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Original Research Article

Ultrasonic predictors of good ovarian response in infertile poly cystic ovarian disease patients

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ABSTRACT

Background: Polycystic ovaries is a common endocrinal ovulatory dysfunction; the presented work presented a ultrasonographic predictor markers with scoring system to predict pregnancy rate in PCO.
Methods: The presented work is controlled trial comparing two different sets of uterine and ovarian ultrasound markers, done at Zinat Alhyat hospital in Benha Egypt. 100 participants divided into two groups induced for ovulation with minimal stimulation protocol in both, 6 different ultrasonic parameter calculated after induction of ovulation in known PCO patients, Group one with collective ultrasound score more than 6,Group two with ultrasound marker score of less than 6.
Results: Regarding the chemical pregnancy when HCG become more than 25 there were 40 out of 50 chemically pregnant in comparison to 25 out of 50 in the second arm with score less than 6 and a p value of 0.001 and a statistically significant difference ,Regarding the clinical pregnancy rate there were 35 cases with proved gestational sacs by ultrasound out of 50 in group one with score more than 6 compared to 18 cases out of 50 in the second group and p value of 0.0007 which was a high significant difference. Regarding miscarriage rate there were one 1 cases out of 35 in group one compared to 5 aborted cases out of 18 in group 2 with p value of 0.006.
Conclusions: Certain ultrasonic parameters 3 ovarian and 3 uterine can be highly correlated with ovulation and pregnancy rates in infertile PCO patients.

Keywords: PCO, Pregnancy rate, Ultrasonic markers

INTRODUCTION

Infertility is a major problem carrying a psychological and financial burden on patients; one of the most common causes of female infertility is polycystic ovarian disease.[1]

Polycystic ovarian disease can affect 6-10 % of population all over the world and there is a higher incidence in the adolescent age group.[2]

Polycystic ovarian disease is a spectrum ranging from mild anovulation with oligomenorrhea to severe degree of anovulation amenorrhea; some cases develop insulin resistance and may have also hyperglycemia.[3-4]

Polycystic ovarian disease complicated by prolonged amenorrhea can cause endometrial hyperplasia with late subsequent endometrial carcinoma, so treatment is important to avoid thus serious complication.[5,6]

Polycystic ovarian disease can be defined as chronic anovulation characterized by hyper androgenic stare chemical or clinical associated with oligoamenorrhea, polycystic ovarian morphology.[7]

PCOD can be classified into four main phenotypes type A characterized by androgen excess, anovulation, polycystic ovarian morphology, type B androgen excess with anovulation only, type C androgen excess, polycystic ovarian morphology and type D anovulation, polycystic ovarian morphology.[1]

Most of the types lie in category D and all types can lead to infertility for a long time. Polycystic ovarian disease can be a cause or as a result of metabolic syndrome which is characterized by morbid obesity, hyperlipidemia, hyperglycemia, insulin resistance.[8]

Many efforts made to enhance ovulation in pcos, induction of ovulation and or ICSI is a solution. Ultrasound is a main part in evaluation and monitoring of patients if infertility.[9]

METHODS

Study design

This was prospective observational study comparing two different scores of ovulation monitored by ultrasound in PCOD.

Sample size

Total 100 PCO cases divided into two equal groups. This study was conducted in Zinat Alhyat hospital Benha Egypt from June 2021 to December 2022.

Inclusion criteria

Polycystic ovaries clinical oligomenorrhea (OA) and radiological polycystic ovarian morphology (POM) age 20-35 presenting with infertility and seeking help for the first time were included.

Exclusion criteria

Patients with adrenal hyperplasia, hypothyroidism, cushing, male factor, tubal block, and submucous myoma were excluded from this study.

This study has two groups, group one with composite sonographic ovarian and endometrial score more than 6 and group two with composite sonographic ovarian and endometrial score score less than 6.

Participant's evaluation

Patients recruited from jam infertility clinic and patients also known to have polycystic ovarian morphology combined with clinical anovulation with oligomenorrhea or anovulatory amenorrhea. All patients subjected to the following history and complete present and menstrual history duration of infertility.

Examination

General vital signs body mass index presence of acanthosis nigricans on skin, waist hip ratio. Abdominal and local examination to exclude other causes of infertility.

