

ORIGINAL RESEARCH

Role of pelvic ultrasonography in evaluation of patients with polycystic ovarian syndrome

¹Dr. Poonam Ohri, ²Dr. Jitesh, ³Dr. Suparna Grover, ⁴Dr. Manasi kohli,
⁵Dr. Manik Sehgal, ⁶Dr. Parushi Kohli

¹Professor and Head, ^{2,5}Junior Resident, Department of Radiodiagnosis, Govt. Medical College, Amritsar, Punjab, India

³Professor, Department of Obstetrics and Gynaecology, Govt. Medical College, Amritsar, Punjab, India

⁴ Medical Officer, Hargun Hospital, Batala Road, Amritsar, Punjab, India

⁶MBBS Student, SGRD Medical College, Amritsar, Punjab, India

Corresponding author

Dr. Jitesh

Junior Resident, Department of Radiodiagnosis, Govt. Medical College, Amritsar, Punjab, India

Email: jiteshswamy2129@gmail.com

Received: 13 February, 2023

Accepted: 16 March, 2023

Abstract

Aims and objectives: 1. To assess the sonographic features of both ovaries and endometrium in female patients of reproductive age group with clinical profile of polycystic ovarian syndrome using transabdominal ultrasonography (transvaginal ultrasound wherever possible). 2.To determine the association between sonographic features of both ovaries and endometrium with biochemical profile of the patients (wherever possible).

Material and methods: A minimum of 100 patients referred from Obstetrics and Gynaecology Department to the Department of Radiodiagnosis and Imaging, Government Medical College, Amritsar with clinical suspicion of features of polycystic ovarian syndrome for pelvic ultrasonography in a period of two years were subjected for the study.

Results: Among 100 patients with clinical suspicion of polycystic ovarian syndrome 70 % of the patients were under 25 years and 73 % were unmarried. Oligomenorrhea was the main complaint in most of the patients and overweight & obesity in 63% of the patients followed by hirsutism (43%) and subfertility (27%). Follicles equal to or more than 12 per ovary was observed in 67% of the patients and 64% had ovarian volume ≥ 10 cc. 91% of the patients had 2-9 mm follicles. Echogenic stroma was observed in 97% of the patients and 38% showed ≥ 10 mm stromal thickness. Ovarian features on ultrasonography were well correlated with biochemical profile. BMI ≥ 25 kg/m² and raised free testosterone were good predictor of polycystic ovaries.

Conclusions: The sonological ovarian and endometrial features in patients with clinical suspicion of polycystic ovarian syndrome correlated well with clinical and biochemical profile in statistically significant number.

Keywords: Polycystic ovarian syndrome, Sonographic features, Biochemical profile.

Introduction

Polycystic ovarian syndrome (PCOS) is a common endocrinal disorder mainly affecting female of reproductive age. Clinical manifestations are diverse which include

hyperandrogenism, anovulation, infertility and increased risk of metabolic disorders besides psychosocial dysfunction.¹ This is incompletely understood disorder of heterogenous nature. It starts appearing at age of 15 to 25 years and it may take years for its clinical features to appear. Prevalence of polycystic ovarian syndrome in India ranges from 3.7 to 22.5% depending on the population studied and the basis used for diagnosis.¹

The true definition of polycystic ovary syndrome (PCOS) includes a combination of morphological and histological changes of the ovary and associated endocrine abnormalities. The original description given by Stein and Leventhal included amenorrhoea, obesity, infertility and hirsutism in association with bilateral enlarged cystic ovaries showing a typical histological appearance of thickened capsule, multiple cysts and dense hypertrophied interstitial tissue. Applying the recommended Rotterdam PCOS Diagnostic Criteria, the presence of two of the three criteria is sufficient to diagnosis PCOS which includes menstrual cycle anomalies (amenorrhea, oligomenorrhea), clinical and/or biochemical HA, and/or the ultrasound appearance of polycystic ovaries after all other diagnoses are ruled out.^{2,3,4}

The sonographic criteria for PCOS requires the presence of 20 or more follicles (as per International evidence-based guidelines for assessment & management of polycystic ovary syndrome 2018) & 12 or more than 12 follicles per ovary (as per Rotterdam criteria) in either ovary measuring 2 to 9 mm in diameter and/or increased ovarian volume (≥ 10 mL). A single ovary meeting these criteria is sufficient to affix the PCO morphology.

