A study to identify and assess the sonological features in patients with clinical features of polycystic ovarian syndrome

Rajashekhar Muchchandi[1*], Nandini Takalaki[2]

{[1]Associate Professor, Department of Radiology} {[2]Assistant Professor, Department of Biochemistry} Al-Ameen Medical College, Vijayapura, Karnataka, INDIA.
Email: radioraj@gmail.com

Abstract
Background and Objectives: Polycystic ovarian syndrome is a heterogeneous endocrine disorder affecting women of reproductive age group characterized by a combination of polycystic ovarian morphology, clinical features and biochemical indices. The objective of this study was to identify the sonological features of ovaries and endometrium. **Methodology:** Pelvic ultrasonography was performed in the patients clinically suspected of having polycystic ovarian syndrome. Previously established cases of polycystic ovarian syndrome and patients with any other known health problems were excluded. Statistical analysis included only those patients having complete data. **Results:** The age range of 60 patients with clinically suspected polycystic ovary syndrome was 15 to 35 years. The mean age distribution was 26 years. Majority (66.67%) of the patients were below 25 years. Majority (70%) of the patients were unmarried. Most(70%) of the patients showed more than 12 follicles per ovary and peripheral arrangement of the follicles was the most common finding in these patients and it was observed in all. Maximum number (83.33%) of the patients showed 2-9mm follicles.$\geq$ 10cc volume was observed in 62% of the patients. Volume range was 7cc to 24cc. 37 % had stromal thickness more than 10mm. Stromal thickness range was 7mm to 14mm. In 98.33 % of the ovaries stroma appeared echogenic. **Conclusion:** The sonological ovarian features in patients with clinical suspicion of polycystic ovarian syndrome correlated well with clinical features
Key Words: Polycystic ovarian syndrome, pelvic sonography, sonological ovarian features

*Address for Correspondence:
Dr. Rajashekhar Muchchandi, Associate Professor, Department of radiology,Al-Ameen Medical College, Vijayapura, Karnataka, INDIA.
Email: radioraj@gmail.com

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INTRODUCTION

Polycystic ovarian syndrome (PCOS) is a common endocrinopathy in women of reproductive age group and an incompletely understood enigmatic disorder of heterogenous nature. It starts appearing at 15 to 25 years of age and it may take years for its clinical presentation to appear. The incidence of polycystic ovarian syndrome is 4% to 22% of women overall and 50% of women seen at infertility clinics[1, 2.] Polycystic ovarian syndrome was first described by Irving Stein and Michael Leventhal in 1935 in a group of patients presenting with amenorrhea, bilateral polycystic ovaries, and masculinising changes which might, according to them be due to the result of some hormonal stimulation very likely related to the anterior lobe of pituitary. Even after seventy years, the underlying cause for its heterogeneity and the development of signs and symptoms is not identified, the diagnostic criteria have yet to be universally agreed upon and the pathophysiology remains a point of intense research and debate.[3] PCOS is characterized by low follicle stimulating hormone levels resulting in anovulation, elevated luteinizing hormone levels, resulting in hyperandrogenism, and insulin-resistance symptoms which may range from simple cystic acne,

cephalic hair loss, or mild facial hirsutism to instances of oligomenorrhoea or amenorrhoea, sterility and severe generalized hirsutism. Classical Stein Leventhal syndrome which manifests as amenorrhoea, hirsutism,sterility and obesity is one extreme form in the broad spectrum of clinical manifestations of PCOS. Chronic anovulation results in endometrial hyperplasia and heterogenous cystic endometrium due to unopposed estrogens[1]. In clinical practice women with polycystic ovarian syndrome are seen for three major reasons. Infertility (mean incidence 74%), menstrual irregularities (mean incidence of dysfunctional uterine bleeding 29%, and amenorrhoea 51%) and androgen excess (mean incidence of hirsutism 69%, virilisation 21%).[4] The diagnosis of PCOS depends on confirming the hyperandrogenism and excluding other causes of hyperandogenic anovulation. Originally, according to Stein and Leventhal (1935) the diagnosis required pathognomonic ovarian findings and the clinical triad of hirsutism, amenorrhea, and obesity. The next diagnostic milestone occurred 30 years later, when researchers in the late 1960s and early 1970s noted derangements in the hypothalamo-pituitary axis. Following this the endocrine criteria were added to the diagnosis such as elevated levels of serum testosterone, and an elevated LH: FSH ratio.[4] Pelvic ultrasonography in the 1970s further added diagnostic specificity to the recognition of PCOS. Ultrasound features of polycystic ovaries were included as a diagnostic criterion following the Rotterdam Consensus meeting for PCOS diagnosis in 2003. The three criteria included in the definition were: i) oligo and/or anovulation; ii) hyperandrogenism and iii) polycystic ovaries with the exclusion of other etiologies. This definition required at least the presence of two from the above three criteria.[5] Thus PCOS has evolved through many steps from the clinical, biochemical and imaging perspectives. Further, advances in imaging technology, particularly transvaginal sonography, have qualitatively enhanced the information on the internal structure of ovary and endometrial morphology.With this background, the present study was undertaken to identify and assess the sonological features in patients with clinical features of polycystic ovarian syndrome.

