



COMPARATIVE STUDY OF COLOUR DOPPLER CHANGES IN CORPUS LUTEUM IN NORMAL PREGNANCY VERSUS THREATENED ABORTION

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ABSTRACT **Background** :Corpus luteum is a dynamic endocrine gland in ovary that plays an important role in regulation of menstrual changes in menstrual cycle and early pregnancy .The corpus luteum secretes the female hormone progesterone Adequate blood flow provides luteal cells with large amount of cholesterol which is needed for the synthesis of progesterone. Progesterone causes decidual changes in endometrium for successful implantation.Hence, there is a strong correlation between abnormal function of corpus luteum and abnormal pregnancy outcome. **Methods**: This study was conducted in women attending OPD/ANC with singleton pregnancy at 6-10 weeks at SMS Medical College, Jaipur. All eligible pregnant females were divided into two groups on the basis of sampling procedure i.e Group 'A' with no clinical features of threatened abortion and Group 'B' with clinical features of threatened abortion. Colour doppler sonography was done to measure certain parameters of corpus luteum of pregnancy such as size, site, morphological type, growth rate and resistance index in both the groups. Repeat colour doppler sonography was done after 1 week to find out change in these parameters. Follow up scan was done at 12 weeks to determine the outcome of pregnancy. Changes in the colour doppler sonography findings of corpus luteum were used to draw inference regarding outcome of pregnancy. **Results**: Colour Doppler parameters of corpus luteum, specifically Resistance Index and size were significantly higher in patients of threatened abortion as compared to the control group. **Conclusion**: This study found that colour Doppler parameters of corpus luteum, specifically Resistance Index can be used to predict the outcome of pregnancy in women with threatened abortion.

KEYWORDS : corpus luteum, threatened abortion, resistance index, colour doppler

INTRODUCTION

Corpus luteum is a dynamic endocrine gland in ovary that plays an important role in regulation of menstrual changes in menstrual cycle and early pregnancy. It originates from theca and granulosa cells after ovulation¹. Extrusion of ovum is followed by collapse of follicular cavity and subsequent haemorrhage into space².

Over next 2-4 days, neovascularisation occurs in the wall of corpus luteum³. The vascularity is seen as a circumferential rim around the corpus luteum. Maturation of corpus luteum takes place as blood is gradually resorbed from within the cavity. If conception occurs, the corpus luteum enlarges further, otherwise it regresses and shrinks³.

The corpus luteum secretes the female hormone progesterone. If the egg is not fertilised, the corpus luteum stops secreting the progesterone about 9 days after ovulation. If the egg becomes fertilised, progesterone continues to be secreted, first by corpus luteum [upto 8 weeks] and then by placenta until delivery.Adequate blood flow provides luteal cells with large amount of cholesterol which is needed for the synthesis of progesterone⁴. Progesterone causes decidual changes in endometrium for successful implantation. It reduces muscle excitability by increasing calcium binding, thereby reducing intracellular calcium. It also stabilises lysosomal membrane and inhibit prostaglandin synthesis. Hence, its inhibitory effect over uterine myometrium keeps the myometrium quiescent during pregnancy. Progesterone along with B-HCG and cortisol protects the conceptus from T lymphocyte mediated tissue rejection⁵.

Hence, there is a strong correlation between abnormal function of corpus luteum and abnormal pregnancy outcome⁶.

The first trimester of pregnancy is a dynamic period that spans ovulation, fertilisation, implantation and organogenesis. Vaginal bleeding in early pregnancy represents a definite threat to the developing embryo and constitutes a source of anxiety to both the patient and obstetrician⁶.

Vaginal bleeding during 1st trimester occurs in 16-25% of all pregnant women^{7,8}. Threatened abortion is clinical entity where the process of miscarriage has started but has not progressed to a state from which recovery is not possible.

Clinical presentation- bleeding per vagina- usually slight and bright red, stops spontaneously and pain abdomen.

On examination— Per vaginam- uterus soft and corresponds to period

of gestation. Internal os is closed. Definitive diagnosis should be made by USG, confirming the presence of cardiac activity in intrauterine pregnancy⁹.

Evaluation of normal patients as well as those presenting with features of threatened abortion with colour doppler examination of blood flow velocity waveforms[specifically Resistance Index] and other growth parameters of corpus luteum was done. Changes in both the groups were related to pregnancy outcome.

Therefore, the present study aims to assess the role of colour doppler sonography changes in corpus luteum to predict the outcome of pregnancy in women with threatened abortion.

