FREQUENCY OF OVARIAN ARTERY DOPPLER INDICES IN PATIENTS OF POLYCYSTIC OVARIAN SYNDROME

Ameenah Khan, Imran Masoud Qasmi, Tariq Mehmood Mirza, Khadija Tul Kubra

Department of Radiology, Combine Military Hospital (CMH), Lahore, Pakistan.

ABSTRACT

BACKGROUND: Polycystic ovarian syndrome is a common endocrine disorder of females of reproductive age group. Recent studies have shown that changes in Doppler indices of ovarian arteries in patients of PCOS are much more marked than changes in morphology of ovary and uterus. **OBJECTIVE:** To determine frequency of deranged ovarian artery Doppler indices in patients of PCOS in the form of percentage. **METHODS:** Total 205 women aged between 18-40 years presenting with PCOS were included. Transvaginal Doppler ultrasound was performed to determine Pulsatility and Resistive indices of ovarian artery which were labelled deranged if above or below the normal range. PI (range: 2.01to 4.30) and RI (range: 0.80 to 0.95). Data was stratified for age, BMI and duration of PCOS. **RESULTS:** Ovarian artery Doppler indices were deranged in 175 (85.4%) women with PCOS. The Pulsatility index ranged from 2.01 to 4.27. Resistive index ranged from 0.80 to 0.94. The mean age of the patients was 27.2 – 5.9 years while the mean duration of PCOS was 18.4 – 7.1 months. The BMI of patients ranged from 20.8 Kg/m^2 to 34.0 Kg/m^2 with a mean of 26.9 – 3.9 Kg/m^2. **CONCLUSION:** In this study, we observed that ovarian artery Doppler indices were deranged in a significant proportion of women with PCOS which suggests potential role of Doppler indices in the diagnostic workup of women with suspicion of PCOS. **Key Words:** Polycystic Ovarian Syndrome, Ultrasound Doppler, Pulsatility Index, Resistive Index

Introduction

Polycystic ovarian syndrome is a complex endocrine disorder of women of reproductive age group. Patients clinically present with obesity, hirsutism, acne and menstrual irregularities and infertility which affect the quality of life by having medical, social, cosmetic and psychological implications.[1] PCOS is hypothesized to result from excessive androgens production by ovaries[2] however insulin resistance and raised levels of gonadotropins are also being held responsible for this disease process.[3,4] PCOS is the most common cause of an-ovulatory infertility affecting 90-95% of patients.[5,6] PCOS is the most common female endocrine disorder in developed countries with prevalence of 15-20 % but prevalence is much higher in south Asian women (52%).[7] Despite its high prevalence and economic burden, no single criterion has been sufficient enough to correctly diagnose it.[8] Currently used criteria include clinical features, hormonal assays and sonographic features. Hormonal assays are expensive investigations and when used alone each of this criteria is unreliable and can result in marked number of false positive and false negative diagnosis.[9,10]

Materials and Methods

This was as descriptive cross sectional study conducted at department of radiology, Combined Military Hospital, Lahore from Nov 2018 to April 2019. Study was approved by ethical committee of CMH Lahore.

Correspondence : Dr. Ameenah Khan
Department of Radiology,
Combined Military Hospital (CMH),
Lahore, Pakistan.
Email: ameenah.nadeem@gmail.com

Polycystic Ovarian Syndrome was defined according to Rotterdam consensus which states presence of any two of the following:

 1-Oligomenorrhea/Anovulation
 2-Signs of Hyperandrogenism.
 3-Polycystic ovaries detected on Grey Scale Ultrasound;>12 follicles in each ovary and/or increased ovarian volume (>10 mL).[8]

Sample size was 205 cases, calculated keeping confidence level 95% with 5% margin of error, and expected percentage of deranged ovarian artery Doppler indices as 84.2%.[12] Patients were selected by Non-Probability, Consecutive Sampling.

Inclusion criteria were diagnosed cases of PCOS as per Rotterdam criteria as stated above. Married patie-nts of reproductive age (18-40 years) were scanned at day 3rd to 8th day of menstrual cycle.

Exclusion Criteria were patients who were receiving oral contraceptive pills or having biochemical evidence of hyperprolactinaemia, thyroid disease or adrenal hyperplasia detected on screening laboratory investigations.

Transvaginal USG (TVS) was used to localize ovarian arteries in the ovarian hilum on both sides . Pulsed Doppler range gate was set across vessel and average of three waveforms was obtained. Ovarian Doppler artery indices including Pulsatility index (PI=S-D/mean) and Resistive index (RI=S-D/S) were computed. Data was stratified for age, BMI and duration of PCOS.