Investigations

In this study following investigations were carried out AMH, FSH, LH, E2, T3, T4, TSH, prolactin, 17 hydroxyprogesterone, vitamin D, S calcium, and HBA1C.

The intervention involved two steps. In step one, induction of ovulation and all cases given letrozole femara 2.5 mg daily from day2 of the menstrual cycle for 5 days then we added FSH ampoules named fostimone highly purified FSH 75 units at day 3, 5 and 7 of the cycle. Then ultrasonic monitoring of ovulation done and when the follicle at least one reached 18-20 mm. In step two, ultrasonic evaluation of the 6 parameters done by Sonoscape p25 china.

Complete ultrasonic evaluation of the following done; 1) Endometrial thickness if it is 7-14 given score 2 if not given; 2) Endometrial blood flow by Doppler to show zone of blood flow if it is in the endometrial stripe it was scored 2; 3) Trilaminar endometrium 2; 4) Perifollicular Doppler show ring of fire more than 3/4th of the circumference; 5) Ovarian stromal flow resistive index less than 0.5 given score 2; and 6) The ovarian cortical length /ovarian stromal length >0.3.

Table 1: PCO composite ovulation score.

Item	2	Zero (0)
Cortical/stromal length	>0.3	<0.3
Stromal resistive index	<0.5	>0.5
Peri-follicular ring of fire	>3/4	<3/4
Tri-laminar endometrium	Present	Absent and hyper echogenic
Endometrial thickness	7-14	<7
Applebaum grade 3 endometrial flow	Present	Absent

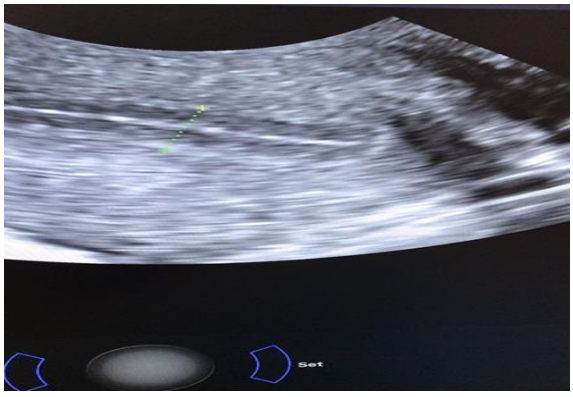

Figure 1: Trilaminar differentiated endometrium given score 2.

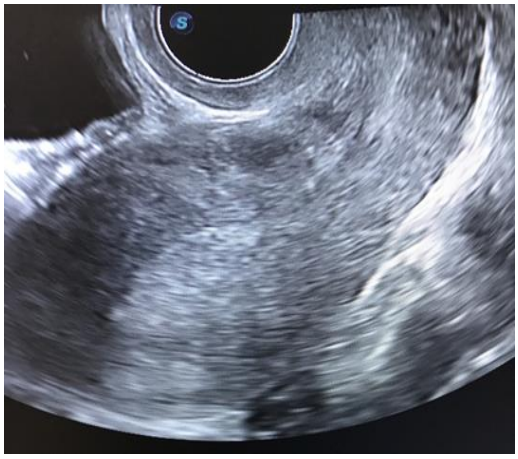

Figure 2: Hyperechogenic nonlaminar endometrium given score 0.

Figure 3: Ovarian cortex/ovarian stromal length <0.3.

Figure 4: Ovarian cortex/ovarian stromal length >0.3 with good mature follicle and bleb sign.

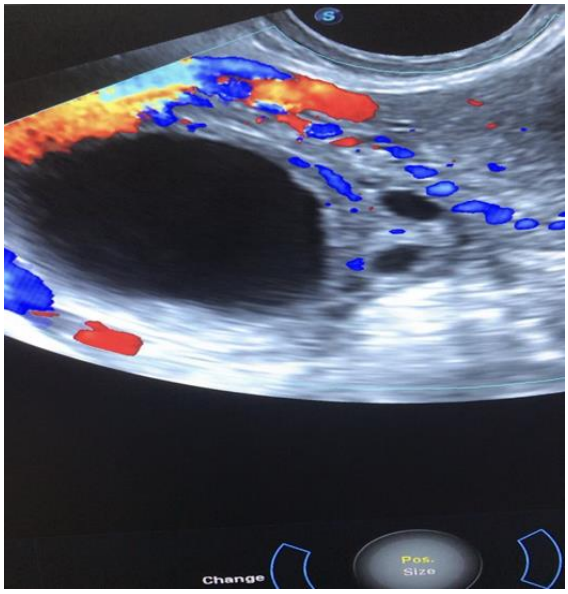

Figure 5: Perifollicular ring of fire with stromal resistive index <0.5.

