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THE USE OF OVARIAN KTP LASER DRILLING IN THE TREATMENT OF ANOVULATORY INFERTILITY AND POLYCYSTIC OVARIAN DISEASE.

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Objective: Determine the efficacy of unilateral laparoscopic ovarian drilling in the management of resistant ovarian syndrome.

Design: A prospective randomized study of 20 women treated over a period of two years with follow-up till 8 months after the last woman was treated.

Setting: Reproductive Endocrine Unit, King Abdulaziz University Hospital and Dr Soliman Fakeeh Hospital.

Patients: 20 patients with refractory anovulatory infertility. All of these 20 women had been treated medically but without success.

Intervention: Laparoscopic ovarian drilling by KTP/532 Laser.

Main Outcome Measures: Rate of ovulation and endocrinal changes after ovarian drilling by KTP/532 laser.

Results: Unilateral ovarian drilling by KTP laser lead to ovulation from both ovaries. Seventy percent of the patients who had unilateral laser cauterisation had ovulation from both ovaries. In the responder group, there was a significant fall in LH concentration.

Conclusion: The mechanism of action of KTP laser drilling of ovaries is by correcting the abnormal hormonal status. Unilateral ovarian drilling leads to bilateral ovarian activity.
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Anovulation is a major cause of infertility. Since 1935 when Stein & Leventhal described the clinical syndrome of amenorrhoea, cystic ovaries, hirsutism and obesity the understanding of pathophysiology of infertility and the result of treatment is disappointing[1-5].

Anovulation induction can be treated in some cases medically with antioestrogen but a proportion fail to respond and the

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pregnancy rate in those who ovulate is often low and the abortion rate is high.

Gonadotrophins therapy may be more successful but expensive and there is a significant risk of hyperstimulation and multiple pregnancy. Therapy with gonadotrophin releasing hormone (LHRH), had been used but the results has been disappointing and the miscarriage is also high.

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 peri-ovarian and peri-tubal adhesion.

Laparoscopic ovarian drilling is known to be a successful form of treatment in resistant cases of polycystic ovarian syndrome[6-7].

Endocrine abnormalities can also be corrected using laser treatment. Laser touching of the ovarian surface triggers ovulation, possibly through an alteration of ovarian pituitary feedback[8]. However, the exact mechanism is not completely understood. This prospective study is designed to compare unilateral with bilateral ovarian drilling with KTP/532 to observe which ovary responded by ovulation after laser. If ovulation take place from treated ovary only then the drilling should be done on both ovary. On the other hand, if ovulation takes place from both ovaries in unilateral ovarian drilling then we can suggest that ovulation takes place by change in the endocrinal environment and not by direct local effect.

METHODS

The study was carried out at the Reproductive Endocrine Units of King Abdulaziz University Hospital and Dr Soliman Fakhee Hospital, Saudi Arabia. Twenty women with anovulatory infertility and resistant polycystic ovary syndrome were randomly allocated to either unilateral or bilateral laparoscopic ovarian drilling by KTP/532 laser KPT (Potassium-Titanyl Phosphate). This type of laser has Argon-like characteristics with light at 532 nm. All the patients were unresponsive to medical treatment i.e. Clomiphene Citrate and Gonadotrophins. Failure of ovulation had been confirmed by a combination of ultrasound scan and low luteal phase progesterone. Ten patients received bilateral laparoscopic ovarian drilling by KTP/532 laser and another ten patients had unilateral ovarian drilling.

Laparoscopy was carried out under general anaesthesia. The pelvic organs were inspected and tubal assessment 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 10 points with KTP/532 on 15 W power for 5 seconds at each point. The ovary was cooled in pool of normal saline (250 ml) both to minimize adhesion formation and to prevent heat trauma to adjacent viscera. The normal saline was left in the peritoneal cavity at the end of the operation.

On the day of the operation blood sample was taken from the patients and at weekly intervals thereafter for three weeks. These samples were analyzed for the levels of FSH, LH and testosterone so as to study the changes before and after treatment with KTP/532 laser. Pelvic ultrasound was performed at each visit to the clinic to see the ovarian follicles changes.

RESULTS

Table 1 shows the clinical characteristics of the 20 patients who underwent laparoscopic ovarian drilling with KTP/532.