Results

This study involved 205 women aged between 18-40 years presenting with PCOS. Pulsatility and Resistive indices of both ovarian arteries was calculated & labelled as deranged if it was above or below the cut-off value (Pulsatility Index: 4.25 – 0.91, Resistive Index: 0.93 – 0.005). The mean age of the patients was 27.2 – 5.9 years while the mean duration of PCOS was 18.4 – 7.1 months. The BMI of patients ranged from 20.8 Kg/m2 to 34.0 Kg/m2 with a mean of 26.9 – 3.9 Kg/m2. 68 (33.2%) women were obese.

The Pulsatility index ranged from 2.01 to 4.27 with a mean of 3.28 – 0.68 while the Resistive index ranged from 0.80 to 0.94 with a mean of 0.87 – 0.03. Ovarian artery Doppler indices were deranged in 175 (85.4%) women with PCOS. There was no statistically signi-
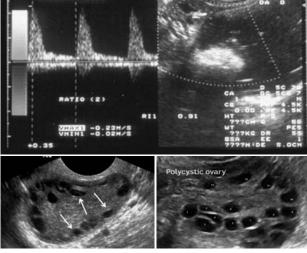
ficant difference in the frequency of deranged ovarian artery Doppler indices across various subgroups based on patient s age (p-value=0.944), BMI (p-value=0.995) and duration of PCOS (p-value=0.931).

Deranged ovarian artery Doppler indices	Frequency (n)	Percent (%)
Yes	175	85.4%
No	30	14.6%
Total	205	100.0%

Table 1: Percentage of deranged ovarian artery Doppler indices in women with PCOS n=205

Subgroups	n	Deranged ovarian artery Doppler indices (n=175)	P-value
Age (years)			
18-29 years	131	112 (85.5%)	0.944
30-40 years	74	63 (85.1%)	
Duration of PCOS (months)			
6-18 months	101	86 (85.1%)	0.931
19-30 months	104	89 (85.6%)	
BMI (Kg/m2)			
20-25 Kg/m2	58	49(84.4%)	0.995
25-30 Kg/m2	69	57(82.6%)	
30-34 Kg/m2	78	69(88.4%)	

Table 2: Stratification & prevalence of deranged ovarian artery Doppler indices in women with PCOS n=205

Figure: TVS showing multiple follicles of PCO S. Ovarian artery Doppler USG showing raised Doppler indices. (RI 0.9)

Discussion

Polycystic ovarian syndrome is a complex endocrine disorder of women of reproductive age group. PCOS

has a prevalence of 6.6% in women of reproductive age and affects 4-5 million women of reproductive age in the United States.[1]

In the present study, the mean age of the patients with PCOS was 27.2 – 5.9 years. A similar mean age of 27.2 – 4.8 years and 27 – 5.2 years has been reported by Artani et al.[9] and Wahab et al. 67 among women presenting with PCOS. Akram et al.[7] reported similar mean age of 26.7 – 4.8 years among such women while Usmani et al.[14] observed it to be 28 – 4.2 years. Similar observation was made by Chaudhari et al.[15] and Kumar et al.[16] who reported mean age of PCOS as 27.7 – 7.6 years and 28.6 – 6.3 years respectively.

We observed that the mean BMI of these patients was 26.9 – 3.9 Kg/m^{2}. Similar mean BMI has been reported among women with PCOS by Akram et al.[7] (26.2 – 4.5 Kg/m^{2}) and Qazi et al.[17] (27.6 – 5.7 Kg/m^{2}) in local population and Gupta et al.[18] (26.5 – 5.1 Kg/m^{2}).

In the present study, the mean Pulsatility index was 3.28 – 0.68 while the mean Resistive index was 0.87 – 0.03 in 84.5% in women with PCOS. Similar results have been reported in another local study where Bano et al.[12] observed the mean PI and RI to be 3.89 – 0.76 and 0.93 – 0.10 respectively among 84.2% of women presenting with PCOS. Our obser-vation is in line with that of Maciolek-Blewniewska et al.[21] who reported similar mean PI (3.19 – 0.52) and mean RI (0.87 – 0.04) in women with PCOS. Similar PI (3.34 – 0.18) & RI (0.86 – 0.02) in 88% of women have been reported by Aleem et al.[22]

Conclusion

In our study we observed the frequency of deranged ovarian artery Doppler indices in 85.4% of women with PCOS. This significant percentage suggests potential role of Doppler indices in the diagnostic workup of women with suspicion of PCOS.

