BILATERAL OR UNILATERAL KTP LASER OVARIAN DRILLING IN POLYCYSTIC OVARIAN DISEASE

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When infertility is the main problem affecting a patient suffering from polycystic ovarian (PCO) disease, ovulation induction is necessary. Anovulation represents a major cause of infertility. Since 1930, when Stein and Leventhal described the clinical syndrome of amenorrhea, cystic ovaries, hirsutism and obesity, the understanding of the pathophysiology and the results of treatment of PCO disease have been disappointing.[1-5] Anovulation can be treated medically in some cases with antiestrogen, but a proportion of patients fail to respond, and of those who ovulate, the pregnancy often occurs later and the miscarriage rate is high.

Gonadotropin therapy may be more successful, but it is expensive, and there is a significant risk of hyper-stimulation and multiple pregnancy.[6-9] Therapy with luteinizing hormone-releasing hormone (LHRH) has been used, but the results have been disappointing and the miscarriage rate has also been high.[10-12]

More recently, laparoscopic ovarian electrocautery has been introduced as an alternative to wedge resection, which had a bad reputation in the past due to the risk of periovarian and peritubal adhesion.[13-15] Laparoscopic ovarian drilling is known to be a successful form of treatment in resistant cases of polycystic ovarian syndrome.[16-17] However, this only gives a temporary effect on ovarian tissue reduction.

Endocrine abnormalities have been shown to be corrected after laser treatment. It seems that laser touching of the ovarian surface triggers ovulation, possibly through an alteration of ovarian pituitary feedback.[18] However, the exact mechanism is not completely understood. This prospective study was designed to determine the efficacy of ovarian cauterization with KTP/532 laser, with particular attention to unilateral ovarian drilling.

Materials and Methods

Thirty-five patients with failure of ovulation as a result of polycystic ovarian syndrome were randomly allocated to either unilateral or bilateral laparoscopic ovarian drilling by KTP/532 laser beams. The criteria for inclusion were the following: infertility secondary to anovulation, as indicated by amenorrhea or oligomenorrhea, elevated serum LH levels and normal-to-low serum FSH levels, clinical evidence of androgen excess (acne, hirsutism), and slightly elevated androgen levels. The clinical characteristics of the 35 patients are as shown in Table 1.

All 35 women had been treated medically with clomiphene citrate and gonadotropins for anovulation, but the treatments had been unsuccessful. They received clomiphene citrate 50 mg daily for five days, from the third to the seventh day. If there was no response, the dosage was increased up to 150 mg daily for five days. If there was still no response, human menopausal gonadotropin was used to stimulate ovulation, in addition to human chorionic gonadotropin between the 14th and 16th day, according to the response of folliculometry. Failure of ovulation was confirmed by a combination of ultrasound scan and low luteal-phase progesterone (day 21).

Eighteen women (group A) received bilateral laparoscopic drilling of ovaries, and another 17 (group B) had unilateral ovarian drilling. Laparoscopy under general anesthesia was carried out after obtaining consent from both groups. The pelvic organs were inspected and tubal assessment was confirmed by transcervical injection of methylene-blue dye. The ovary was lifted up and sited to the anterior wall of the uterus away from any bowel, and was cauterized at 5 points with KTP/532 laser beam of 15 w power of 5 sec. at each point. Cooling of the ovary was achieved by irrigation with Ranger lactate solution, and 250 mL of the solution was left in the peritoneal cavity at the end of the operation to minimize the risk of adhesion. On the day of the operation, blood samples were taken from the patients and at weekly intervals thereafter for four weeks. Pelvic ultrasound scan was performed at each visit to the clinic.

Results

Twenty-seven of the 35 patients (77.1%) ovulated within 12 weeks of laparoscopic ovarian drilling, but the remaining eight patients failed to ovulate. Thirteen of the 17 patients (76%) who received unilateral ovarian drilling (group B) ovulated from both ovaries. Fourteen of the 18 patients (77.7%) who received bilateral ovarian drilling (group A) ovulated from both ovaries. Ovulation was assessed by ultrasound scan and serum progesterone at

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mid-luteal phase. The mean pretreatment and post-treatment FSH, LH, and testosterone concentrations are shown in Table 2. The table also shows the level of these hormones in responders and in nonresponders irrespective of whether they had unilateral or bilateral drilling.