METHODS

A Hospital based observational study titled “ Comparative Study of Colour Doppler Changes In Corpus Luteum In Normal Pregnancy Verses Threatened Abortion In The Department Of Obstetrics And Gynaecology, SMS Medical College, Jaipur” was conducted in women attending OPD/ANC with singleton pregnancy at 6-10 weeks at SMS Medical College, Jaipur. All eligible pregnant females fulfilling inclusion criteria were explained about the purpose of study. After taking complete history, general physical examination was done. Women were divided into two groups on the basis of sampling procedure i.e Group 'A' with no clinical features of threatened abortion and Group 'B' with clinical features of threatened abortion such as pain abdomen and bleeding per vagina with closed cervical os. Apart from routine ANC investigations, Colour doppler sonography was done to measure certain parameters of corpus luteum of pregnancy such as size, site, morphological type, growth rate and resistance index in both the groups. Repeat colour doppler sonography was done after 1 week to find out change in these parameters. Follow up scan was done at 12 weeks to determine the outcome of pregnancy. Change in the colour doppler sonography findings of corpus luteum were used to draw inference regarding outcome of pregnancy

STATISTICAL ANALYSIS Continuous variables were summarized as Mean and Standard Deviation, whereas nominal / categorical variables as proportion (%). Unpaired 't' test and parametric test were used for analysis of continuous variables while chi-square test / Fischer exact test and other non- parametric test were used for nominal / categorical variables. p-value<0.05 was taken as significant.

RESULTS

Demographic profile including age of the patient, religion, socio

economic status, education, gestational age, parity were comparable in both groups and no significant difference was found.

TABLE -1
Size of corpus luteum in cases and controls

Size (in mm)	Cases		Controls		P-value
	Mean	SD	Mean	SD	
1st visit	22.52	1.75	20.54	1.61	<0.001
2nd Visit	23.23	1.76	20.93	1.61	<0.001

The mean size of corpus luteum in cases at 1st visit was 22.52 mm and at 2nd visit was 23.23 mm. Similarly, mean size of corpus luteum in controls at 1st visit was 20.54 mm and at 2nd visit was 20.93 mm. Statistically there was significant difference in mean size of corpus luteum of cases and controls at 1st and 2nd visit with p-value<0.001

TABLE- 2 Distribution of cases and controls according to Site of Corpus Luteum

Site of Corpus Luteum	Cases		Controls		P-value
	N	%	N	%	
Left	31	38.75	41	51.25	0.112
Right	49	61.25	39	48.75	

In cases 61.25% has corpus luteum on right side and 38.75% has on left side. Similarly, in controls 51.25% has corpus luteum on right side and 48.75% has on left side. Statistically there was no significant difference in site of corpus luteum in cases and controls with p-value=0.112

TABLE- 3 Distribution of cases and controls according to Morphological Type of Corpus Luteum

Morphological	Cases		Controls		P-value
	N	%	N	%	
Type of Corpus Luteum					
Complex	36	45	14	17.5	0.007
Thick wall	24	30	43	53.75	
Hypoechoic	12	15	11	13.75	
Simple	8	10	12	15	

In cases majority had complex type (45%) of corpus luteum followed by thick walled (30%) corpus luteum, 15% had Hypoechoic corpus luteum and 10% had simple corpus luteum. Similarly, in controls majority had thick walled (53.75%) corpus luteum followed by complex corpus luteum (17.5%), 15% had simple and 13.75% had hypoechoic corpus luteum. Statistically, there was significant difference in morphology of corpus luteum in cases and controls (P-value=0.007)

TABLE- 4 Distribution of cases and controls according to resistance index of Corpus Luteums

RI	Cases		Controls		P-value
	Mean	SD	Mean	SD	
1st visit	0.52	0.03	0.47	0.02	<0.001
2nd Visit	0.61	0.05	0.53	0.03	<0.001

The mean Resistance index in cases at 1st visit is 0.52 and at 2nd visit was 0.61. Similarly, mean Resistance index in controls at 1st visit was 0.47 and at 2nd visit was 0.53. Statistically there was significant difference in mean Resistance index of cases and controls at 1st and 2nd visit with p-value<0.001

TABLE-5 Distribution of cases and controls according to outcome

Outcome of Pregnancy at 12 Weeks	Cases		Controls		P-value
	N	%	N	%	
Abort	41	51.25	10	12.5	<0.001
Cont.	39	48.75	70	87.5	

There was statistically significant difference in outcome among cases and controls (P-value<0.001) with highest abortion (51.25%) in cases

DISCUSSION

The primary function of the corpus luteum in pregnancy is the production of progesterone, which helps to sustain early pregnancy until the placenta takes over. The placenta starts functioning at 7 to

8 weeks of gestation. Subsequently, the corpus luteum decreases in size between 8 to 16 weeks⁶⁴.

