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Increased clitoral artery pulsatility index and decreased sexual desire level in women with polycystic ovary syndrome

Sefik Gokce[1], Dilsad Herkiloglu[1], Nuray Bakal[2], Meryem Eken[3], Ates Karateke[4]

[1]Department of Obstetrics and Gynaecology, Gaziosmanpasa Hospital, Yeni Yuzyil University, Istanbul, Turkey
[2]Department of Radiology, Zeynep Kamil Training and Research Hospital, Istanbul, Turkey
[3]Department of Obstetrics and Gynaecology, Hisar Intercontinental Hospital, İstanbul, Turkey
[4]Department of Obstetrics and Gynaecology, Istanbul Medeniyet University Faculty of Medicine, Istanbul, Turkey

ABSTRACT

Objectives: Polycystic ovary syndrome (PCOS) is claimed to effect the sexual desire, and recently, blood flow in the clitoral artery (CA) was measured by Doppler ultrasound (USG) examination and the level of sexual desire was objectively demonstrated by determining the pulsatility index (PI).

In the present study, it was aimed to quantitatively determine the sexual desire levels in women with PCOS using Doppler USG and to compare the data with healthy women.

Material and methods: The study included 71 patients diagnosed with PCOS and 78 healthy women who applied to our tertiary hospital gynecology clinics and for control purposes. Pulsatility indices were determined by measuring blood flows in the clitoral artery, uterine artery, ovarian artery and labial artery using Doppler USG in all participants.

The clitoral artery pulsatility index was found to be increased significantly in women with PCOS.

Results: The mean age was 28.5 ± 3.7 in the polycystic ovary syndrome group and 30.0 ± 5.2 in the control group. The mean clitoral artery pulsatility index (1.4 ± 0.5 cm/sec) in the PCOS group was significantly higher than the control group (1.2 ± 0.4 cm/sec) (p = 0.033 cm/sec).The mean ovarian artery pulsatility index (0.8 ± 0.2 cm/sec) in the PCOS group was also significantly higher than the control group (0.7 ± 0.2 cm/sec) (p = 0.015 cm/sec).

PCOS is showed to influence sexual desire with an objective measurement.

Since trying to obtain objective data about the level of sexual desire, questionnaires were not applied to the participants and no questions were asked.

Conclusions: In our study, it was found that the clitoral artery pulsatility index, that is, the rate of resistance in the blood flow to the clitoral region, increased significantly in women with PCOS. This finding shows that the level of sexual desire in women with PCOS has decreased compared to healthy women.

Key words: polycystic ovary syndrome (PCOS); clitoral artery blood flow; pulsatility index; PI; clitoral volume

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is an endocrinological disease that affects 5–10% of women. At least two of the major findings such as cysts, hyperandrogenism, and ovulatory dysfunction are present in PCOS [1, 2]. As a result of endocrinological disorders occurring in PCOS, follicle-stimulating hormone (FSH) is inadequate and luteinizing hormone (LH) is excessive. This leads to the production and release of large amounts of androgens in the ovaries, resulting in ovulatory dysfunction [2–4].

Endocrine disorders seen in PCOS, menstrual disorder, diabetes, cardiovascular disease, and infertility lead to the development of many important complications [4, 6]. In addition to this, the appearance of hirsutism with obesity and excessive hair causes the patient to experience psychological and social problems and decrease the quality of life.

Corresponding author:
Sefik Gokce,
Department of Obstetrics and Gynecology, Gaziosmanpasa Hospital of Yeni Yuzyil University, no: 51 Cukurcesme Street, Istanbul 34245, Turkey
e-mail: sefgokce@gmail.com

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In addition, it is stated that PCOS can significantly reduce the level of sexual desire. It has been reported that when womens' sexual desires decreases, they can also experience sexual and/or marital life problems [7–9].

The level of decrease in sexual desire of women has been attempted to be evaluated subjectively with some questionnaires [10, 11]. However, recently, blood flow in the clitoral artery (CA) was measured by Doppler ultrasound (USG) examination and the level of sexual desire was objectively demonstrated by determining the pulsatility index (PI) [12–14].

To date, sexual desire level in PCOS patients was attempted to be shown using only questionnaires in a subjective way. However with the present study, it was aimed to show the sexual desire level using a quantitative method for clitoral blood flow with Doppler USG. The present study was aimed to calculate the pulsatility indices and quantify the sexual desire levels by comparing these data with healthy women by measuring the blood flow in the clitoral artery, uterine artery, ovarian artery and labial artery with Doppler USG in women with PCOS.

