Ovarian Volume in Turkish Women with Normal and Polycystic Ovaries

Normal ve Polikistik Over Sendromlu Türk Bayanlarda Overyan Volüm

PCOS'da Over Volümü / Ovarian Volume in PCOS

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Özet

Amaç: Bu çalışmadaki amacımız, konuyla ilgili literatürün sınırlı olması nedeniyle, polikistik over sendromlu Türk bayanlarda farklı overyan volüm eşiği olasılığını değerlendirmek ve polikistik over sendromlu tanısı için bir eşik değer belirlemektir. Gereç ve Yöntem: Klinik çalışmamız Tekirdağ Namık Kemal Üniversitesi Tıp Fakültesinde gerçekleştirildi. Bu vaka kontrol çalışması Roterdam krıterlerine göre tanısı konmuş 132 polikistik over sendromlu bayan ile 75 sağlıklı bayanı kapsamaktadır. Hastaların overyan volumleri ultrason yardımıyla ölçüldü ve sağlıklı kontrollerin sonuçları ile karşılaştırıldı. Bulgular: Biz PCOS grubunda ortalama over volümü 9.44 ± 4.3 cm^3 , kontrol grubunda 7.63 ± 3.66 cm^3 olarak bulduk. Eğri altında bulunan alan over volume için 0.633'di. Yapilan ROC analizinde ortalama overyan volüm eşik değeri olarak 8.2 cm^3 belirlendiğinde en yüksek duyarlılık ve özgüllük sırasıyla % 53.8 ve % 61.3 olarak saptanmıştır. Tartışma: Sağlıklı ve hasta grubunu birbirinden ayırt etmek için Roterdam kriterlerine göre belirlenen eşik değer bizim hastalarımızın değerlerinin altında kalmaktadır, bu nedenle Roterdam kriterlerleri farklı toplumlara göre tekrar değerlendirilmelidir.

Anahtar Kelimeler

Polikistik Over Sendromu; Over; Tanı; Organ Hacmi

Abstract

Aim: We aimed to investigate possibility of different ovarian volume threshold and to study diagnostic thresholds for polycystic ovary in Turkish women, since the literature on this subject is very limited. Material and Method: Clinical study carried out Namik Kemal University School of Medicine, Tekirdag, Turkey.This case-control study included 132 patients with polycystic ovary syndrome (PCOS), diagnosed according to Rotterdam criteria and 75 controls. Comparison of ovarian volumes between PCOS patients and control group. Results: We found a mean ovarian volume of 9.44 ± 4.3 cm3 in PCOS cases and 7.63 ± 3.66 cm3 in control cases. The area under curve (AUC) for mean ovarian volume (MOV) was 0.633. The analysis showed that setting the threshold of MOV at 8.2 cm3 offered the best compromise between specificity (61.3%) and sensitivity (53.8%). Discussion: Optimum threshold of ovarian volume to distinguish the PCOS from normal women and the mean ovarian volume in Turkish PCOS patients remain beneath the criteria by Rotterdam.

Keywords

Polycystic Ovary Syndrome; Ovary; Diagnosis; Organ Volume

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Introduction

Polycystic ovary syndrome (PCOS) affects 6.5-8 % of women, making it the most common endocrine disorder among women of reproductive age [1]. Although originally considered a gynecological disorder, the syndrome is now well recognized as having a major effect throughout life on the reproductive, metabolic and cardiovascular health of affected women [2].

Diagnosis of the syndrome is generally based clinically on the presence of amenorrhoea/oligomenorrhoea or symptoms of hyperandrogenism, and biochemically on the presence of elevated serum luteinizing hormone (LH) and androgen concentrations. More recently, transvaginal ultrasound examination of ovarian morphology has been used to help make the diagnosis [3]. It has been also stated that ovarian enlargement is a key feature of PCOS; the typical PCO was considered to be two or five times larger than a normal ovary. Since the advent of ultrasound, especially high-resolution ultrasound, it has been playing an important role in diagnosing PCOS on account of its repeatability and non-invasiveness [4].

Since the PCOS international consensus held at Rotterdam in 2003, ultrasound criteria has been included in the diagnosis of this syndrome. These criteria include the ovarian volume (OV) and follicle number, which have been considered the key feature of polycystic ovaries for more than 15 years. They were combined according to the following definition: either 12 or more follicles measuring 2-9 mm in diameter or increased ovarian volume (> 10cm3). Some studies showed lower threshold of ovarian volume for diagnosing polycystic ovaries in comparison to the those reported in previous western studies and those proposed by the Rotterdam PCOS international conference [5,6].

