Polycystic ovary syndrome (PCOS) is characterized by hyperandrogenism and chronic anovulation, and it is one of the most common endocrine disorders, affecting 5% to 10% of reproductive age women [1]. Although the etiology of the syndrome is complex, insulin resistance and hyperinsulinemia are thought to play a major role in the pathophysiology of PCOS. Insulin resistance is thought to be caused by obesity, although recent studies have found that underweight women with PCOS are more likely to show insulin resistance than a normal control group. These results suggest that PCOS is independent of body weight for underweight women, although it is widely accepted that obesity is a key factor in insulin resistance in the general population. Prevalence rates

PREDICTORS OF ABNORMAL GLUCOSE TOLERANCE AMONG WOMEN WITH POLYCYSTIC OVARY SYNDROME

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Objective
To determine the parameters associated with the risk for abnormal glucose tolerance (AGT) among women with polycystic ovary syndrome (PCOS) and to assess the optimal screening tests to predict AGT within this population.

Methods
We evaluated 85 women with PCOS and 53 control women. All participants had an oral glucose tolerance test (OGTT) and hormonal blood profiles, including the measurement of follicle stimulating hormone, luteinizing hormone, estradiol testosterone, and serum lipid profiles.

Results
Among the women with PCOS, those with AGT had significantly higher homeostasis model assessment of insulin resistance ($P<0.001$) values than those with normal glucose tolerance. The prevalence of impaired glucose tolerance (IGT) and/or impaired fasting glucose was 48.2% (41/85) in women with PCOS; 16 of 41 subjects with AGT were IGT. Six of 16 subjects (37.5%) with IGT had normal fasting plasma glucose (FPG<100 mg/dL). Thus, the FPG failed to detect 37.5% of women with PCOS who were found to have AGT with the OGTT. Multivariate logistic regression analysis revealed that insulin, body mass index (BMI), age, and triglyceride (TG) were significant risk factors for abnormal glucose metabolism.

Conclusion
Insulin, BMI, age, and TG predicted abnormal glucose metabolism in women with PCOS. The OGTT was a more reliable predictor of AGT than fasting plasma glucose. We recommend that women with PCOS undergo periodic screening for AGT using the OGTT, particularly if they have any of the above risk factors.

Keywords: Polycystic ovarian syndrome; Oral glucose tolerance test; Prevalence; Risk factors

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for insulin resistance, impaired glucose tolerance (IGT), and type 2 diabetes among women with PCOS are higher than expected for women of similar age, reaching 50% to 70%, 30% to 40%, and 10%, respectively [2,3]. Although glucose intolerant patients do not have symptoms, glucose intolerance accelerates the development of type 2 diabetes and cardiovascular diseases, so these patients should be screened to ensure early detection of these disorders. There is considerable disagreement on when and how screening should be conducted. The fasting glucose test has been widely used to detect abnormal glucose tolerance (AGT) because it is convenient and inexpensive. However, many women with PCOS who take the fasting glucose test have normal fasting glucose levels, and this test failed to detect 58% of those who were diagnosed with type 2 diabetes through the glucose test [4].

The purpose of this study was to determine the risk factors for AGT among women with PCOS and to assess the optimal screening tests to predict AGT within this population.

Materials and Methods

1. Subjects
This study was conducted from August 2009 to May 2010 in the Department of Obstetrics and Gynecology at Kangbuk Samsung Hospital. We enrolled 85 women with PCOS, as well as 53 healthy women who were a similar age and body mass index (BMI) as the women with PCOS. The control group had regular menstrual cycles and no symptoms of hyperandrogenism, diabetes, and high blood pressure. They also had no history of cardiovascular disease and no family history of diabetes.

The diagnosis of PCOS was made according to the Rotterdam criteria, and patients were diagnosed with PCOS when at least two of the three following criteria were met: 1) the presence of cycle abnormalities, namely oligomenorrhea (6 or fewer menses per year) or anovulation (more than three months between menses); 2) clinical and/or biochemical evidence of hyperandrogenism; 3) enlarged ovaries containing at least twelve small (2 to 9 mm) follicles per ovary [5,6]. Other conditions with similar clinical manifestations, such as 21-hydroxylase deficiency, Cushing syndrome, hypothyroidism, hyperprolactinemia, and androgen-secreting tumors, were ruled out.

We used Choo’s [7] categorization system for Asians to classify subjects according to BMI: underweight, less than 18.4 kg/m²; normal, between 18.5 kg/m² and 22.9 kg/m²; overweight, between 23.0 kg/m² and 24.9 kg/m²; obese, between 25.0 kg/m² and 29.9 kg/m²; extremely obese=over 30.0 kg/m². Participants were excluded from the study if they had a history of glucose intolerance (including gestational diabetes) or non-insulin-dependent diabetes mellitus (NIDDM) hyperprolactinemia, thyroid dysfunction, late onset congenital adrenal hyperplasia, or Cushing’s syndrome. We also excluded women who were taking medications that could alter their hormonal or biochemical profiles. No patients included in the study were pregnant. This study was approved by the Kangbuk Samsung Hospital Institutional Review Board, and all participants provided written informed consent.

2. Diagnostic method
Overnight fasting blood samples were taken between days 2 and 5 of the menstrual cycle, if present. Hormonal and biochemical analyses included the measurement of glucose, lipid, insulin, testosterone, sex hormone-binding globulin (SHBG), leutinizing hormone (LH), and follicle stimulating hormone (FSH). Blood samples for an oral glucose tolerance test (OGTT) were obtained at 30-minute intervals over two hours to measure glucose after ingestion of a standard 75 g of glucose.

The OGTT was performed in accordance with the criteria of the American Diabetes Association (ADA) [8]. Participants were considered to have AGT if they had either impaired fasting glucose (IFG), IGT, or overt diabetes mellitus (DM). IFG was defined as an elevated fasting plasma glucose (FPG) concentration between 100 mg/dL and 125 mg/dL, in accordance with the criteria of the ADA. IGT was defined as a plasma glucose level between 140 mg/dL and 200 mg/dL after a 75 g glucose load on the OGTT. Overt DM was defined as a plasma glucose level of 200 mg/dL or greater. Since the above definitions led to overlap between the two groups, we also determined which participants had combined glucose intolerance (CGI), which was defined as the presence of both IFG and IGT. Normal glucose tolerance (NGT) was defined as an FPG below 100 mg/dL and a 2-hour plasma glucose level below 140 mg/dL.

Insulin levels were measured with immunoradiometric assay (Dia Source, Nivelles, Belgium). Blood glucose was measured with the hexokinase method. Insulin resistance and ß-cell function were calculated as: higher homeostasis model assessment (HOMA) of insulin resistance (fasting insulin [mU/L] × fasting glucose [mmol/L]/22.5). BMI was calculated as body weight (kg) divided by body height squared (m²). Serum total testosterone, free testosterone, dehydroepiandrosterone-sulphate (DHEA-S) SHBG, FSH, LH, and estradiol were measured with radioimmunoassay (RIA) methods (Siemens, Los Angeles, CA, USA). The free androgen index was