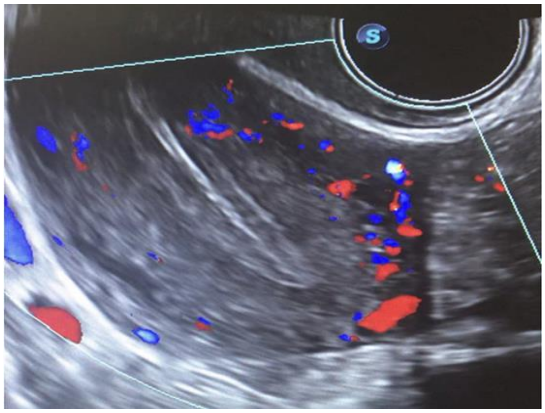

Figure 6: Applebaum grade 2 flow at the junctional zone.

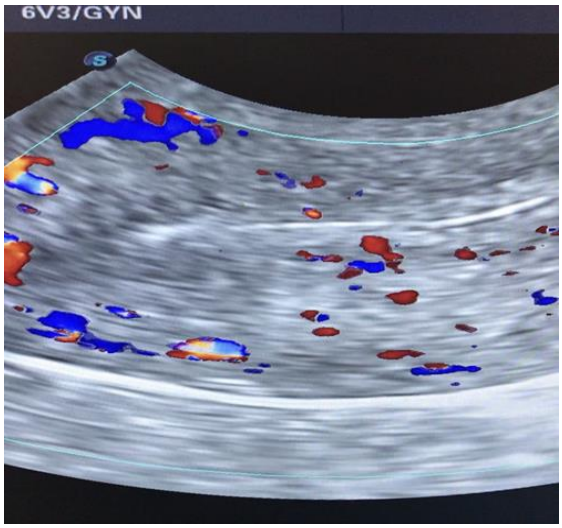

Figure 7: Grade 3 Applebaum with flow into the endometrial stripes.

Then when the leading follicle reached c20 mm HCG choriomon 10000 unit given IM to trigger ovulation. Luteal phase support with progesterone like duphaston (Abott)given twice daily from day of ovulation for 14 days then quantitative HCG done with urine test to detect pregnancy then cases followed up two weeks later to document clinical pregnancy and sometime at 5 weeks after one week only we can detect sac by ultrasound.

Statistical analysis

Data were statistically described in terms of mean ± standard deviation (± SD), median and range, or frequencies (number of cases) and percentages. Exact fisher t test was used when the expected frequency was less than 5. Proportions were compared by χ^2 test. $P < 0.05$ was considered statistically significant. All statistical calculations were done using computer program SPSS (Statistical Package for the Social Science; release 11.5; SPSS, Inc., Chicago, IL). Kelsey formula:

$$n_{cases-Kelsey} = \frac{\left(z_{\alpha/2} + z_{1-\beta}\right)^2 * p * (1-p) * (r+1)}{r * (p_0 - p_1)^2}$$

Where, α -The probability of type I error, β-The probability of type II error (1 - power of the test), P_0 -The proportion for cases, P_1 -The proportion for controls, OR The calculated odds ratio, r-The ratio of case-control (1 case/r controls).

RESULTS

Regarding the chemical pregnancy when HCG become more than 25 there were 40 out of 50 chemically pregnant in comparison to 25 out of 50 in the second arm with score less than 6 and a p value of 0.001 and a statistically significant difference.

Table 2: Demographic data.

	Group 1	Group 2	P value
Age			
Mean	29.3	29.7	
SD	3.3	2.6	0.5
Variance	11.4	6.7	
BMI			
Mean	26.7	26.5	0.8
SD	4.1	3.3	
Duration of infertility			
Mean	3.8	3.7	0.9
SD	1.6	1.3	

Regarding the clinical pregnancy rate there were 35 cases with proved gestational sacs by ultrasound out of 50 in group one with score more than 6 compared to 18 cases out of 50 in the second group and p value of 0.0007 which was a high statistically significant difference.

