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Original Research Article

Ultrasonic Indicators for Good Ovarian Response in Patients with Infertile Poly Cystic Ovarian Disease

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Abstract:

Background and Aim: Polycystic ovaries are a prevalent hormonal disorder affecting ovulation. The study introduced an ultrasonographic scoring system that can predict the likelihood of pregnancy in individuals with PCO. Various strategies have been employed to improve ovulation in individuals with polycystic ovary syndrome (PCOS), including the use of ovulation induction and/or intracytoplasmic sperm injection (ICSI) as a viable treatment. Ultrasound plays a crucial role in the assessment and surveillance of patients with infertility.

Material and Methods: This study was a prospective observational study that compared two distinct scores of ovulation tracked by ultrasound in women with polycystic ovary syndrome (PCOS). A total of 160 cases of PCO were separated into two groups of similar size. This study was carried out at the Department of Obstetrics and Gynaecology in a prestigious teaching institute in India for a period of one year. A total of 160 participants were divided into two groups and induced for ovulation using a minimal stimulation protocol. After the induction of ovulation in patients with known polycystic ovary syndrome (PCOS), six different ultrasonic parameters were calculated. Group one had a collective ultrasound score greater than 6, while group two had an ultrasound marker score of less than 6.

Results: The demographic statistics of both groups were similar and there was no statistically significant difference. The p-value is greater than 0.05. In relation to chemical pregnancy, there were 65 out of 80 individuals who had an HCG level greater than 25, compared to 40 out of 80 individuals in the second group with a score less than 6. This difference was statistically significant.

Conclusion: The development of a novel composite ovarian and endometrial score for individuals with polycystic ovarian disease demonstrates a favourable prognostic and predictive capacity for determining the clinical pregnancy rate and ovulation rate. The sonographic score comprises measurements of cortical/stromal length, stromal resistive index, presence of a perifollicular ring of fire, tri-laminar endometrium, endometrial thickness, and applebaum grade 3 endometrial flow.

Key Words: Endometrium, Infertility, Polycystic ovary syndrome, Ultrasound

Introduction

Infertility is a significant issue that places a financial and psychological strain on patients; polycystic ovarian disease is one of the most prevalent causes of infertility in women. [1]. PCOS, or polycystic ovary syndrome, is the most prevalent endocrine disorder. 6% of women of reproductive age may be affected by it, per the diagnostic criteria of the National Institutes of Health (NIH), and 8–13% of these women may be affected, per the Rotterdam criteria. [2] .Potential polycystic ovaries on ultrasound, hyperandrogenism, and chronic anovulation are distinctive features of this heterogeneous disorder. PCOS is diagnosed exclusively on the basis of androgen excess and the presence of oligo-anovulation in accordance with NIH criteria, once all alternative causes of anovulatory infertility have been ruled out. [3,4]

Treatment is crucial in order to prevent the development of endometrial hyperplasia and subsequent endometrial carcinoma, which are severe complications that may arise from polycystic ovarian disease complicated by protracted amenorrhea. [5,6] Type A is distinguished by an excess of androgen, anovulation, and polycystic ovarian morphology; type B is characterized solely by anovulation; type C is distinguished by an excess of androgen and polycystic ovarian morphology; and type D is distinguished by anovulation and polycystic ovarian morphology. [5,6] The majority of types fall under category D, and all types have the potential to result in prolonged infertility. Metabolic syndrome, which includes pathological obesity, hyperlipidemia, hyperglycemia, and insulin

resistance, may develop into or be induced by polycystic ovarian disease. [7]

The Rotterdam consensus criteria established in 2004 utilized ultrasonographic evidence to diagnose polycystic ovarian syndrome (PCOS). PCOM was defined as the presence of ≥12 follicles per ovary (FNPO), with a mean diameter of 2–9 mm (for both ovaries), in addition to an increased ovarian volume (OV) of ≥10 mL. [8]

For the diagnosis of PCOM, the 2018 ESHRE PCOS guideline committee recommended a threshold of >20 FNPO with or without an OV ≥ 10 mL in either ovary when employing transvaginal ultrasound transducers with an 8 MHz frequency bandwidth.[5] It is noteworthy to mention that the diagnosis of PCOM remains unchanged at an OV of 10 mL or higher, despite significant advancements in imaging techniques. [6] Despite this, FNPO remains the preferred method for diagnosing PCOS over OV due to its superior predictive capability and reduced variability. [9] Conversely, intra-observer and inter-observer reliability were greater for OV assessment than for FNPO and follicle number per section. [10] Consequently, OV remains a prospective diagnostic instrument for the detection of PCOS. The relationship between OV and PCOS, obesity, insulin resistance, androgen activity, metabolic syndrome, and AMH levels in PCOS patients has been the subject of numerous studies. [11-15]

Despite the numerous attempts to induce ovulation in PCOS, induction of ovulation or ICSI remains a viable solution. Ultrasound plays a critical role in the assessment and surveillance of infertile patients.