METHODOLOGY

Study setting: - Department of radiology, Sri Siddhartha medical college, Tumkur, Karnataka department of radiology

Study design: - Prospective cross sectional study.

Source of data:- 60 female patients in age group of 15-35 years referred from the Obstetrics and Gynaecology department of Sri Siddhartha medical college, Tumkur for pelvic ultrasonography were included in this study.

METHOD OF COLLECTION OF DATA

A prospective study of 60 female patients in reproductive age group.

Evaluation of ovarian morphology and endometrium by pelvic ultrasonography by transvaginal and transabdominal (in those patients where transvaginal was contraindicated).

INCLUSION CRITERIA:

Patients referred from Obstetric and Gynecology department with clinical suspicion of features of polycystic ovarian syndrome for pelvic sonography. The specific inclusion criteria included were the following:

- Female patients in reproductive age group (15 – 35 years)
- Irregular or no Menstrual periods
- Hirsuitism / Acne (Androgen excess)
- Infertility
- Obesity

EXCLUSION CRITERIA:

- Known cases of Polycystic ovarian syndrome on treatment and follow up
- Less than 15 years or greater than 35 years age group
- Patients with other known or incidentally detected health problems.
- Patients without hormonal investigations
- Patients lost for follow up

EQUIPMENT AND PROTOCOL:

Transabdominal Ultrasonography:-

The study was performed using GE- VOLUSON 730 PRO, GE LOGIQ 500 PRO ultrasound scanners using convex probes of frequency ranging from 3 to 5 MHZ.

Transvaginal or Endovaginal Ultrasonography:-

The study was performed using GE- VOLUSON 730 PRO, GE LOGIQ 500 PRO ultrasound scanner using curved probes of frequency ranging from 7 to 10 MHZ.

Statistical analysis:

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test or Fischer's exact test (for 2x2 tables only) was used as test of significance for qualitative data.

Correlations were performed with Pearson Correlation coefficient

P value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS

The age range of 60 patients with clinically suspected polycystic ovary syndrome was 15 to 35 years. The mean age distribution was 26 years. Majority (66.67%) of the patients were below 25 years. Majority (70%) of the patients were unmarried.

Table 1: Distribution of patients according to Chief complaints

Chief complaints	Number of patients	%
Oligomenorrhea	48	80
Obesity	21	35
Hirsutism	30	50
Infertility	16	26.67

Table 2: Distribution of patients according Type of sonological procedure done

	Number of patients	%
TAB only	56	93.33
TVS + TAB	4	6.67
Total	89	100

Trans abdominal USG examination was performed in all patients and TVS was also performed in 4 patients.

Table 3: Arrangement, number and size of the follicles per ovary

Follicle distribution	Number of patients	%
Peripheral	60	100.0
Irregular	-	-
Total	60	100.0
Number of follicles	Number of patients	%
<12	18	30
≥12	42	70
Total	60	100.0
Follicle size (in mm)	Number of patients	%
<2.0	1	1.67
2.0-9.0	50	83.33
>9.0	9	15
Total	60	100.0

Most(70%) of the patients showed more than 12 follicles per ovary and peripheral arrangement of the follicles was the most common finding in these patients and it was observed in all. Maximum number (83.33%) of the patients showed 2-9mm follicles. ≥ 10cc volume was observed in 62% of the patients. . Volume range was 7cc to 24cc. 37 % had stromal thickness more than 10mm. Stromal thickness range was 7mm to 14mm. In 98.33 % of the ovaries stroma appeared echogenic.

Table 4: Correlation between duration of irregular menstruation, hirsutism with ovary and endometrium

		Sonological features				
		Endometrial thickness	Follicle e no	follicle e size	Stromal thickness s	Volume of ovary
Duration of Irregular menstruation	r value	0.203	0.219	0.012	0.239	0.318
	p value	0.284	0.030	0.250	0.714	0.070
Hirsutism	r value	0.021	0.008	0.034	0.131	0.213
	p value	0.384	0.312	0.250	0.124	0.030

Duration of the irregular menstruation has positive correlation with endometrial thickness and stromal thickness. But this is not statistically significant. Whereas duration of the irregular menstruation shown statistically significant positive correlation with follicle number and volume of the ovary. Hirsutism has positively significant correlation with volume of the ovary, whereas statistically insignificant positive association with stromal thickness.