However, many women with PCOS will not have typical sonographic findings. Ovarian volume may be normal in 30% of patients.^{5,6} Using transvaginal ultrasound, increased stromal echogenicity has also been reported as a sensitive and specific sign of polycystic ovaries.^{7,8} In a few number of patients, the sonographic findings may be unilateral.⁹⁻¹³

Material & methods

A descriptive correlation study was conducted in minimum of 100 patients referred from Obstetrics and Gynaecology Department to the Department of Radiodiagnosis and Imaging, Government Medical College, Amritsar with clinical suspicion of features of polycystic ovarian syndrome for pelvic ultrasonography in a period of two years were subjected for the study. They were evaluated for ovarian morphology and endometrium by pelvic ultrasonography in follicular phase of menstrual cycle and findings were correlated with clinical findings and biochemical analysis. A complete clinical history of the each patient was taken, which included irregular periods, hirsutism, obesity, infertility and others. The sonographic Rotterdam criteria for PCOS:- 12 or more than 12 follicles per ovary measuring 2 to 9 mm in diameter and/or increased ovarian volume (≥ 10 cc).

Results

The age range of 100 patients with clinically suspected polycystic ovary syndrome was 15 to 35 years. The mean age distribution was 23 years. Majority (70%) of the patients were below 25 years. Maximum cases were seen in group of 21 to 25 years. Majority (73%) of the patients were unmarried.

Almost 80% of the patients had oligomenorrhea and other main complaints were pre-obesity & obesity 63%, hirsutism 43% and subfertility 27%.

The majority (71%) of the patients showed menarche at 12-16 years of age.

In our study out of 100, 23 patients were obese and 40 patients were overweight. Most of the patients were showing BMI between 25.0 to 29.9 kg/m². Mean value of BMI was 25 kg/m².

Transabdominal ultrasound examination was performed in all patients and TVS was also performed in 6 patients in addition to transabdominal ultrasound.

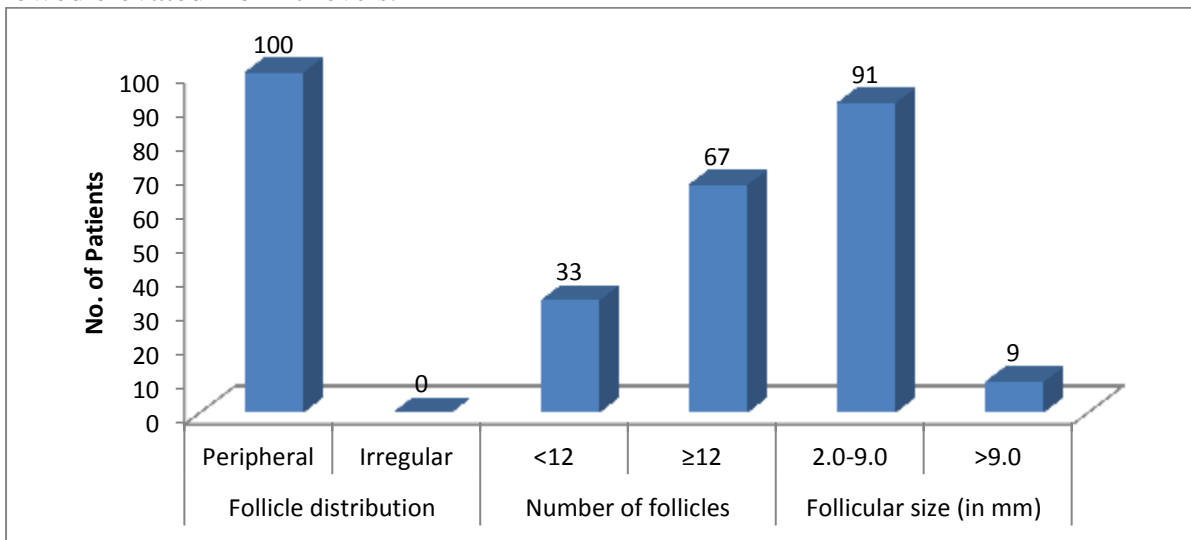
In our study, most (67%) of the patients showed more than 12 follicles per ovary and peripheral arrangement of the follicles was observed in all patients. Maximum number (91%) of the patients showed follicles of size 2-9mm.