Material and Methods

This prospective observational study compared two distinct ovulation scores as detected by ultrasound in patients with PCOD. 160 PCO cases in total were divided into two equal categories. The present investigation was carried out for a period of one year at the Tertiary Care Teaching Institute of India, Department of Obstetrics and Gynaecology.

Inclusion criteria were clinical oligomenorrhea (OA) and radiological polycystic ovarian morphology (POM) of polycystic ovaries in patients aged 20-35 who presented with infertility and sought medical attention for the first time.

A list of exclusion criteria Exclusion criteria for this study included patients diagnosed with adrenal hyperplasia, hypothyroidism, cushing, male factor, tubal block, or submucous myoma.

Group one consists of participants with a composite sonographic ovarian and endometrial score exceeding 6, while Group Two comprises participants with a composite sonographic ovarian and endometrial score falling below 6.

Individuals who are diagnosed with polycystic ovary morphology and exhibit clinical anovulation accompanied by oligomenorrhea or anovulatory amenorrhea. The duration of infertility was documented in the comprehensive present and menstrual history of every patient.

Examination

Standard vital indicators waist-to-hip ratio, body mass index, and the presence of acanthosis nigricans on the epidermis. Local and abdominal examination in order to rule out alternative causes of infertility.

Investigations

The subsequent biomarkers were assessed in this investigation: AMH, FSH, LH, E2, T3, T4, TSH, prolactin, 17-hydroxyprogesterone, vitamin D, S calcium, and HBA1C.

The intervention was comprised of two stages. In the first stage, ovulation induction, 2.5 mg of letrozole femara was administered to all cases starting on day 2 of the menstrual cycle for a duration of 5 days. Subsequently, 75 units of FSH ampoules called fostimone highly purified FSH were added on days 3, 5, and 7 of the cycle. At that point, ovulation is monitored ultrasonically until at least one follicle reaches a diameter of 18-20 mm. Sonoscape P25 China conducts an ultrasonic evaluation of the six parameters in the second phase.

Perform a comprehensive ultrasonic evaluation of the following: 1) Endometrial thickness, if between 7 and 14, is assigned a score of 2, if not provided; 2) Endometrial blood flow using Doppler to identify the zone of blood flow within the endometrial stripe, is assigned a score of 2; 3) Trilaminar endometrium, is assigned a score of 2; 4) Perifollicular Doppler reveals a ring of fire exceeding 3/4 of the circumference; 5) Ovarian stromal flow resistive index below 0.5; and 6) The ovarian cortical length divided by ovarian stromal length is also assigned a score of 3.

The dominant follicle was then injected intramuscularly with 10,000 units of HCG choriomonomonal in order to induce ovulation. Luteal phase support with progesterone such as duphaston (Abott) administered twice daily for fourteen days beginning on the day of ovulation, followed by quantitative HCG detection via urine test to establish pregnancy, case follow-up two weeks later to document clinical pregnancy, and occasionally sac detection by ultrasound at five weeks after one week.

Statistical analysis

Following the compilation and entry of the recorded data into a spreadsheet application (Microsoft Excel 2007), the information was exported to the data editor tab of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). The levels of significance and

confidence were established at 5% and 95%, respectively, for every test. On the basis of their distribution, quantitative variables were described as means and standard deviations or median and interquartile range. The presentation of qualitative variables consisted of counts and percentages.

Results

Comparable demographic information distinguished the two groups; the difference was insignificant. ($p>0.05$) In the first arm, 65 out of 80 participants were chemically pregnant when HCG levels exceeded 25, whereas in the second arm, only 40 out of 80 participants achieved pregnancy with a score below 6. This difference in pregnancy rates was found to be statistically significant. (Table 2)

In terms of the clinical pregnancy rate, of the eighty cases in group one that underwent ultrasound to confirm the presence of gestational sacs, sixty had scores greater than six. In contrast, the second group had only thirty-two cases with scores above six; the difference was statistically significant at a p value of 0.001. (Table 2)

Discussion

Previous research on the ovarian responsiveness to CC in patients with polycystic ovary syndrome (PCOS) has observed that anovulatory women who do not respond to CC treatment tend to be more obese than CC responders. This finding may indicate that obesity contributes to an increase in CC resistance. Insulin levels in nonresponders tended to be relatively elevated. [16-18]

