly if one prefers to avoid electrocautery, hMG/hCG therapy has a definite role in laparoscopic follicular puncture and drainage. It is most suited for subjects who undergo vaginal sonographically guided follicular puncture for the following reasons : (1) Thin follicular wall permits easy puncture and drainage by the sonographically guided needle; (2) because the ovaries are heavy and fall inside the pelvic cavity, access to the follicles is easy at endovaginal aspiration; and (3) since the follicles are enlarged aspiration under direct visualization is possible.

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