A very strong limitation to this study was lack of a control group which could have further established the role of deranged ovarian artery Doppler indices in the discrimination of women with and without PCOS. Such a study is highly recommended in future research.

Conflict of Interest: None

References

1. Sirmans SM, Pate KA. Epidemiology & management of PCOS. Clin Epidemiol 2014; **6:** 1.

2. Rosenfield RL, Ehrmann DA. The pathogenesis of polycystic ovary syndrome (PCOS): the hypothesis of PCOS as functional ovarian hyperandrogenism revisited. Endocr Rev 2016; **37(5):** 467-520.

3. Ehrmann DA. Polycystic ovary syndrome. N Engl J Med 2005; **352(12):** 1223-36.

4. Schmid J, Kirchengast S, Vytiska-Binstorfer E, Huber J. Infertility caused by PCOS--health-related quality of life among Austrian and Moslem immigrant women in Austria. Hum Reprod 2004; **19(10):** 2251-7.

5. Teede H, Deeks A, Moran L. Polycystic ovary syndrome: a complex condition with psychological, reproductive and metabolic manifestations that impacts on health across the lifespan. BMC Med 2010; **30(8):** 41.

6. Boyle J, Teede HJ. Polycystic ovary syndrome - an update. Aust Fam Physician 2012; **41(10):** 752-6.

7. Akram M, Roohi N. Endocrine correlates of polycystic ovarian syndrome in Pakistani women. J Coll Physicians Surg Pak 2015; **25(1):** 22-6.

8. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to PCOS Fertil Steril 2004; **81(1):** 19-25.

9. Artini PG, Di Berardino OM, Simi G, Papini F, Ruggiero M, Monteleone P, et al. Best methods for identification and treatment of PCOS. Minerva Ginecol 2010; **62(1):**

10. Battaglia C. The role of USG and Doppler analysis

in diagnosis of PCOS Obstet Gynecol 2003; **22:** 225-32.

11. Pellizzari P, Esposito C, Siliotti F, Marchiori S, Gangemi M. Colour Doppler analysis of ovarian and uterine arteries in women with hypoestrogenic amenorrhoea. Hum Reprod 2002; **17(12):** 3208-12.

12. Bano A, Tariq A, Rehman AU. Diagnosis of PCOS on Doppler based resistive and pulsatility index. J Rawal Med Coll 2016; **20(4):** 305-8.

13. Wahab S, Farnaz, Karim R. Role of metformin in polycystic ovarian syndrome. J Postgrad Med Inst 2013; **27(2):** 179-83.

14. Usmani A, Rehman R, Akhtar Z. Association of BMI and dietary habits with ovarian and uterine morphology with PCOS. J Postgrad Med Inst 2014; **28(2):** 133-8.

15. Chaudhari AP, Mazumdar K, Mehta PD. Anxiety, depression, and quality of life in women with polycystic ovarian syndrome. Indian J Psychol Med 2018; **40(3):** 239-46.

16. Kumar A, Barki S, Raghav V, Chaturvedi A, Kumar KVSH. Correlation of Vitamin D with metabolic parameters in polycystic ovarian syndrome. J Family Med Prim Care 2017; **6(1):** 115-9.

17. Qazi II, Qazi AT, Ijaz F, Jawed S, Aftab RK, Qazi SR. Relationship of obesity with insulin resistance in polycystic ovarian syndrome. Pak J Physiol 2018; **14(3):** 46-9.

18. Gupta V, Sharma S, Raina SK, Bedi GK. Clinical and biochemical correlates of PCOS: a case-control study from a tertiary care center in North India. J Sci Soc 2018; **45(1):**

19. Wagan F. Polycystic ovarian syndrome: response to metformin therapy. Pak J Med Health Sci 2011; **27(5):** 11-24.

20. Raja SA, Prasad PVS, Kaviarasan PK. Prevalence and pattern of PCOS in women presenting with acne, a hospital based prospective observational study. Int J Res Med Sci 2018; **6:** 899-903.

21. Maciolek-Blewniewska G, Kozarzewski M, Szpakowski M, Pertynski T, Nowak M. [The evaluation of blood flow in uterine arteries in girls with PCOS by transvaginal color Doppler ultrasonography]. Ginekol Pol 1999; **70(5):** 412-7.

22. Aleem FA, Predanic M. Transvaginal color Doppler determination of the ovarian and uterine blood flow characteristics in polycystic ovary disease. Fertil Steril 1996; **65(3):** 510-6.