There was no significant statistical difference between the hormonal level in serum FSH and testosterone when pretreatment and post-treatment levels were compared in both responders and nonresponders. However, in the responders, there was a significant fall in serum LH concentration after ovarian drilling by KTP/532 laser beams (P=0.032), whereas in the nonresponders there was no significant difference in LH concentration before and after treatment.

TABLE 1. *Characteristics of 35 patients undergoing laparoscopic ovarian drilling by KTP/532 laser beams.**

	Group A n=18	Group B n=17
Age (years)	26.2±1.2	28.5±2.1
Duration of infertility	10.2±2.3	9.2±1.3
Body mass index	24.1±1.3	25.2±2.4
Testosterone (nmol/L)	2.0±1.2	2.2±1.5
FSH (IU/L)	5.7±1.3	5.2±1.6
LH (IU/L)	13.4±1.7	15.2±4.2

*Values are means±SD.

TABLE 2. *Pretreatment and post-treatment blood level of hormones in responders and nonresponders.**

	Pretreatment	Post-treatment
LH		
Responders	11.7±4.2	7.1±2.2
Nonresponders	13.7±5.2	10.5±4.2
FSH		
Responders	5.7±1.2	5.2±1.3
Nonresponders	6.2±2.1	6.1±3.3
Testosterone		
Responders	2.3±2.2	2.1±1.0
Nonresponders	3.6±1.4	3.4±1.3

*Values are means±SD.

Discussion

In 1930, before we had a good understanding of the hypothalamic pituitary ovarian axis, before the radio-immunoassay concept, and before the presence of drugs for ovulation induction, Stein and Leventhal described the classic syndrome which bears their names. Over the next 35 years, surgical treatment in the form of wedge resection was the accepted treatment of polycystic ovary syndrome.[19] In his series of 108 patients, Stein reported a pregnancy rate of 85%.[1] In another series, the pregnancy rate was lower, and since then the efficacy of wedge resection has been questioned. Some authorities have reported mechanical problems after wedge resection in the form of periovarian and peritubal resections, and have largely replaced wedge resection with laser beams. Resection by means of multiple biopsy has also been tried and has had some success, but the risk of adhesion formation is high.

Partial ovarian destruction using laparoscopic ovarian cauterization by diathermy has been replaced nowadays by wedge resection as a surgical modality. In the first reported series, ovarian cauterization by electrocautery resulted in ovulation in 90%, and conception in 70% of the women treated.[13] A significant number of subsequent studies have produced similarly encouraging results, despite the variation in technique and degree of damage caused to the ovary.[13,20-22] The main adverse effect is the risk of periovarian adhesion formation.

The application of laser is a rather new procedure, and only a few studies are available to date. CO_2, KTP/532 and Nd:YAG have all been used via laparoscope for the drainage of visible subcapsular follicles on both ovaries.[20,23] In 1989, Keckstein drilled randomly placed craters into the ovarian stroma.[16] Depending on the size of the cystic ovaries, he drilled 25-40 vaporization sites. In his series, 56% of the patients conceived within six months of laparoscopy. He presented a technique for CO_2 laser vaporization to evacuate the atretic follicular cysts and destroy androgen-producing tissue. He followed that by complete vaporization of the interior wall of the opened cyst. In a series of 19 patients, he achieved an overall conception rate of 44%. He reported the importance of careful raising of the vaporized area to remove the resident carbonized debris.

In terms of the adverse effects of ovarian cauterization, whether by electrocautery or laser, periovarian adhesion is the main concern. For this reason, some authorities[5] advocate a strategy of minimizing the number of holes in each ovary, with the intention of reducing the periovarian adhesion, and they even suggest the cauterization of only one ovary. In this study, ovulation took place from both ovaries in patients who had only one ovary treated with laser beams.

Despite the fact that the precise mechanism is still unclear, we can conclude that the effect of laser drilling works via endocrine effect, presumably on ovarian pituitary feedback rather than local effect. The number of holes should be minimized to five to reduce the risk of postoperative adhesions and thus increase the pregnancy rate. We plan to report the pregnancy rate and outcome in patients treated with KTP laser, whether by the unilateral or the bilateral technique, in the near future.

