

Ovarian Volume by Transvaginal Sonography in the Prediction of Ovarian Response to Ovulation Induction



Medical Science

KEYWORDS : Volume of smaller ovary, total ovarian volume, clomiphene citrate, transvaginal sonography, number of follicles.

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ABSTRACT

• **Background:** The objective of the study was to examine co-relation between pre-induction ovarian volume measurement by transvaginal ultrasound and ovarian response in terms of number of follicles, size of follicles and endometrial response. The relationship of ovarian volume to women's age was also studied.

• **Methods:** 50 cases were randomly selected. On 3rd day of menstrual cycle, transvaginal ultrasonographic evaluation was done and ovarian volume calculated using ellipsoid formula. Ovulation was induced using clomiphene citrate from day 3 to day 7 of cycle. Post induction ovarian response was measured using number of follicles, size of follicles and endometrial thickness(m.m) using follow up scan on 12th day and scan was repeated on 14th day if adequate response was not seen.

• **Results:** The maximum mean volume of smaller ovary and mean total ovarian volume of 5.1+/- 2.3 and 10.7+/- 4.9 respectively was seen in patients < 30 years. As TOV increased, the mean number of follicles increased significantly. As volume of smaller ovary and TOV increased, the number of patients with endometrial thickness>8 mm also increased.

• **Conclusion:** As age increased volume of smaller ovary and total ovarian volume decreased. Ovarian volume correlates well with post induction parameters like number of follicles and endometrial thickness.

INTRODUCTION :

Assisted Reproduction Technology (ART) procedures are time consuming, expensive and require effort from both clinician and patient's side. It would be clinically and economically helpful if there were easy methods for prior assessment of likelihood of an adequate ovarian response. This study is done with the intention of assessing the role of ovarian volume measurement as a predictor of ovarian response to ovulation induction. It has been stated in some studies that some women with small ovarian size on ultrasound demonstrate poor response to ovulation induction. Ovarian volume measurement by transvaginal ultrasound is quick, cost effective and minimally invasive and therefore can be used as easy predictor for counselling couples regarding potential success to be expected by pursuing ovulation induction procedures

MATERIALS AND METHODS :

50 infertile patients from teaching hospital attached to J.J.M.M.C namely Chigateri Government Hospital, Bapuji Hospital and Women and Children Hospital, Davangere were selected. A prospective randomized study was undertaken.

Inclusion criteria :

- Patients presenting with primary and secondary infertility
- Patients undergoing cycle of ovulation induction
- Patients with both ovaries well visualized on transvaginal sonography.

Exclusion criteria :

- Patients with -
- History of partial/complete resection of ovary.
 - Ovarian cysts > 8mm in diameter.
 - Appearance of polycystic ovaries i.e. 10 follicles of < 9mm with hyperechogenic stroma.

PROCEDURE OF STUDY :

Patients satisfying the criteria are divided into 3 groups based on age.

- Group I : Age < 30 years
Group II : Age 31-35 years
Group III : Age > 36 years

Thorough history, examination and investigations are undertaken.

On 3rd day of menstrual cycle, transvaginal ultrasonographic evaluation is done with 5-7.5 MHz curvilinear intravaginal transducer and ovarian volume calculated using ellipsoid formula which is $0.523 \times D_1 \times D_2 \times D_3$ where.

D_1 = maximum transverse diameter

D_2 = maximum anteroposterior diameter.

D_3 = maximum longitudinal diameter

Ovulation was induced using clomiphene citrate from day 3 to day 7 of cycle. Post induction ovarian response was measured using number of follicles, size of follicles and endometrial thickness(m.m) using follow up scan on 12th day and scan was repeated on 14th day if adequate response was not seen.

Statistical analysis

Correlation analysis was performed to assess relationship between ovarian volume and other parameters like women's age, number of follicles, size of follicles and endometrial thickness.

RESULTS :

Present study group patients ranged from 18 to 40 years. Maximum cases were in age group of < 30 years. 66% of patients had volume of smaller ovary of 3 - 9 cm³.

In this study it was found that as maternal age was increasing, mean volume of smaller ovary was decreasing and this was found to be statistically significant. It is seen here that as age increased mean total ovarian volume decreased with largest mean total ovarian volume of 10.7+/- 4.9 was seen in age group of < 30 years.

As volume of smaller ovary increased, mean number of follicles increased from 1.6 +/-0.5 to 4 +/-1. but this relationship was not statistically significant. As total ovarian volume increased, number of follicles in response to induction increased from 2.4+/- 1 to 4.5+/-0.7. This relationship was statistically significant.

In this study there was no relationship between ovarian volume and mean endometrial thickness.

As ovarian volume increased, size of follicle > 18 mm increased but the relationship was not statistically significant.

