A novulation is a common problem in women with polycystic ovarian disease. Clomiphene citrate is now accepted as the first-line treatment of choice for infertile women with polycystic ovarian disease, but proportions of them fail to respond. Human menopausal gonadotropins, follicle stimulating hormone, or combination of gonadotropin-releasing hormone agonist and gonadotropins may be used as a second-line treatment. However, the patients with polycystic ovaries treated with these hormones tend to develop a multifollicle response, with the associated risks of ovarian hyperstimulative syndrome (OHSS) and multiple pregnancies. Polycystic ovaries may raise serum luteinizing hormone and androgen levels that can lower the rates of ovulation, fertilization, and pregnancy. 

In this study, we describe a retrospective analysis of a consecutive series of 6 cases of polycystic ovaries in women with anovulatory infertility, treated with laparoscopic ovarian drilling with diathermy during a ten-month period in the Kinmen County Hospital.

**METHODS**

Patients were selected between September 2000 and July 2001. Six in fertile patients with the ultrasonographic pattern of polycystic ovaries who visited the Kinmen...
County Hospital consented to the study. The characteristics and hormone conditions of the 6 women are presented in Table 1. Four had primary infertility and 2 had secondary infertility. The mean duration of infertility was 3.83 years (range 2 to 7 years). All patients had experienced significant irregular menstrual cycle and oligomenorrhea, and had the ultrasonographic features of polycystic ovaries. Oligomenorrhea could be defined as that duration of menstrual cycle between 35 days and 6 months. The ultrasonographic features of polycystic ovaries were enlarged ovary (> 3.5 cm) with stromal hypertrophy and multiple, small follicles (6-8 mm) arrayed in the periphery. All patients had been unresponsive to treatment with clomiphene citrate in doses up to 100 mg per day for 5 days. The partners of all patients had normal semen analysis results. No previous abdominal or pelvic surgery was mentioned in all patients. Diagnostic laparoscopy with methylene blue chromopertubation was performed before ovarian drilling to inspect the pelvic organs and confirm the tubal patency. Laparoscopic ovarian drilling with diathermy was performed for the patients according to the method previously described. The ovary was lifted onto the anterior wall of the uterus. Unilateral drilling was applied with power set at 4 (40W). Six to 10 holes were made in each ovary; the duration of each diathermy was about 4-5 seconds; the holes created were about 3-4 mm in diameter and 6-8 mm in depth. At the end of the treatment, Ringer’s solution irrigation over the ovarian surface was done.

Following the operation, basal body temperature charts were used to monitor whether ovulation occurred. Transvaginal ultrasonography was also performed at each visit to the clinic to monitor the ovarian follicular status. When there was no evidence of ovulation within 3 months of operation, medication with clomiphene citrate 50 mg to 100 mg per day for 5 days, from the third day to the seventh day of menstruation, was prescribed. Pregnancy was diagnosed after a positive pregnancy test and confirmation of an intra-uterine gestational sac by ultrasonogram.

### RESULTS

Diagnostic laparoscopy with methylene blue chromopertubation was performed for each patient. Only case 5 had some endometriosis spots over the uterine surface and pelvic wall. But all 6 cases presented with patent tubes and no pelvic adhesions. After laparoscopic ovarian drilling with diathermy, patients were followed up for menstruation regularity and pregnancy. The clinical characteristics of the patients after laparoscopic ovarian drilling with diathermy are presented in Table 2. Four of the 6 patients resumed regular menstruation within 3 months; the other 2 (cases 2 and 5) had irregular menstruation for more than 3 months, so clomiphene citrate 50 mg per day was prescribed for them for 5 days. But only one of them (case 2) responded to clomiphene citrate and achieved pregnancy. The mean time to the first conception was 81 days (range 12 to 172 days).

Five of the 6 patients achieved pregnancy. Four of the 5 pregnant women had spontaneous conception, while the other one had conception with the aid of clomiphene citrate. Of the 5 pregnancies, 3 ended in the delivery of live healthy babies after 37 weeks’ gestation (2

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age</th>
<th>Duration of infertility (years)</th>
<th>Previous pregnancies</th>
<th>FSH (IU/L)</th>
<th>LH (IU/L)</th>
<th>Testosterone (nmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32</td>
<td>5</td>
<td>1 baby + 1 miscarriage</td>
<td>4.9</td>
<td>8.6</td>
<td>2.1</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>2</td>
<td>0</td>
<td>5.5</td>
<td>12.4</td>
<td>1.6</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>5</td>
<td>0</td>
<td>6.2</td>
<td>13.8</td>
<td>2.2</td>
</tr>
<tr>
<td>4</td>
<td>37</td>
<td>7</td>
<td>2 miscarriages</td>
<td>3.3</td>
<td>2.4</td>
<td>1.8</td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>2</td>
<td>0</td>
<td>5.1</td>
<td>2.0</td>
<td>5.4</td>
</tr>
<tr>
<td>6</td>
<td>26</td>
<td>2</td>
<td>0</td>
<td>8.9</td>
<td>20.8</td>
<td>0.4</td>
</tr>
</tbody>
</table>

FSH = Follicle-stimulating hormone; LH = Luteinizing hormone.
by normal spontaneous delivery and 1 by cesarean section due to failure to progress in active labor); case 4 ended with a preterm delivery at 34 weeks’ gestation due to preterm premature rupture of membranes; case 6 ended with miscarriage at 8 weeks’ gestation.