In our study, ≥ 10 cc volume was observed in 64% of the patients. Volume range was 6cc to 33cc. 37% of the patients had stromal thickness more than 10mm. Stromal thickness range was 6mm to 15.5mm. In 97% of patients the ovarian stroma appeared echogenic.

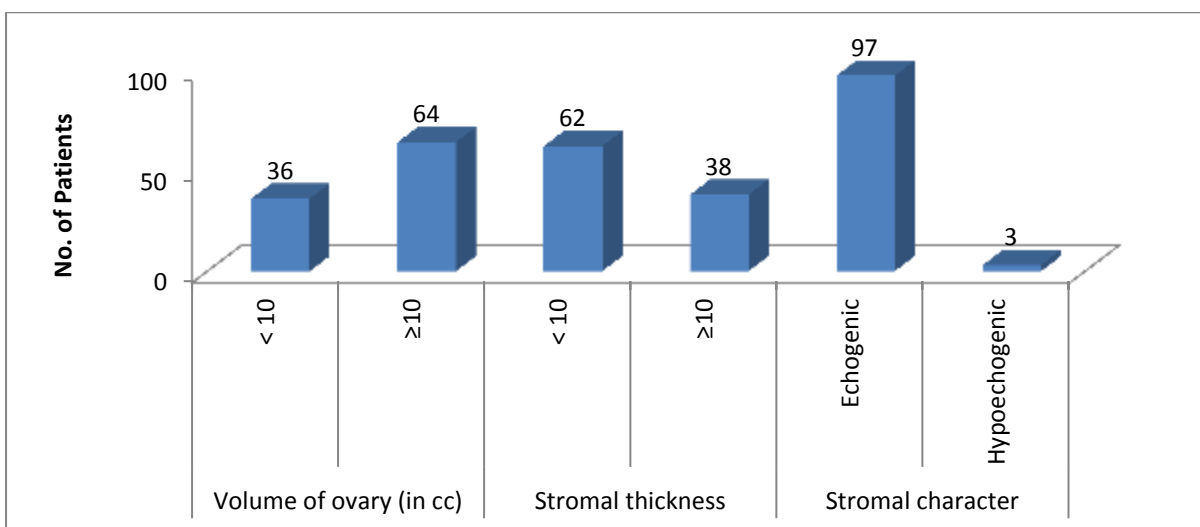
Majority (55%) of the patients showed endometrial thickness between 5-10mm in follicular phase. 23% of the patients showed endometrial thickness between 10-20mm. 22% of the patients showed endometrial thickness between 1-5mm.

Majority (79%) of the patients showed normal endometrium. Heterogenous and thickened endometrium was seen in three cases. Out of 100, 18 patients showed thickened and homogenous endometrium.

In our study, 72% of the patients showed elevated serum testosterone levels. 34% and 24% of the patients showed increased free testosterone and DHEAS respectively. TSH levels were <4.5 uIU/ml in most (93%) of the patients. 42% of the patients showed impaired glucose intolerance and 6% of the patients were found to be diabetic. These patients showed elevated HbA1c levels.



Graph 1: Bar Chart Showing Distribution Of Patients According To Arrangement, Number And Size Of Follicles Per Ovary.