In this study we aimed to investigate possibility of different ovarian volume threshold and to study diagnostic thresholds for PCO in Turkish women, since the literature on this subject is very limited.

Material and Method

Subjects

This case-control study included 132 patients with PCOS and 75 controls. PCOS was diagnosed according to the criteria of the Rotterdam European Society of Human Reproduction and Embryology (ESHRE) and the American Society of Reproductive Medicine (ASRM)-Sponsored PCOS Consensus Workshop Group [6]. When two out of the following three features were present: 1. oligoovulation and/or anovulation, 2. clinical and/or biochemical signs of hyperandrogenism, and 3. polycystic ovaries on ultrasound examination (the presence of 12 or more follicles measuring 2-9 mm in diameter. Oligo-anovulation was defined as the presence of oligomenorrhea (menstrual cycles of > 35 days) or amenorrhea (lack of menstrual period for 6 months or more).

Hirsutism was scored in accordance with the modified Ferriman-Gallwey (mF-G) score, and an mF-G score > 6 was classified as hirsutism [7].

Patients who had DM, hyperprolactinemia, congenital adrenal hyperplasia, manifest hypothyroidism or hyperthyroidism, Cushing's disease, hypertension, hypercholesterolemia, a history of neoplasm, and those using any medication (e.g., insulin-sensitizing drugs, oral contraceptives, antiandrogens, statins, aspirin, corticosteroids and GnRH agonists and antagonists) excluded within 90 days prior to enrollment. A total 75 healthy women served as controls. None was hirsute and all had regular menstrual cycles. Subjects were weighed on an electronic scale. For each patient, height and weight measurements were used to calculate body mass index (BMI).

Laboratory tests

For hormonal and biochemical analyses, between 8 am and 10 am after an overnight fasting, serum and plasma samples were collected from PCOS subjects with amenorrhea exceeding three months without hormone-induced withdrawal bleeding, and in the early follicular phase for those women who had regular menses. Serum levels of LH, FSH, E2, and insulin were determined by electrochemiluminescence immunoassay for the autoanalyzer Roche Cobas e411.

Glucose, total cholesterol, triglyceride (TG) were measured by standard enzymatic techniques by use of a Roche diagnostic Cobas autoanalyzer e311.

Ovarian volume measurement

Ultrasound was performed to evaluate the uterus and ovaries, used a Siemens Acuson SSA-220A (Siemens, Germany) real-time sonography fitted with a 6-MHz transvaginal and transrectal transducer. Regularly menstruating women were scanned between cycle 3 and 5, oligomenorrheic or amenorrheic women were scanned either at random or between days 3-5 after a progestin-induced withdrawal bleeding. Ultrasound measurements were taken in real

time, according to a standardized protocol. If the ultrasound scanning revealed a ovarian mass or dominant follicle (more than 10mm in diameter), the participant was excluded from this study. The highest possible magnification was used to examine the ovaries.

After the longest medial axis of the ovary had been determined, the length and thickness were measured and ovarian volume was calculated using a manual simplified formula: 0.5 x length x width x thickness as described previously[5].

Statistical analysis

The data were analyzed with SPSS for Windows 11.5 package program. Shapiro-Wilk test was used to test the normality of distribution for continuous variables, and data were expressed as mean ± standard deviation or as medians and 95% central range as appropriate. The differences between groups were assessed by using unpaired t-tests for parametric data and Mann-Whitney U-test for nonparametric data. Correlations between variables were evaluated with use of Spearman's correlation coefficient. A value of $P < 0.05$ was considered statistically significant. Receiver Operating characteristic (ROC) curves were constructed to examine the diagnostic test performance of ovarian volume.

Results

132 patients with PCOS and 75 controls were included in the study. The clinical characteristics and hormonal data of woman with diagnosed PCOS and female controls are shown (Table 1). We found a mean ovarian volume of 9.44 ± 4.3 cm3 in PCOS cases and 7.63 ± 3.66 cm3 in control cases. PCOS patients were found to be have elevated WHR, weight and BMI. However, controls have significantly higher height compared to women with PCOS. The mean serum levels of hormones were comparable

Table 1. Basic characteristics, hormonal and metabolic parameters of women with polycystic ovary syndrome (PCOS) and controls.