Table 3: Outcome measures.

	Score over 6 (50)	Score below 6 (50)	P value
Chemical pregnancy	40	25	0.001
Clinical pregnancy	35	18	0.0007
Miscarriage rate	1	5	0.006

Regarding miscarriage rate there were one 1 cases out of 35 in group one compared to 5 aborted cases out of 18 in group 2 with p value of 0.006 and a high statistically significant difference.

So, the score is highly predicting ovulation and pregnancy rate if the score is more or less than 6.

DISCUSSION

Polycystic ovarian disease is a spectrum from mild cases of anovulation to the more sophisticated metabolic syndrome with morbid obesity insulin resistance and hyperglycemia.[10-12]

There are many different phenotypes of polycystic ovarian disease categorized according to three parameter which are the androgen excess, oligoanovulation with oligoamenorrhea, and the polycystic ovarian morphology by ultrasound.

Infertility imposes a financial and psychological load on patients, and one of the main factors of female infertility is polycystic ovarian disease.[13]

Polycystic ovarian diseases can affect from 6 to 10 percent of population worldwide.[14-15]

The presented work compare between two groups of confirmed PCOS patient in relation to ultrasonic score composed of 6 parameters three for uterus and three for the ovary

Cases recruited from those attending at Zinat Alhyat hospital in Benha Egypt from June 2021 to December 2022 and then induction of ovulation done with fixed protocol consisted of femara 2.5 mg twice daily from the second day of the cycle with addition of Fostimone ampoules purified FSH taken IM at days 3, 5 and 7 of the cycle then ovulation monitored by ultrasound sonoscape p25 and a score made from 6 items to be correlated with pregnancy rate and ovulation rate.

Score taken at day 2 then the most important was summation of the score when the leading follicle reached 18-20 mm or when we reached day 14 of the menstrual cycle.

The score included trilaminar endometrium, endometrial thickness between 7-14 mm, endometrial flow into the endometrial stripe, ovarian cortex length /ovarian stromal length ratio, perifollicular ring of fire more than ¾ of circumference of dominant follicle, and stromal resistive index of flow to be less than 0.5 and each item given number 2 if good and 0 if abnormal. Score calculated when the dominant follicle reached 18 mm or when we reached the14th day of the cycle.

Cases divided then into two groups according to the summated score group one with score more than 6 and group two with score less than 6. Then after induction of ovulation luteal phase supported by progesterone and after ovulation groups tested with urine pregnancy test then confirm by quantitative HCG

Regarding the chemical pregnancy when HCG become more than 25 there were 40 out of 50 chemically pregnant in comparison to 25 out of 50 in the second arm with score less than 6 and a p value of 0.001 and a statistically significant difference. Regarding the clinical pregnancy rate there were 35 cases with proved gestational sacs by ultrasound out of 50 in group one with score more than 6 compared to 18 cases out of 50 in the second group and p value of 0.0007 which was a high statistically significant difference. Regarding miscarriage rate there were one 1 cases out of 35 in group one compared to 5 aborted cases out of 18 in group 2 with p value of 0.006 and a high statistically significant difference. So, the score is highly predicting ovulation and pregnancy rate if the score is more or less than 6.

The most important about the presented work was it summated 6 parameters three of them endometrial and three of them ovarian so it was highly correlated with clinical pregnancy rate so it gives a good prediction and hope.

Lakhani et al studied the arterial RI derived from the spectrum of ovarian stroma and uterine arteries on each side of PCO cases. The findings showed no significant difference in the statistical scale.[16]

Several studies tested Applebaum uterine vascular flow pattern to predict endometrial receptivity in IVF before embryo transfer and found a significant association of good Applebaum, score and implantation with clinical pregnancy rate higher in group.[17]

CONCLUSION

A new composite ovarian and endometrial score in cases with polycystic ovarian disease has a good prognostic and redictive value for the clinical pregnancy rate and ovulation rate the sonographic score includes cortical/stromal length, stromal resistive index, peri-follicular ring of fire, tri-laminar endometrium, endometrial thickness and applebaum grade 3 endometrial flow.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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