Graph 2: Bar Chart Showing Distribution Of Patients According To Volume, Stromal

Thickness And Character Of Ovary

Discussion

In 100 patients with clinical features of polycystic ovarian syndrome the mean age was 23 years. The age range was 15 to 35 years. Maximum cases were seen in the age group of 21-25 years. Most of the patients were under 25 years. Out of 100 patients 73% were unmarried. Similar results were observed in the studies of Begum HR et al, Anjali CS et al and Muchchandi R & Takalaki N.^{10,15,16}

Among 100 patients oligomenorrhea (80%) was the most common complaint. Other complaints were overweight & obesity, hirsutism, subfertility and family history of diabetes mellitus in the descending order. Majority of the patients showed menarche at 12-16 years. These observations were similar to the studies by Begum HR et al, Alakananda D et al and Carroll J et al.^{17,18,19}

Out of 100 patients 23% of the patients were obese and 40% patients were overweight. Study by Smitha CC et al showed 30% of the patients were overweight with BMI 25 to 29.9kg/m² and 25% of the patients were obese which was closely similar to our study.²⁰ Transabdominal ultrasonography was done in all of the patients.

The range of endometrial thickness was 5-10mm in most of the patients. This observation was comparable with the study by Peri N & Levine D.¹⁶

Peripheral arrangement of follicles was seen in all patients. Among 100 patients 67 (67%) had ≥ 12 follicles per ovary. 91% of the patients had 2-9 mm follicles. Out of 100 patients 64% had ovarian volume ≥ 10 cc. Echogenic stroma was observed in 97% of the patients and 38% showed ≥ 10 mm stromal thickness. The range of stromal thickness was 6mm to 15.5mm. Similar findings were observed in study conducted by Muchchandi R & Takalaki N, Begum HR, Hann LE et al and Muchchandi R & Takalaki N.^{16,21,22,23}

Out of 100 patients 72% had higher serum testosterone levels and 34% had elevated free testosterone levels. 24% of the patients had raised DHEAS levels. More than 93% patients had TSH values < 4.5 uIU/ml. Out of 100 patients 42% were prediabetic and 6% were diabetic. Out of 100 patients 48% had elevated HbA1c levels. Similar results were seen in the study of Begum HR et al and Renuka P et al.^{21,25}

The study showed statistically significant relationship between the following parameters:

- Follicular number with raised free testosterone, OGTT and raised HbA1c.
- Stromal thickness with raised serum testosterone, raised free testosterone, raised DHEAS, OGTT and raised HbA1c.
- Volume of ovary with raised serum testosterone and raised free testosterone.
- Thinned endometrium with raised serum testosterone.
- Thickened endometrium with OGTT and raised HbA1c levels.
- Thickened heterogenous endometrium, follicular number and ovarian volume with subfertility.
- Follicular number, follicular size, stromal thickness and volume of ovary with hirsutism and BMI ≥ 25 kg/m²
- Thickened heterogenous endometrium and stromal thickness with family history of DM.
- The study observed negative correlation between sonological ovarian features and rise in TSH levels.

BMI ≥ 25 kg/m² and raised free testosterone were good predictor of polycystic ovaries. Similar results were supported by the study of Begum HR et al.²¹