MATERIAL AND METHODS

This study was approved by the local ethics committee and was planned prospectively.

Patients and tests

The study included 71 patients diagnosed with PCOS and 78 healthy women who applied to our tertiary hospital gynecology clinics for control purposes. A signed consent form was received from all participants.

To avoid selection bias, we recruited women between the ages of 20–45 and not of reproductive age to obtain reliable results about sexual desire and accordingly about clitoral blood flow.

Women who are not of reproductive age, those with chronic diseases and those with a history of gynecological surgery were excluded. PCOS was diagnosed according to the Rotterdam criteria [1, 2].

Doppler USG

Clitoral artery blood flow in all women was measured using colored Doppler USG. Doppler USG was performed with the Aplio Ultrasound System (SSA-790; Toshiba, Tokyo, Japan) using a convex 7.5 MHz probe. This procedure was performed by at least five years of experienced Obstetrics and Gynecology specialist.

Each woman was placed in gynecological position for Doppler USG procedure. The Doppler translabial probe was placed sagittally on the clitoris at an angle of less than 20°, so as not to press on the tissues. After determining the crotroal artery by color flow mapping, the Doppler probe was placed on the artery and at least three sequential Doppler waveforms were obtained. In this way, pulsatility indices were measured and recorded. The same procedure was repeated for uterine artery, ovarian artery, and labial artery, and pulsatility indexes were measured and recorded [14].

In addition, right (RO) and left ovary (LO) volumes and follicle numbers were measured and recorded.

Statistical analysis

All statistical analyzes in the study were done using SPSS 25.0 software (IBM SPSS, Chicago, IL, USA). Whether continuous variables are suitable for normal distribution was confirmed by the Kolmogorov-Smirnov Test. The differences between the groups in terms of continuous variables were analyzed using Independent Samples' t Test, and the comparison of mean values between multiple groups by variance analysis. The relationship between continuous variables was tested using Pearson's correlation analysis. The results were evaluated within the 95% confidence interval, and $p < 0.05$ values were considered significant. Bonferroni correction was made where appropriate.

We performed a power analysis using the software G*Power (version 3.1.9.4, Düsseldorf, Germany) with an effect size 0.6, and according to the analysis, a total of 148 subjects would be needed to obtain statistical power at the level 0.95.

RESULTS

The mean age in the polycystic ovary syndrome group was 26.5 ± 3.7, and in the control group it was 30.0 ± 5.2. The mean body mass index (BMI) (26.7 ± 4.8 kg/m^2) was significantly higher in the PCOS group compared to the control group (24.8 ± 4.6 kg/m^2) ($p = 0.017$).

The mean right ovarian volume (14.5 ± 5.0) in the PCOS group was significantly higher than the control group (6.4 ± 2.7) ($p < 0.001$). Similarly, the mean left ovarian volume (13.3 ± 4.5) in the PCOS group was significantly higher than the control group (7.3 ± 4.9) ($p < 0.001$).

The mean clitoral artery pulsatility index (1.4 ± 0.5 cm/sec) in the PCOS group was significantly higher than the control group (1.2 ± 0.4 cm/sec) ($p = 0.033$ cm/sec). The mean ovarian artery pulsatility index (0.8 ± 0.2 cm/sec) in the PCOS group was also significantly higher than the control group (0.7 ± 0.2 cm/sec) ($p = 0.015$ cm/sec). However, the mean clitoral volume was similar between the groups ($p = 0.18$). The mean menstruation time (13.2 ± 14.5 days) in the PCOS group was also significantly higher than the control group (8.0 ± 9.5) ($p = 0.014$) (Tab. 1).

In correlation analysis, the clitoral artery pulsatile index was found to be significantly correlated with clitoral volume ($p = 0.001$; $r = 0.364$), the uterine artery pulsatile index ($p = 0.028$; $r = 0.255$) and the labial artery pulsatile index ($p = 0.006$; $r = 0.333$) (Tab. 2).

