**RAPID COMMUNICATION**

**Homeostasis Model Assessment-Insulin Resistance (HOMA-IR), a Key Role for Assessing the Ovulation Function in Polycystic Ovary Syndrome (PCOS) Patients with Insulin Resistance**

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**Abstract.** According to our research, we evaluated that for the ovulation function in polycystic ovary syndrome (PCOS) with IR, Homeostasis model assessment-insulin resistance (HOMA-IR) is a clinic, simple and practical and sensitive index for assessing the ovulation failure. Meanwhile, after anti-IR treatment, HOMA-IR is also a reliable and simple for accessing the recovering ovulation function.

**Key words:** Polycystic ovary syndrome, Homeostasis model assessment-insulin resistance, Ovulation function

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**OVULATORY** disorders represent a major cause of infertility, and the oligoovulation and anovulation with polycystic ovary syndrome (PCOS) are common cause of infertility, which is the most common endocrinopathy of reproductive aged women affecting 6–10% of the population [1].

In young women with PCOS, insulin resistance (IR) may occur with high frequency. All studies have shown that there is impaired insulin metabolism in a large number of women with PCOS. Thus, short-term treatment with insulin-sensitizing drug, such as metformin, may be useful for ovulation in women with insulin resistance, especially, for the ovulatory infertility. Homeostasis model assessment-insulin resistance (HOMA-IR) is a widely accepted index for evaluating the IR in diabetes by fasting plasma glucose and insulin concentration, however, few studies have evaluated the HOMA-IR for the ovulation function in PCOS with IR [2]. Therefore, the purpose of this study was to assess the role of HOMA-IR in evaluating the ovulation failure and ovulation recovery as a simple and practical index for PCOS diagnosis and the treatment of anti-IR.

**Materials and Methods**

More than 150 out-patient clinic cases of PCOS in fertile-aged woman were collected at Women’s and Children’s Hospital of Western China Medical Center. All these patients were included in this study. PCOS diagnoses were based on the clinic feature, B type ul-
Multiple ultrasound images of ovarian follicles and hormone examination of luteinizing hormone (LH), follicle-stimulating hormone (FSH) and testosterone (T). Moreover, IR with PCOS was confirmed by the clinic feature and the insulin releasing test and oral glucose tolerance test (OGTT), and easily the HOMA-IR was calculated by FPG (fasting plasma glucose) *FNS (insulin concentration at 0 h on insulin releasing test) / 22.5 for evaluating the ovulation function. The ovulation state of the PCOS accompanying IR was detected by basal body temperature (BBT) and type-B ultrasonic monitoring, and insulin-sensitizing drugs. Metformin and Glucophage were used in the PCOS accompanying IR, basically, Diane-35 was administrated simultaneously. Meanwhile, the ovulation state was detected by the BBT and type-B ultrasonic monitoring after IR disappearing which was confirmed by insulin releasing test and OGTT in 6 months, 9 months, or 1 year. HOMA-IR was used for assessing the ovulatory function after insulin-sensitizing drugs healing. The study was in compliance with regulations approved by university, ethics committee. In the study, according to the size of follicles monitored by B-type ultrasound, we classified the follicle as following: calculating dominant follicle (>10 mm but lower than 15 mm), ovary follicle (>15 mm). In addition, double phase temperature and luteal phase beyond 12 days was classified normal ovulation function with BBT. Ovulation function cases and IR cases were compared using $\chi^2$ test.

### Results

The average serum hormone values of LH, FSH and T were 30.23 ± 2.56 mU/ml, 5.6 ± 1.98 mU/ml and 1.25 ± 0.59 ng/ml in the diagnosed PCOS patients respectively, at the same time, the ratio of LH/FSH was 2.96 ± 0.69 in them. Diagnosed PCOS cases were well represented, and there is 34.06% (78/229) accompanying IR in the diagnosed PCOS which HOMA-IR was 5.27 ± 0.12 (Table 1), and the average serum values of FPG was 7.12 ± 1.09 mmol/L, FNS was 25.86 ± 2.75 U/mL. Meanwhile, the patients with IR accompanying with obesity 64.06% (41/64) (BMI>16) were anovulia in our research.