References

1. Stein IF, Leventhal ML. Amenorrhea associated with bilateral polycystic ovaries. Am J Obstet Gynecol 1930;29:181-91.
2. Rhodes P. The effect of wedge resection of the ovaries in 63 cases of Stein-Leventhal syndrome. J Obstet Gynaecol Br Common 1968;75: 1108-12.
3. Adashi EY, Rock JA, Guzick D, Wentz AC, Jones GS, Jones Jr. HW. Fertility following bilateral ovarian wedge resection: a critical analysis of 90 consecutive cases of polycystic ovary syndrome. Fertil Steril 1981;36:320-5.
4. Lunde O. Polycystic ovarian syndrome: a retrospective study of the therapeutic effect of ovarian wedge resection after unsuccessful treatment with clomiphene citrate. Ann Chir Gynaecol 1987;71:330-3.

5. Conway GS, Honour JW, Jacobs HS. Heterogenicity of the polycystic ovary syndrome: clinical, endocrine and ultrasound features in 556 patients. Clin Endocrinol 1989;30:459-70.
6. Adams M, Cooke ID. Management of ovulation. In: Cooke ID, editor. Clinics in Obstetrics and Gynecology. London: WB Saunders, 1947;1:285-311.
7. Asch RH, Greenblatt RB. Update on the safety and efficacy of clomiphene citrate as a therapeutic agent. J Reprod Med 1976;17: 175.
8. Buttler JK. Clinical results with human gonadotropins in anovulation using two alternative dosage schemes. Postgrad Med J 1972;48:23.
9. Rabau E, David A, Serr DM, Mashiach S, Lunernfeld B. Human menopausal gonadotropins for anovulation and sterility. Am J Obstet Gynecol 1967;98:92-8.
10. Eshel A, Abdulwahid NA, Armar NA, Adams JM, Jacobs HS. Pulsatile luteinizing hormone-releasing hormone therapy in women with polycystic ovary syndrome. Fertil Steril 1988;49:956-60.
11. Homburg R, Armar NA, Eshel A, Adams JM, Jacobs HS. Influence of serum luteinizing hormone concentrations of ovulation, conception and early pregnancy loss in polycystic ovary syndrome. BMJ 1988;297:1024-6.
12. Regan L, Owen EJ, Jacobs HS. Hypersecretion of luteinizing hormone, infertility and miscarriage. Lancet 1990;336:1141-4.
13. Gjonnaess H. Polycystic ovarian syndrome treated by ovarian electrocautery through the laparoscope. Fertil Steril 1984;41:20-5.
14. Armar NA, McGariggle HHG, Honour J, Holownia P, Jacobs HS, Lachelin GCL. Laparoscopic ovarian diathermy in the management of anovulatory infertility in women with polycystic ovaries: endocrine changes and clinical outcome. Fertil Steril 1990;53:45-9.
15. Kovacs G, Buckler H, Bnagah M, et al. Treatment of anovulation due to polycystic ovarian syndrome by laparoscopic ovarian electrocautery. Br J Obstet Gynaecol 1990;98:30-5.
16. Keckstein J, Borchers K, Wolf A, Rossmanith W, Steiner R. Is laparoscopic laser surgery an alternative treatment of polycystic ovarian disease? In: Donnez J, editor. Laser operative laparoscopy and hysteroscopy. New York: Nauwelaerts Printing, 1989:95-107.
17. Kojima E, Yanagibori A, Otaka K, Hirakawa S. Ovarian wedge resection with contact Nd:YAG laser irradiation used laparoscopically. J Reprod Med 1989;34:444-6.
18. Balen AH, Tan SL, Jacobs HS. Hypersecretion of luteinizing hormone: a significant cause of infertility and miscarriage. Br J Obstet Gynaecol 1993;100:1082-9.
19. Stein I. Duration of fertility following ovarian wedge resection: Stein-Leventhal syndrome. West J Surg Obstet Gynaecol 1964;78: 124-7.
20. Dabirashrafi H, Mohamad K, Behjatnia Y, Moghadami-Tabrizi N. Adhesion formation after ovarian electrocauterization on patients with polycystic ovarian syndrome. Fertil Steril 1991;55:1200-1.
21. Armar NA, Lachelin GC. Laparoscopic ovarian diathermy: an effective treatment for anti-oestrogen resistant anovulatory infertility in women with the polycystic ovary syndrome. Br J Obstet Gynaecol 1993;100:161-4.
22. Naether OG, Fischer R, Weise HC, Geiger-Kotzler L, Delfs T, Rudolf K. Laparoscopic electrocoagulation of the ovarian surface in infertile patients with polycystic ovarian disease. Fertil Steril 1993;60:88-94.
23. Daniell JF, Miller W. Polycystic ovaries treated by laparoscopic laser vaporisation. Fertil Steril 1989;51:232-6.