Variable	PCOS (n = 132) Mean ± SD	Controls (n = 75) Mean ± SD	P value
Age(years)	24.5±6.1	26.94±6.41	0.014
BMI(kg/m2)	26.83±5.7	23.61±4.02	0.001
Waist:hip ratio	0.83±0.10	0.78±0.23	0.034
FSH(IU/L)	6.13±3.8	6.39±2.06	0.583
LH(IU/L)	9.2±6.6	5.15±2.19	0.001
E2(pmol/L)	58.9±47.1	53.76±21.07	0.365
TT(nmol/L)	0.38±0.19	0.29±0.12	0.001
DHEAS(µmol/L)	208.5±94.6	202.9±86.7	0.673
Fasting Glucose(mg/dL)	89.89±12.3	90.55±7.96	0.004
OGTT 120th-minute glucose (mg/dL)	100.1±30.51	97.16±24.8	0.478
Fasting Insulin(µU/mL)	9.93±7.56	7.17 ±4.08	0.004
Total cholesterol(mg/dL)	178.68±47.51	178.0±36.0	0.914
Triglyceride(mg/dL)	109.4±62.4	79.61±30.68	0.001
HbA1C (%)	5.49±0.46	5.45±0.32	0.476
Mean ovarian volume (cm^3)	9.44±4.3	7.63±3.66	0.003

P<0.05 was considered statistically significant.

between the groups, apart from LH and total testosterone, which were significantly higher in the PCOS group (Table 1). Some of the risk factors for cardiovascular disease are shown in Table 2. Fasting insulin levels were significantly higher in the PCOS group than the control group (9.93 ± 7.56 µU/ ml PCOS groups vs 7.17 ± 4.08 µU/ ml controls, p = 0.004), whereas no difference in the fasting or OGTT 60th – 120th- minute glucose concentrations were observed between groups. Pearson correlation analysis revealed no correlation between age, height, weight and ovarian volume in PCOS and control patients (Table 2). ROC curve analysis was used to examine the diagnostic test performance of ovarian volume. The area under curve (AUC) for mean ovarian volume (MOV) was 0.633 (Table 3). The analysis showed that setting the threshold of MOV at 8.2 cm3 offered the best compromise between specificity (63.3%) and sensitivity (53.8%).

Table 2. Correlation coefficient for mean ovarian volume and anthropometric, metabolic and hormonal variables

	MOV	
	PCOS	Control
Age(years)	- 0.028	0.171
BMI(kg/m2)	- 0.122	0.134
Waist:hip ratio	- 0.045	0.009
Weight(kg)	- 0.066	0.153
Height(cm)	0.118	0.149

*P<0.05 is considered to be statistically significant.

Table 3. Distribution of Mean Ovarian Volume (MOV) ROC analysis results

					95% CI for AUC	
Variable	Groups	AUC	Std.error	P	LB	UB
MOV	PCOS vs. Controls	0.633	0.040	0.001*	0.554	0.712

Notes: *P<0.05 is considered to be statistically significant. AUC = area under curve; CI = confidence interval; LB = lower bound; UB; upper bound

Discussion

Our study was based on Turkish PCOS patients and controls with ultrasound scanning for ovarian volume. This study confirms the results of previous studies that ovarian volume in PCOS patients with clinical and biochemical signs of disease is increased significantly in comparison with a normal group [8,9]. We found that the total ovarian volume increased in women with PCOS as reported before for general PCOS patients and proposed by the Rotterdam consensus conference [6,10].

There were some ultrasound studies of ovarian volume for diagnosing PCOS: Adams et al showed that ovarian volume > 15 cm3 had specificity of 100% but sensitivity of 33%. [3], Yeh et al showed that ovarian volume > 10 cm3 had a specificity of 100% and sensitivity of 70% [11]. Our results indicated that the 8.2 cm3 threshold of mean ovary volume obtained 53.8% sensitivity and 61.3% specificity, which offered the best combination of sensitivity and specificity to distinguish PCOS from normal ones.

For Turkish women with PCOS there are very few studies on this subject. In a study of Leylek et al. , they investigated the relationship between the ultrasonic findings of PCO and endocrine milieu in ovulatory women with PCOS and in ovulatory controls[12]. They found a mean ovarian volume of 12.06 ± 3.9 cm3 in PCOS cases and 4.44 ± 1.04 cm3 in control cases. Comparing this results with the previous reports mentioned above and international consensus, we found lower ovarian volume threshold to distinguish the PCO from normal women. As we mentioned before we found 8.2 cm3 as a diagnostic threshold of ovarian volume for Turkish women with PCOS, which is a lower diagnostic threshold in comparison to the Rotterdam criteria.

Conclusion

Our results confirmed that increased ovarian volume was one of the reliable diagnostic criteria for Turkish PCOS, however the optimum threshold of ovarian volume to distinguish the PCOS from normal women and the mean ovarian volume in Turkish PCOS patients remain beneath the criteria by Rotterdam. That's why it should be reevaluated according to different populations.

Competing interests

The authors declare that they have no competing interests.

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