Spontaneous abortions are serious life events for both family and society. The frequency of early spontaneous abortions is estimated to be 10–15% of clinically recognized pregnancies and as many as 30% of clinically unrecognized pregnancies. Although chromosomal abnormalities of the fetus or increasing maternal age are the major risk factors of early spontaneous abortions, it is not uncommon to attribute such adverse event to the CL insufficiency in clinic. At present, the prognosis of intrauterine pregnancy mostly depends on the clinical symptoms such as vaginal bleeding and abdominal pain and low level of hCG or progesterone, which have poor specificity and sensitivity. It is well-known that the CL continues to grow under the stimulation of hCG after fertilization and is the only source to produce progesterone to maintain pregnancy before the formation of placenta. Therefore, the normal function of CL is vital for pregnancy. In early pregnancy, the ovary can be induced to sprout new blood vessels which emitting collateral circulation into the CL, so the blood perfusion around the CL is significantly abundant. Sonography has unique advantages in detecting the CL function by measuring its morphology, echo, size, volume, as well as evaluating the vascularity with color Doppler velocimetry⁶⁵. We found that in cases 61.25% had corpus luteum on right side and 38.75% had on left side. Similarly, in controls 51.25% had corpus luteum on right side and 48.75% had on left side. Statistically there was no significant difference in site of corpus luteum in cases and controls with p-value=0.112. In **El-Tamamy et al⁶⁶** study, the CL was situated in the right ovary in 45 cases (45%) and the left ovary in 45 cases (45%) and wasn't seen in 10 cases (10%). There was no significant difference between the site of corpus luteum in normal pregnancy and threatened abortion (p-value>0.05 NS). In a study by **Samsoic et al⁶⁷**, they postulated that the corpus luteum was situated mainly in the right ovary in some abnormal pregnancies.

The mean size of corpus luteum in cases at 1st visit was 22.52 mm and at 2nd visit was 23.23 mm. Similarly, mean size of corpus luteum in controls at 1st visit was 20.54 mm and at 2nd visit was 20.93 mm. Statistically there was significant difference in mean size of corpus luteum of cases and controls at 1st and 2nd visit with p-value<0.001. Our results were in accordance with **Da Silveira et al⁶⁷** when comparing the mean values of the larger diameter and volume of the CL of pregnant women with those who aborted, a figure that approached statistical significance. **Ahmad et al⁶⁶** found in their study relation between CL volume and pregnancy outcome was significant (p-value was 0.02). Being smaller in those that spontaneously aborted during the first trimester.

There was also significant difference in morphology of corpus luteum in case and controls (P-value=0.007).

In present study, the mean Resistance index in cases at 1st visit was 0.52 and at 2nd visit was 0.61. Similarly, mean Resistance index in controls at 1st visit was 0.47 and at 2nd visit was 0.53. Statistically there was significant difference in mean Resistance index of cases and controls at 1st and 2nd visit with p-value<0.001. Our results were in accordance with study conducted by **Salim et al⁶⁸** where they found that the mean RI from the CL blood flow was higher in patients of missed abortion than in women with normal pregnancy. **Han et al⁶⁹** also reported that the RI was significantly lower in control group (0.72 ± 0.21) than those values of cases group (0.86 ± 0.14; P < 0.05). Similarly, in **Gupta et al⁶⁴** study RI was 0.5 ± 0.08 in live intrauterine pregnancies, whereas it was 0.61 ± 0.09 in patients with missed abortions. A significant difference in RI was seen between the two groups (t = 3.9, df = 46, P < .01)

In our study we found that at 1st visit sensitivity of RI is 56.88%, specificity is 80.39% for predicting abortion outcome and positive predictive value is 86.11% and negative predictive value is 46.59%. At 2nd visit sensitivity of RI is 63.3%, specificity is 90% positive predictive value is 96.0% and negative predictive value is 56.04%

CONCLUSION

This study found that colour Doppler parameters of corpus luteum, specifically Resistance Index can be used to predict the outcome of pregnancy in women with threatened abortion.

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