Table 1. Comparison between polycystic ovarian syndrome group and control group in terms of mean Doppler measurements

	PCOS group		Control group	
	Mean	SD	Mean	SD
Age [years]	28.5	3.7	30.0	5.2
RO volume	14.5	5.0	6.4	2.7
LO volume	13.3	4.5	7.3	4.9
Clitoral volume	1.2	0.6	1.1	0.4
CA PI [cm/sec]	1.4	0.5	1.2	0.4
OA PI [cm/sec]	0.8	0.2	0.7	0.2
UA PI [cm/sec]	1.9	0.5	2.0	0.6
LA PI [cm/sec]	1.8	0.7	1.8	0.6
BMI [kg/m^2]	26.7	4.8	24.8	4.6
Duration of menstruation [days]	13.2	14.5	8.0	9.5

*Significant at the 0.001 level (99.9% CI); **Significant at the 0.05 level (95% CI). Independent Samples' t Test was used; PCOS — polycystic ovary syndrome; SS — standard deviation; RO — right ovary; LO — left ovary; CA — clitoral artery; PI — pulsatile index; OA — ovarian artery; UA — uterine artery; LA — labial artery; BMI — body mass index

Table 2. Correlation analyzes in polycystic ovarian syndrome group

		Age	RO volume	LO volume	Number of follicles	Clitoral volume	CA PI	OA PI	UA PI	LA PI	BMI
RO volume	r	0.052									
	p	0.659									
LO volume	r	0.065	0.691								
	p	0.583	< 0.001								
Number of follicles	r	0.047	–0.078	0.064							
	p	0.698	0.517	0.595							
Clitoral volume	r	0.076	0.151	0.014	–0.238						
	p	0.518	0.200	0.903	0.046						
CA PI	r	–0.051	0.092	0.147	–0.084	0.364					
	p	0.664	0.436	0.210	0.485	0.001					
OA PI	r	–0.077	–0.163	–0.043	–0.191	–0.055	–0.157				
	p	0.513	0.166	0.716	0.110	0.639	0.181				
UA PI	r	–0.154	0.044	0.071	–0.092	0.111	0.255	0.079			
	p	0.191	0.711	0.545	0.444	0.345	0.028	0.505			
LA PI	r	–0.088	–0.107	–0.078	–0.024	–0.167	0.333	–0.137	0.148		
	p	0.477	0.387	0.527	0.847	0.175	0.006	0.267	0.227		
BMI	r	0.057	0.186	0.209	–0.089	0.126	–0.143	0.060	0.095	–0.040	
	p	0.635	0.120	0.080	0.471	0.296	0.233	0.617	0.430	0.754	
Duration of menstruation	r	–0.205	0.197	0.196	0.030	–0.064	–0.140	0.072	0.047	–0.202	0.103
	p	0.107	0.122	0.123	0.818	0.621	0.275	0.577	0.714	0.128	0.422

Pearson's correlation analysis was used for all analyzes; RO — right ovary; LO — left ovary; CA — clitoral artery; PI — pulsatile index; OA — ovarian artery; UA — uterine artery; LA — labial artery; BMI — body mass index

Right and left ovarian volumes were significantly correlated with each other ($p < 0.001$; $r = 0.691$). The clitoral volume was negatively correlated with the number of follicles ($p = 0.044$; $r = –0.235$).

DISCUSSION

The pulsatility index is a flow parameter calculated using the maximum, minimum and average Doppler frequency during a cardiac cycle [PI = (Vmax–Vmin)/(Vmean);

PI = (peak systolic flow-peak diastolic flow)/(mean flow)]. It is used in conjunction with the resistance index to evaluate resistance in a vascular system. The pulsatility index increases when there is an obstacle ahead of the measured artery. Resistance index, systolic flow/diastic flow ratio and pulsatility index can be measured easily and quickly and provide information about the resistance of the flow. However, in cases where diastolic flow is absent or decreases to zero, only the pulsatility index can be used [12–18]. Khalife et al. [12] measured the clitoral blood flow resistance with Doppler USG by determining the pulsatility index and stated that this method is a non-task, cheap and quantitative method. They also suggested that the clitoral blood flow resistance determined by this method could quantitatively determine the level of sexual desire in women [12]. Oiwa et al. [13] measured the clitoral artery pulsatility index after surgery and stated that this method can be used as a useful parameter related to genital circulation and sexuality in women. Mercier et al. [17] showed that there is no significant difference in repeated measurements and that the pulsatility index can be used to provide reliable data in determining the resistance of the clitoral blood flow. Karatas et al. [11] found the clitoral blood flow measurements they made using Doppler USG correlated with the survey values they made to determine the level of sexual desire and showed that the clitoral blood flow measurement reflects the level of sexual desire. Rosato et al. [14] stated that the clitoral blood flow shows the level of sexual desire and therefore they tried to determine the level of sexual desire by measuring the amount of blood flow in the clitoral artery by Doppler USG. In our study, the clitoral artery pulsatility index was measured using Doppler USG and the sexual desire levels of women with PCOS were determined.