DISCUSSION

The present study which included 60 patients who were clinically suspected of having polycystic ovarian syndrome was conducted. In our study The age range of 60 patients with clinically suspected polycystic ovary syndrome was 15 to 35 years. The mean age distribution was 26 years. Majority (66.67%) of the patients were below 25 years.Similar results were observed in the following studies. According to study conducted by Luciano G.Nardo and William M.Buckett, the mean age was 31 ±3.1years with age range of 26 to 37 years.In study by S.Jonard, Y.Robert the age range was 21 to 34 years with a median age of 27 years. It is a prospective study of 214 patients of polycystic ovarian syndrome.Range of age was 14 to 37 years with a mean age of 24 years in a study of 104 patients diagnosed as having polycystic ovarian syndrome by Hsu-Chong Yeh and Walter Futterweit. In our study Majority (70%) of the patients were unmarried.This observation was different from the results of the study conducted by Gayatri .M in 2001, out of 120 patients with polycystic ovarian syndrome most of the patients were married and 24% were unmarried. This study was mainly focussed for infertility management and this might be the reason for the difference. In the present study all of the patients (80%) had irregular periods particularly oligomenorrhea. The other main complaints of the patients were obesity which constituted about 35% of the patients followed by 50% of hirsutism and infertility 26.67%.These observations were similar to the study by Adams *et al* and Luciano G. Nardo *et al*. In this study along with oligomenorrhea (100%), infertility (85%) and hirsutism (65%) were the main complaints of the patients with polycystic ovarian syndrome.Study by Nagamani Peri *et al* in 245 patients with polycystic ovarian syndrome, 146 showed menstrual irregularities, 38 had hirsutism, 15 had infertility. The range of follicle number observed in the present study was between 10 and 20, with a mean of 12 ± 2. Maximum numbers of patients (70%) were in the group of ≥12follicles, 30% showed < 12 follicles. This cut off point was taken as per the Rotterdam consensus definition of polycystic ovarian syndrome.If the cut off point was ≥ 10 follicles following the criteria of Adams *et al*, 100% of the patients in the present included in this group. Present study showed peripheral distribution of follicles in 100% of the patients. This observation was seen in many other studies by Adams J, 60% in peripheral distribution and 40 % in irregular distribution, Ardaens Y. 55% in irregular and scattered, 45 % in peripheral distribution, Hann LE 73% in peripheral distribution. The range of follicle

size in this study was between 2 to 10mm. Mean size observed was 4mm. Most common size range observed in this study was 2-9mm which was seen in 83.33% of the patients. >9mm follicles were seen in 15% of the patients and <2 mm in 1.67%. This observation was supported by other studies by Adams *et al*, Polson *et al*, Conway *et al* whose studies observed 2-9mm was the most common (> 60%) follicular size in patients with polycystic ovarian syndrome. Hann *et al* found that mean follicular size was 5mm±1, with range 2 to 12mm, and most common follicular size observed was 2-9mm (80%).Adams *et al* described < 8mm was the most common size of the follicle. The subjective evaluation of the stroma in this present study showed echogenic and thickened in 98% of the patients and non echogenic and thin in 2% of the patients. This observation was supported by Hughesdon *et al*, and Ardaens *et al*. The quantitative measurement of the stromal thickness in this present study ranged between 2 mm to 14mm. In this present study <10 mm stromal thickness was seen in majority (65.2%) of the patients, whereas ≥10 mm was seen in 34.8% of the patients. Study by Hughesdon *et al* described the echogenicity of the stroma in their study and showed significant histopathological correlation. Ardaens *et al* subjectively assessed the echogenicity and confirmed with transvaginal scan.In the study by Pache *et al* increase in stromal echogenicity was found in 55%, with ≥10 mm as the cut off point. The volume range observed in the present study was between 7 to 14 mm. When ≥ 10cc was taken as the criteria for polycystic ovarian syndrome according to Rotterdam consensus meeting, this study was observed ≥ 10cc volume in most (63%) of the patients and in 37.1% the volume was less than 10cc.This observation was supported by Adams *et al*, most 70% of the PCOS patients showed ≥ 10cc.Hann et.al., study showed ≥ 10cc in 71% and normal ovarian volume in about 29%. The present study observed significant rise in the number of follicles and volume of the ovary with increase in the duration of the irregular menstruation. There is significant rise in the volume of the ovary with increase in the severity of the Hirsutism. And also endometrial thickness and stromal thickness are more with increase in duration of irregular menstruation. But this was not statistically significant. The intra-ovarian hyperandrogenism promotes excessive early follicular growth up to the 2-5mm stage independently from LH and inhibits apoptosis. This physiological process was exaggerated in polycystic ovarian syndrome The other reason for this follicular number and size of the follicles could be the further growth of the follicle to the dominant follicle cannot be proceed because of the follicular arrest by this

hyperandrogenism and lower FSH levels in polycystic ovarian syndrome patients. This increase in follicle number and increase in stroma because of hyperandrogenism (raised testosterone levels) adds to the bulk of the ovary. The reason for the increase in endometrial thickness could be prolonged exposure to excessive estrogen levels and also irregular periods i.e. increase in the length of the cycle. These results of the study were supported by study by Wickenheisser *et al*.

CONCLUSION

The sonological ovarian features in patients with clinical suspicion of polycystic ovarian syndrome correlated well with clinical features. It was observed that endometrial thickness and stromal thickness are more with increase in duration of irregular menstruation. Ovarian volume, number of follicles show positive correlation with duration of the irregular menstruation and hirsutism.

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