**DISCUSSION**

In this study, we analyzed the spontaneous ovulation rates and pregnancy rates following laparoscopic ovarian drilling with diathermy. There are 4 kinds of criteria - clinical, ultrasonographic, biochemical and laparoscopic - by which to diagnose polycystic ovarian disease, but there are no universally definitive criteria for the diagnosis of polycystic ovarian disease. In our study, all patients experienced oligomenorrhea and had the ultrasonographic features of polycystic ovaries. They also had had the infertility problem for several years. It is recognized that some patients possess ultrasonographic evidence of polycystic ovaries which is not in accord with the endocrinological criteria of polycystic ovarian disease (e.g. plasma LH/FSH > 2 or plasma LH > 10 IU/L).

In our study, 4 of the 6 patients (66.6%) resumed regular menstruation spontaneously within 3 months; five of the 6 patients (83.3%) achieved pregnancy; the mean time to the first conception was 81 days; one of the 5 pregnancies ended in miscarriage at 8 weeks’ gestation, and the miscarriage rate was 20%. By reviewing the previous studies, we found that the postoperative ovulation rate was from 70% to 90%; the pregnancy rate was from 40% to 70%; the miscarriage rate was around 10% and 15%. Our patients’ treatment outcomes were very similar to those reported in previous studies.

These results are very encouraging in a group of infertile women with ultrasonographic patterns of polycystic ovaries who had been treated unsuccessfully with clomiphene citrate or other hormones. The treatment with hormones of human menopausal gonadotropins, follicle-stimulating hormone, or combination of ganadotropin-releasing hormone and gonadotropins carry the risk of OHSS and multiple pregnancies. Furthermore, the above drugs are expensive and also intensive monitoring by clinic staff are needed. Laparoscopic ovarian drilling with diathermy offers an alternative for infertile women with polycystic ovaries who are resistant to clomiphene citrate therapy. This operation provides the chance for regular spontaneous ovulation and pregnancy with out frequent and time consuming hospital visits.

It has been stated that the major consistent endocrinological change after laparoscopic ovarian drilling with dia therm is the re duction of plasma LH con centrations. Other studies also showed that a significant reduction in luteinizing hormone, androstenedione, dehydroepiandrosterone, and testosterone levels was noted after laparoscopic ovarian drilling. An observation has been reported that the rate of spontaneous ovulation and pregnancy without frequent and time consuming hospital visits.

### Table 2. The clinical characteristics of the six polycystic ovaries patients after laparoscopic ovarian drilling with diathermy

<table>
<thead>
<tr>
<th>Case No</th>
<th>Ovulation Type</th>
<th>Pregnancy Outcomes</th>
<th>Final gestational age (weeks)</th>
<th>Type of delivery</th>
<th>Fetal body weight (gm)</th>
<th>Days to conception*</th>
<th>Postpartum menstruation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spontaneous</td>
<td>Yes</td>
<td>41</td>
<td>C/S</td>
<td>3330</td>
<td>172</td>
<td>Regular</td>
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<tr>
<td>2</td>
<td>CC- induced</td>
<td>Yes</td>
<td>39</td>
<td>SVD</td>
<td>2335</td>
<td>128</td>
<td>Regular</td>
</tr>
<tr>
<td>3</td>
<td>Spontaneous</td>
<td>Yes</td>
<td>38</td>
<td>SVD</td>
<td>3210</td>
<td>66</td>
<td>Regular</td>
</tr>
<tr>
<td>4</td>
<td>Spontaneous</td>
<td>Yes</td>
<td>34</td>
<td>SVD</td>
<td>2700</td>
<td>12</td>
<td>Regular</td>
</tr>
<tr>
<td>5</td>
<td>CC- induced</td>
<td>Nil</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>NA</td>
<td>Irregular</td>
</tr>
<tr>
<td>6</td>
<td>Spontaneous</td>
<td>Yes</td>
<td>8</td>
<td>D&amp;C</td>
<td>Missed abortion</td>
<td>27</td>
<td>Regular</td>
</tr>
</tbody>
</table>

CC = Clomiphene citrate; C/S = Cesarean section; D&C = Dilation and curettage; LMP = Last menstrual period; NA = Non-analysis; SVD = Spontaneous vaginal delivery; * = From the date of operation to the date of LMP.
nancy rates.

However, the possible complications of laparoscopic ovarian drilling with diathermy are post-operative adhesions and ovarian insufficiency leading to premature ovarian failure. In previous studies, post-operative intra-peritoneal adhesion rates were found to be from 19% to 27%, and they were usually mild and unilateral. Regarding ovarian insufficiency leading to premature ovarian failure, it may be due to excessive diathermy damage of ovary. To prevent these complications, we used a slightly lower energy of laparoscopic ovarian diathermy, restricting the electrocauterizing time to 4-5 seconds and limiting the number of diathermy holes to 6-10 per ovary.

In conclusion, laparoscopic ovarian drilling with diathermy was in deed an effective treatment for the infertile women who had ultrasonographic pattern of polycystic ovaries and were resistant to clomiphene citrate treatment. Besides a high pregnancy rate being achieved, no multiple pregnancies were noted in this study. Laparoscopic ovarian drilling with diathermy provides the normal hormone environment in most patients to resume spontaneous ovulation and produces a high percentage of successful pregnancy. It also enables a more favorable ovarian response to gonadotropin stimulation. Hence, for the reason of the cost of effect on the therapy of infertile women with polycystic ovaries, laparoscopic ovarian drilling with diathermy should be considered to be an alternative choice for infertile women with the history of failed response to clomiphene treatment.

REFERENCES