- Med Res. 2019;150(4):333-44.
2. El Hayek S, Bitar L, Hamdar LH, Mirza FG, Daoud G. Polycystic ovarian syndrome: an updated overview. *Front Physiol.* 2016;7(3):01-15.
 3. Xita N, Georgiou I, Tsatsoulis A. The genetic basis of polycystic ovary syndrome. *Eur J Endocrinol.* 2002;147(6):717-26.
 4. Sanders RC, Parsons AK. Anteverted retroflexed uterus: a common consequence of cesarean delivery. *Am J Roentgenol.* 2014;203(1):W117-24.
 5. Goldstein SR. The endometrial echo revisited: have we created a monster?. *Am J Obstet Gynecol.* 2004;191(4):1092-6.
 6. Zvanca M, Andrei C. Volume Ultrasound in Uterine and Tubal Evaluation. *DonaldSch J Ultrasound Obstet Gynecol.* 2011;5(3):243-56.
 7. Amer SA, Li TC, Bygrave C, Sprigg A, Saravelos H, Cooke ID. An evaluation of the inter-observer and intra-observer variability of the ultrasound diagnosis of polycystic ovaries. *Hum Reprod.* 2002;17(6):1616-22.
 8. Ardaens Y, Robert Y, Lemaitre L, Fossati P, Dewailly D. Polycystic ovarian disease: contribution of vaginal endosonography and reassessment of ultrasonic diagnosis. *Fertil Steril.* 1991;55(6):1062-8.
 9. Battaglia C, Regnani G, Petraglia F, Primavera MR, Salvatori M, Volpe A. Polycystic ovary syndrome: it is always bilateral? *Ultrasound Obstet Gynecol.* 1999;14(3):183-7.
 10. Merz E, Miric- Tesanic D, Bahlmann F, Weber G, Wellek S. Sonographic size of uterus and ovaries in pre- and postmenopausal women. *Ultrasound Obstet Gynecol.* 1996;7(1):38-42
 11. Platt JF, Bree RL, Davidson D. Ultrasound of the normal nongravid uterus: correlation with gross and histopathology. *J Clin Ultrasound.* 1990;18(1):15-9.
 12. Verguts J, Ameye L, Bourne T, Timmerman D. Normative data for uterine size according to age and gravidity and possible role of the classical golden ratio. *Ultrasound Obstet Gynecol.* 2013;42(6):713-7.
 13. Orsini LF, Salardi S, Pilu G, Bovicelli L, Cacciari E. Pelvic organs in premenarcheal girls: real-time ultrasonography. *Radiology.* 1984;153(1):113-6.
 14. Miller EI, Thomas RH, Lines P. The atrophic postmenopausal uterus. *J Clin Ultrasound.* 1977;5(4):261-3.
 15. Fleischer AC, Kalemeris GC, Entman SS. Sonographic depiction of the endometrium during normal cycles. *Ultrasound Med Biol.* 1986;12(4):271-7.
 16. Forrest TS, Elyaderani MK, Muilenburg MI, Bewtra CH, Kable WT, Sullivan P. Cyclic endometrial changes: US assessment with histologic correlation. *Radiology.* 1988;167(1):233-7.
 17. Bakos O, Lundkvist Ö, Bergh T. Transvaginal sonographic evaluation of endometrial growth and texture in spontaneous ovulatory cycles—a descriptive study. *Hum Reprod.* 1993;8(6):799-806.
 18. Nalaboff KM, Pellerito JS, Ben-Levi E. Imaging the endometrium: disease and normal variants. *Radiographics.* 2001;21(6):1409-24.
 19. Randall JM, Fisk NM, McTavish A, Templeton AA. Transvaginal ultrasonic assessment of endometrial growth in spontaneous and hyperstimulated menstrual cycles. *Br J Obstet Gynaecol.* 1989;96(8):954-9.
 20. Heremans R, Van den Bosch T, Valentin L, Wynants L, Pascual MA, Fruscio R, et al. Ultrasound features of endometrial pathology in women without abnormal uterine bleeding: Results from the International Endometrial Tumor Analysis Study (IETA3). *Ultrasound Obstet Gynecol.* 2022;60(2):243-55.
 21. Begum HR, Reddy KA, Kaleemullah M. Polycystic ovarian syndrome: a hormonal and radiological correlation. *Int J Contemp Med Surg Radiology.* 2018;3(4):D1-5.

22. Hann LE, Hall DA, McArdle CR, Seibel M. Polycystic ovarian disease: sonographic spectrum. *Radiology*. 1984;150(2):531-4.
23. Muchchandi R, Takalaki N. A study to identify and assess the sonological features in patients with clinical features of polycystic ovarian syndrome. *Int J Radiology*.2019; 12(1):12-7.
24. Bui HN, Sluss PM, Hayes FJ, Blincko S, Knol DL, Blankenstein MA, Heijboer AC. Testosterone, free testosterone, and free androgen index in women: Reference intervals, biological variation, and diagnostic value in polycystic ovary syndrome. *Clin Chim Acta*. 2015;450:227-32.
25. Renuka P, Shakthiya T, Vm V. Study of Glycated Hemoglobin Levels in Polycystic Ovary Syndrome. *Asian J Pharm Clin Res*. 2018;11(5):191-3.