TABLE - 1 : relationship of ovarian volume to maternal age

Age	No. Of subjects	Mean volume of smaller ovary(cm ³)	Mean total ovarian volume(cm ³)
<30	28	5.1+/-2.3	10.7+/-4.9
31-35	18	3.1+/-0.5	6.7+/-1.2
36-40	4	2.8+/-0.2	5.8+/-0.3
	ANOVA	F= 7.97	F=7.63
	p- value	P<0.05, s	P<0.05, s

TABLE - 2 : relationship of volume of smaller ovary and ovarian response(no. of follicles and endometrial thickness)

Volume of smaller ovary(cm ³)	No. Of subjects	no.of follicles (mean+/-SD)	Endometrial thickness(mean+/-SD)
<3	14	1.6+/-0.5	9.0+/-1.3
3-9	33	3.2+/-0.8	9.8+/-1.5
>9	3	4.0+/-1.0	7.0+/-0.4
	ANOVA	F=27.2	F=6.5
	P value	P<0.05, s	P<0.05, s

TABLE - 3: relationship of total ovarian volume and ovarian response (no. Of follicles and endometrial thickness)

Total ovarian volume (cm ³)	No. Of subjects	no.of follicles (mean+/-SD)	Endometrial thickness(mean+/-SD)
<8.6	31	2.4+/-1.0	9.5+/-1.5
8.6-22.2	17	3.4+/-0.6	9.6+/-1.5
>22.2	2	4.5+/-0.7	7.1+/-0.4
	ANOVA	F=12.0	F=2.5
	P value	P<0.05, s	P=0.09, ns

DISCUSSION :

The present study was planned to examine co-relation between pre-induction ovarian volume measurement by transvaginal ultrasound and ovarian response in terms of number of follicles, size of follicles and endometrial response and also to study the relationship of ovarian volume to women's age.

In the present study, 66% of patients had volume of smaller ovary of 3-9 cm³. In the study by Pai MV et al 46% of patients had volume of smaller ovary of <3 cm³ and 48% of patients had volume of smaller ovary between 3 and 9 cm³.¹

In the present study and study by Pai MV et al it was seen that as maternal age was increasing , mean volume of smaller ovary was decreasing. This trend was found to be statistically significant in our study but not significant in the study by Pai MV et al. As part of Kentucky university screening programme, 13963 women were studied and a statistically significant decrease in ovarian volume was seen with each decade of life from 30 to 70 years . Mean ovarian volume was 6.6 ml in women <30 years , 6.1 l 30-39 years, 4.8 in 40-49 years , 2.6 in 50- 59 years and 2.1 in 60-69years .²

In our study, it was seen that patients with volume of smaller ovary>3 cm³ showed better response in the form of number of follicles. This was found to be statistically significant. This is even seen in the study by Pai MV et al as 61.1% and 75% of patients in 3-9 cm³ and>9 cm³ volume produced more than 3 follicles but only 40% of patients with volume of smaller ovary <3 cm³ had shown response in the form of more than 3 follicles.

In the study by Lass A , patients with ovaries< 3 cm³ had 10.3 mean number of follicles and patients with ovarian volume >3cm³ produced 14.5 mean number of follicles .³ In the study by , Frataerelli JL, Levi AJ et al, mean ovarian volume of <2 cm³ was associated with decreased number of follicles.⁴ This is seen because ovarian volume is a marker of ovarian reserve. Patients with larger ovaries have more number of antral follicles and therefore respond to stimulation and produce more number of antral follicles after ovulation induction. In study of Syrop CH, Dawson JD , smaller ovarian volume showed retrieval of fewer mature oocytes implying less number of follicles and less follicles had size >18 mm. ⁵

In this study and many other studies as there is good co relation between ovarian volume and ovarian response to induction, ovarian volume measurement should be an integral part of infertility evaluation.

CONCLUSION :

Our study concludes that ovarian volume correlates with age of patient and as age of patient increases TOV and volume of smaller ovary decreases. Ovarian volume is a good predictor of ovarian reserve as it correlates well with post induction parameters like number of follicles and endometrial response. TVS is a quick, cost effective and minimally invasive method to measure ovarian volume and to counsel couples regarding potential success to be expected by pursuing ovulation induction procedures.

REFERENCE

1. Pai MV, Shanta Kumari S, Pratap Kumar. Ovarian volume by transvaginal sonography in the prediction of ovarian response to induction of ovulation. J Obstet. Gynaecol India 2002 Jan/Feb;52(1):108-11. | 2. Pavlik E, DePriest PD, Gellion HH, Veland FR, Reedy MB, Kryscio RJ et al. | 3. Lass A, Skull J, McVeigh E, Margarat R, Winston RML et al . Measurement of ovarian Ovarian volume related to age. Gynecol oncol 2000 ;77 :410-2.volume by transvaginal sonography before ovulation induction with human menopausal gonadotrophin for invitro fertilization can predict poor response . Human Reproduction 1997;12(2):294-7. | 4. Frataerelli JL, Levi AJ, Miller BT, Segar JH. Prognostic use of mean ovarian volume in in-vitro fertilization cycles : a prospective assessment. Fertil Steril 2004 Oct;82(4):811-5. | 5. Dawson JD, Syrop CH, Husman KJ, Sparks AEJ, Van Voorhis BJ. Ovarian volume may predict assisted reproductive outcomes better than FSH concentration on day 3. Human Reproduction 1999 July;14(7):1752-6 . | 6. Syrop CH, Willhoite A, Van Voorhis BJ. Ovarian volume : a novel outcome predictor | 7. Kupescic S, Kurjak A, Bjeilos D, Vujisic S. Three dimensional ultrasonographic ovarian measurements and in vitro fertilization outcome are related to age. Fertil Steril 2002 Jan;79(1):190-7. |