There were 36.99% (27/73), 39.73% (29/73), 13.70% (10/73) with ovulation function and menstrual cycle recovery in 6 months, 9 months and 1 year after drugs administration respectively, meanwhile with insulin resistance disappearing (Table 1), that is HOMA-IR ≤ 1 (Table 1). And there were 56.16% (41/73), 16.44% (12/73), 2.74% (2/73) with ovulation failure in 6 months, 9 months and 1 year after drugs administration respectively, meanwhile with insulin resistance still existing, that is HOMA-IR > 1 (Table 1).

Ovulation function cases and IR cases had similary accuracy ($P = 0.45$ by $\chi^2$ analysis, Table 1).

### Discussion

Most women fail to ovulate or conceive in PCOS with insulin resistance, especially there is a high percentage of aovulation. Thus, the relationship between IR and ovulation function are emphasized with PCOS. In our study, insulin-sensitizing treatments is effective for the clinic feature disappearing and recovering ovulation. At the same time, it is beneficial for recovering glycometabolism. Treatment of the patient with infertility accompanying with PCOS has been improved in the last decade due to the introduction of new medications. Insulin-sensitizing drugs, such as metformin, became an integral part of treatment [3]. Women who

### Table 1. Comparision of the accuracy of PCOS with IR and ovulation function

<table>
<thead>
<tr>
<th></th>
<th>Ovulation</th>
<th>Ovulation failure</th>
<th>HOMA-IR</th>
</tr>
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<tbody>
<tr>
<td>IR</td>
<td>0/229</td>
<td>78/229</td>
<td>5.27 ± 0.12</td>
</tr>
<tr>
<td>None IR</td>
<td>56/229</td>
<td>95/229</td>
<td>0.57 ± 0.14</td>
</tr>
<tr>
<td>Anti-IR treatment in 6 months with IR</td>
<td>1/73</td>
<td>41/73</td>
<td>4.95 ± 0.32</td>
</tr>
<tr>
<td>Anti-IR treatment in 6 months with none-IR</td>
<td>27/73</td>
<td>2/73</td>
<td>0.82 ± 0.09</td>
</tr>
<tr>
<td>Anti-IR treatment in 9 months with IR</td>
<td>1/73</td>
<td>12/73</td>
<td>4.56 ± 0.23</td>
</tr>
<tr>
<td>Anti-IR treatment in 9 months with none-IR</td>
<td>29/73</td>
<td>1/73</td>
<td>0.80 ± 0.11</td>
</tr>
<tr>
<td>Anti-IR treatment in 1 year with IR</td>
<td>1/73</td>
<td>2/73</td>
<td>5.13 ± 0.07</td>
</tr>
<tr>
<td>Anti-IR treatment in 1 year with none-IR</td>
<td>10/73</td>
<td>0/73</td>
<td>0.79 ± 0.14</td>
</tr>
</tbody>
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fail to ovulate or conceive after first-line treatment options are often referred for gonadotropin treatment. Laparoscopic ovarian drilling, which has been evaluated in well-designed trials, may be an alternative to gonadotropins, and in vitro fertilization, which yields high pregnancy rates, is the final treatment option when all else fails.

The association of insulin resistance and reproductive abnormalities with clinical hyperandrogenism in a woman was first demonstrated by Achard and Thiers in the “diabetes of bearded woman” [4]. The positive effect of the insulin-sensitizing treatments could be explained by a decrease in the peripheral insulin resistance but also by a direct action at the ovarian level.

The link of PCOS with insulin resistance was subsequently established by clinical studies characterizing the profound insulin resistance in obese and lean PCOS but are not required for the diagnosis. Given that the central role of insulin resistance in the pathogenesis of PCOS, co-administration of some insulin sensitizers may be helpful for the regulation of cycle abnormalities and the facilitation of pregnancy in obese PCOS. In our study, we explored whether HOMA-IR is simple and practical index for assessing anovulation or recovering ovulation function while diagnosed PCOS and after anti-IR treatment. We concluded that HOMA-IR is a feasible index for assessing the ovulation function in woman with PCOS and insulin resistant.

For the IR with PCOS, HOMA-IR is a clinic, simple and practical and sensitive Index for assessing the ovulation failure. Meanwhile, after anti-IR treatment, HOMA-IR is also a reliable and simple for accessing the recovering ovulation function. Simultaneously, anti-IR treatment with PCOS is favourable for the recovering ovulation function, preventing the endocrine disturbance furtherly, and reducing possibility the incidence of 2-type diabetes. The association among ovulation function, endocrine disturbance, reproductive endocrine and the suitable clinic assessment should be involved by the gynaecologist and the researchers on endocrine.

References