Table 1. Characteristics of the 20 patients who underwent laparoscopic ovarian drilling with KTP/532 Laser*

Age (years)	27.52.2
Years of infertility	7.21.2
Body mass index	24.22.3
Testosterone (nmol/L)	2.11.6
FSH (IU/L)	5.81.7
LH (IU/L)	14.24.5

* Values are means ± SD

Thirteen patients (65 %) ovulated within 8 weeks of laparoscopic ovarian drilling and the remaining 7 patients failed to ovulate by 12 weeks. Seven of the ten patients who received unilateral ovarian drilling ovulated from both ovaries. Six of the ten patients who received bilateral ovarian drilling also ovulated from both ovaries. Ovulation was assessed by serial ultrasound and serum progesterone on day 21. Serial ultrasound scan showed good ovarian activity by observing the size of the follicles.

Table 2 shows the mean pretreatment and post-treatment levels of FSH, LH and testosterone, in responders and non-responders (irrespective of unilateral or bilateral status). There were no significant difference between the hormonal level in serum FSH and testosterone between the pretreatment and post-treatment values whether in responders or non-responders.

Table 2. Pretreatment and post-treatment blood level of hormone in responders and non-responders*

	Pretreatment	Post-treatment
LH:		
Responders	12.83.1 ± 7.2	4.2 ±
Non-responders	14.84.2 ± 11.5	5.1 ±
FSH:		
Responders	5.61.1 ± 5.1	1.1 ±
Non-responders	6.73.1 ± 6.2	2.0 ±
Testosterone		
Responders	2.41.0 ± 2.2	1.1 ±
Non-responders	3.71.2 ± 3.5	1.6 ±

* Values are means ± SD

However in the responders there was a significant fall of the serum LH after ovarian drilling by KTP/523 laser (P 0.032) whereas in the non-responders there was no significant difference in LH concentration before and after treatment.

DISCUSSION

Over 35 years, surgical treatment in form of wedge resection of the ovaries was the accepted treatment of polycystic ovary syndrome[9]. Stein in his series of 108 patients reported a pregnancy rate of 85 %. In other series the pregnancy rate was lower and since then the efficacy of wedge resection had been questioned. Some authorities reported mechanical problem after wedge resection in the form of peri-ovarian and peritubal adhesion in 30-100 % of the cases[10-12]. For these reason laparoscopic ovarian partial resections has largely replaced wedge resection. It may be performed by electrocautery of the ovaries or with laser beam. Resection by means of multiple biopsies has also been tried and with some success but the risk of adhesion formation is high.

Common to all these procedure is that the postoperative adhesion is less than wedge resection. Partial ovarian destruction using laparoscopic ovarian cauterisation by diathermy has replaced wedge resection. In the first reported series ovarian cauterisation by electrocautery resulted in ovulation in 90 % and conception in 70 % of the 62 women treated[13]. A significant number of subsequent studies produced similar encouraging results despite the variation in

technique and degree of damage caused to the ovary[14-17]. The main adverse effect was the risk of peri-ovarian adhesion. This can be reduced by minimizing the number of diathermy points[18].

Application of laser is a rather new procedure and only few studies are available. CO_2, KTP/532, and Nd:YAG laser had been used via laparoscope for drainage of all visible sub capsular follicles on both ovaries[19,20]. Keckstein in 1989 drilled randomly placed craters into the ovarian stroma. Depending on the size of the cystic ovaries he placed 25-40 vaporization sites. In his collection, 56 % of the patients conceived within 6 months of laparoscopy. He presented a technique of CO_2 laser vaporisation 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 his series of the 19 patients he achieved an overall conception rate of 44 %.

This study showed that ovulation took place from both sides in patient who had only one treated ovary. Ovulation was assessed in this study by observing the size of ovarian follicles which reached up to 18-20 mm. The hormonal level of progesterone also confirmed the findings of ultrasound scan i.e. ovulatory level. Also the level of LH was reduced significantly in the responding group.

CONCLUSION

Although not clear, the mechanism of action of laser drilling may be via endocrine effect, presumably on ovarian pituitary feedback rather than local effect. Thus the mechanism of action of KTP/532 laser in ovarian drilling is by correcting the abnormal hormonal environment, so that unilateral ovarian drilling will lead to bilateral ovarian activity.

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