It is a matter of debate whether women with PCOS have decreased levels of sexual desire compared to healthy women due to the different hormonal levels of healthy women, the development of hirsutism, and their predisposition to obesity [7, 9, 19]. Stovel et al. [10] Hashemi et al.[20] and Yildiz et al. [21] found that women with PCOS had the same level of sexual desire as control groups in their studies using questionnaires. In all three studies, only the average orgasm score was found lower than the control group [10, 21, 22]. Eftekhar et al. [19] showed that the level of sexual desire in women with PCOS decreased significantly compared to healthy women. In our study, the mean clitoral artery pulsatility index (1.4 ± 0.5 cm/sec) in the PCOS group was significantly higher than the control group (1.2 ± 0.4 cm/sec) (p = 0.033 cm/sec). The mean ovarian artery pulsatility index (0.8 ± 0.2 cm/sec) in the PCOS group was also significantly higher than the control group (0.7 ± 0.2 cm/sec) (p = 0.015 cm/sec). These findings suggest that the level of sexual desire in PCOS patients may be lower than that of healthy women.

Battaglia et al. [15] reported that there was no significant difference in depression level between women diagnosed with PCOS and the healthy control group with similar age and BMI values. Morotti et al. [22] did not find a significant difference between PCOS group and control group in terms of mean clitoral volume, clitoral artery pulsatility index and labial artery pulsatility index in their study to measure the level of sexual behavior in weak women with PCOS. These data suggest that psychological status and sexual desire levels are associated with obesity in women with PCOS. These findings mean that the sexuality level of women with PCOS but without obesity does not differ from healthy women. However, in our study, no significant correlation was found between BMI and clitoral volume, clitoral artery pulsatile index, and labial artery pulsatile index in the PCOS group. This result may be attributed to the fact that the number of patients in our study group is not very high, however, this finding suggests that it may not be very accurate to completely link the level of sexual desire in women with PCOS to obesity. It should be taken into consideration that both hormonal levels differ in women with PCOS and excessive hairiness such as hirsutism can affect sexual desire levels.

Özay et al. [23] and Mala et al. [24] found that the ovarian artery pulsatility index in women with PCOS was significantly lower than the control group. In our study, the mean ovarian artery pulsatility index was found significantly higher in the PCOS group. Battaglia et al. [15] Adali et al. [25] and Mala et al. [24] found that the uterine artery pulsatility index in women with PCOS was significantly higher than the control group. In our study, no significant difference was found between the two groups in terms of both the average uterine artery and the labial artery pulsatility indexes. These differences between the results of the studies may have resulted from the differences in the formation of the groups. Because both the average age and the average BMI in the groups in our study are much higher than these two studies. In our study, the ages of women were tried to be kept in a wider range and the average age was higher in order to better reflect the situation of women of reproductive age.

Battaglia et al. [15] reported in two separate studies that there was no significant difference between patients with PCOS and healthy women in terms of the mean clitoral volume [14, 15]. In our study, the mean clitoral volume was similar among the groups. These data mean that the clitoral volume does not show a significant change in PCOS patients.

In the correlation analysis performed in our study, the clitoral artery pulsatile index was found to be significantly correlated with both the uterine artery pulsatile index (p = 0.028; r = 0.255) and the labial artery pulsatile index (p = 0.006;

r = 0.333). These findings mean that the blood supply resistance in the sexual areas can be evaluated together in patients with PCOS.

There were some limitations in our study. Since the blood flow to the clitoral region was measured only with Doppler USG in the study, it was tried to obtain objective data about the level of sexual desire, and questionnaires were not applied to the participants and no questions were asked in order to avoid statistical bias due to subjective responses. Therefore, how the participants feel subjectively about their sexual desire levels was not evaluated. Since the study was also cross-sectional, long-term changes of women could not be analyzed.

CONCLUSIONS

In the present study, it was found that the clitoral artery pulsatility index, that is, the rate of resistance in blood flow to the clitoral region, increased significantly in women with PCOS. This finding shows that the level of sexual desire in women with PCOS has decreased compared to healthy women.

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Not applicable.

Conflict of interests

All the authors declare that they do not have any conflict of interests.

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