The phenotypes of polycystic ovarian disease are diverse and can be classified based on three parameters: an excess of androgen, oligoanovulation accompanied by oligoamenorrhea, and the morphology of the polycystic ovary as determined by ultrasound. Patients are burdened financially and psychologically by infertility, and polycystic ovarian disease is a leading cause of infertility in women. Varieties of polycystic ovary syndrome can impact between 6 and 10 percent of the global population. [19-21]

The current study employed a fixed protocol for inducing ovulation, which included the administration of femara 2.5 mg twice daily beginning on the second day of the cycle. Fostimone ampoules containing purified FSH were added intramuscularly on days 3, 5, and 7. Ovulation was then monitored using an ultrasound sonoscape p25 and a score composed of six items that were correlated with both pregnancy rate and ovulation rate.

The most significant score was the aggregate of the scores obtained on day 14 of the menstrual cycle, or when the leading follicle measured 18–20 mm. The score was initially recorded on day 2. The criteria for evaluation were as follows: trilaminar endometrium, endometrial thickness ranging from 7 to 14 mm, endometrial flow into the endometrial stripe, ovarian cortex length to ovarian stromal length ratio, perifollicular ring of fire exceeding one-half of the circumference of the dominant follicle, and stromal resistive index of flow below 0.5. Each of these factors was assigned a value of two, indicating normal condition, and zero for abnormality. When the dominant follicle measured 18 mm or the fourteenth day of the cycle arrived, the score was computed. Prior research has documented that women with polycystic ovary syndrome (PCOS) have a greater average OV than the general population. [22-24] An increase in the OV was the result of thecal cell hyperplasia and hypertrophy, stromal hyperplasia and hypertrophy, and cortical thickening, all of which were observed in varying degrees on the ovaries of PCOS patients. [25,26] Multiple studies, in accordance with the Rotterdam consensus, have proposed a reduced threshold for ovarian volume, varying between 6.4 and 7.5 mL, in order to enhance the precision of the polycystic ovary diagnosis.

The cases were subsequently divided into two categories based on the summated scores: group one, consisting of cases with scores exceeding 6, and group two, comprising cases with scores falling below 6. Then, following progesterone-stimulated luteal phase subsequent to ovulation, the groups underwent urine pregnancy testing to confirm pregnancy, followed by quantitative HCG analysis. In the second arm, forty out of fifty individuals were chemically pregnant when HCG levels exceeded twenty-five, compared to only twenty-five out of fifty in the first arm (with a p-value of 0.001, indicating a statistically significant difference and a score below six). In regard to the clinical pregnancy rate, 35 out of 50 cases in group one had confirmed gestational sacs by ultrasound, with a score greater than 6, whereas in group two, there were 18 cases out of 50 with such confirmations; the difference was highly statistically significant ($p = 0.0007$). Parisi et al. [27] identify the ultrasound observation of bilaterally enlarged ovaries exhibiting a rounded morphology as a diagnostic criterion for peos. The most significant diagnostic criterion for peos in the United States, according to Yeh et al [28] was the presence of multiple (>5) small follicular cysts (0.5 to 0.8 cm) in each ovary. The reported range for the minimum number of follicles required to establish a diagnosis is "at least 15" and "more than 5." Nonetheless, typical ovarian volume was reported by 30% of patients with peos, according to a number of researchers. [19-21] Pache et al. [29] stated that none of the US parameters could be used individually as a singular reference to differentiate between normal women and patients with peos due to substantial overlap in ovarian volume, follicular number, and size between the two groups.

Importantly, the work presented a summary of six parameters, three of which were endometrial and three of which were ovarian. This summarization was highly correlated with the clinical pregnancy rate, providing optimism and a reliable prediction. The arterial RI derived from the spectrum of ovarian stroma and uterine arteries on both sides of PCO cases was investigated by Lakhani et al. There were no statistically significant differences in the results. [30] Several studies that utilised Applebaum uterine vascular flow pattern to predict endometrial receptivity in in vitro fertilisation (IVF) prior to embryo transfer discovered a significant correlation between a high Applebaum score, successful implantation, and a higher clinical pregnancy rate in the group that obtained favourable results. [5,8,31]

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The data did not represent the general population because the study population consisted of women from infertile couples and was conducted at a solitary centre. Thus, it is necessary to evaluate our conclusions in consideration of these constraints.

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, perifollicular ring of fire, tri-laminar endometrium, endometrial thickness and applebaum grade 3 endometrial flow. Further prospective studies with agematched controls are needed for more definitive conclusions.

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