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ORIGINAL ARTICLE

CORRELATION OF PRENATAL ULTRASOUND FINDINGS WITH PLACENTAL PATHOLOGY IN HIGH RISK PREGNANCY

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ABSTRACT: OBJECTIVE: To correlate the prenatal ultrasound findings with placental pathology in high risk pregnancy. **METHOD:** After approval by institutional ethical committee the prospective observational study was conducted in the department of obstetrics & gynecology, NSCB Medical College, Jabalpur (M.P.) from 1st September 2010 to 31st august 2011. A total of 77 cases were studied including antenatal women with mean gestational age >= 28 weeks not in active labor with high risk factor (inclusion criteria). Prenatal ultrasound and histomorphology of placenta was done in the respective department of the same institution. Statistical analysis was done by using t test and chi square test. **RESULT:** The sensitivity of prenatal ultrasound to detect retroplacental clot was 16.7%.The cases with severe pre-eclampsia and IUGR had more number of cases with abnormal flow in Color Doppler than there with other risk factor. Infarcts and retroplacental clot were found only in cases of severe pre-eclampsia. The sensitivity of color Doppler to detect abnormal placental pathology was found to be 76%. The prenatal ultrasound was not found sensitive enough to detect the placental infarcts. **CONCLUSION:** Placental pathologies adversely affect the perinatal outcome. Prenatal USG can identify a range of these abnormalities and can help to take timely action during antenatal period to improve the perinatal outcome.

INTRODUCTION: Placenta is a unique and wonderful organ that arises de novo, directly related to the growth and development of the fetus in the uterus. Most obstetricians and pediatricians would agree that examination of the placenta often helps to explain an abnormal neonatal outcome.

Numerous and varied pathologies of the placenta can be detected by routine ultrasound. The sonologists are strongly encouraged to study this amazing structure with ultrasound because significant pathologies affect the placenta, often before the fetus. Placental abnormalities therefore can be an "early warning system" for fetal problem. In the present study, sonographic findings of the placenta during prenatal ultrasound were studied and correlated with placental pathology.

MATERIALS AND METHODS: The present prospective observational study was approved by the hospital ethical committee and was conducted at the department of obstetrics and gynecology NSCB Medical College, Jabalpur, during the period from 1st September 2010 to 31st August 2011.

A total of 77 antenatal women with mean gestation >=28 weeks, who were not in active labor and having the high risk factor were studied. History was obtained. General and obstetric examination was done and significant findings were noted. All routine investigations were done and specific investigations were done as per the high risk condition. Detail prenatal ultrasound of all the cases was done for mean gestational age, fetal weight, amount of liquor, presentation, placenta (localization, thickness, maturity, grade and other lesion like infarcts etc.). Color Doppler was done as per indication.

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After delivery the placenta was collected in a sterile tray. Gross examination was done to note size, shape, weight, diameter, and thickness. The placenta was then put in a container containing 10% formalin and was sent to the Department of Pathology for histopathological examination.
The histomorphology of placenta was then correlated with prenatal ultrasound findings.

The data was analyzed using the software SPSS 17. Appropriate univariate and bivariate analysis were carried out using the Student **t** test for the continuous variable (age) and two-tailed Fisher exact test or chi-square (χ^2) test for categorical variables. All means are expressed as mean ± standard deviation. The critical levels of significance of the results were considered at 0.05 levels i.e. $P < 0.05$ was considered significant.

RESULTS: Out of total 48 cases, in which Color Doppler was performed in uterine artery, umbilical artery and middle cerebral artery, 100% of cases of IUGR had abnormal flow in one or more vessel, 63.3% of cases of severe preeclampsia had abnormal flow, and 20% of cases with mild preeclampsia had abnormal flow. Rest of the cases had normal flow. The abnormal flow in cases of IUGR and severe preeclampsia was statistically significant ($P<0.05$) (figure1). Out of total 77 cases, retroplacental clot was found in 20% of cases with severe preeclampsia. Rest of the cases (92.2%) had no retroplacental clot. This was statistically significant($X^2 =10.19$ $p<0.0001$) (figure1). Placental infarcts were present in 10% of cases of severe preeclampsia. Rest of the cases (96.1%) had no infarcts. This was statistically significant ($X^2=4.89$ $p<0.05$) (figure1). Out of total 6 cases with retroplacental clot on Pathological examination of placenta, the clot was also detected in 16.7% of cases on prenatal ultrasound. Thus, the prenatal ultrasound has the sensitivity of 16.7%, specificity 100%, positive predictive value 100% and negative predictive value 93.4%, to detect the retroplacental clot (Table - 2). Out of 2 cases with placental infarcts, none was detected on prenatal ultrasound. 2 cases, in which echocystic lesions were detected on prenatal ultrasound, had no corresponding abnormality in HPR. Thus, placental infarcts are generally not picked up by prenatal ultrasound (Table-3). Out of total 77 cases, Color Doppler was performed in 48 cases. Out of these 48 cases, 25 cases were found to have abnormal flow and their corresponding HPR findings proved abnormality in 76% cases. Thus, the Color Doppler has the sensitivity 76%, specificity 87%, positive predictive value 76% and negative predictive value 87%, to detect the placental abnormality (Table-4)

DISCUSSION: In the present study out of total 6 cases with retroplacental clot on Pathological examination of placenta, the clot was detected in 16.7% of cases on prenatal ultrasound. Thus, the prenatal ultrasound has the sensitivity of 16.7%, specificity 100%, positive predictive value 100% and negative predictive value 93.4%, in detecting the retroplacental clot. (Table-2)

According to Isabelle Trop et al (2001)[1] the sensitivity of ultrasound to detect retroplacental clot is low (2-20%).

Glantz Chris et al (2002)[2] in their study on clinical utility of ultrasound in diagnosis of placental abruption found the sensitivity of 24%, specificity 96%, positive predictive value 88%, negative predictive value 53%.

The result of our study shows that the prenatal ultrasound is less sensitive but highly specific in detecting the retroplacental clot. This is in accordance with the results of above studies.

In the present study out of 2 cases with placental infarcts, none was detected on prenatal ultrasound. 2 cases, in which echocystic lesions were detected in prenatal ultrasound, had no

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corresponding abnormality in HPR. Thus, placental infarcts are generally not picked up by prenatal ultrasound. (Tbale-3)

Proctor L.K. (2010)[3] in their study found that echocystic lesions are mostly due to intervillous thrombosis.

Reis NS et al (2005)[4] in their study found that presence of placental lakes do not seem to indicate an increase in the risk for an adverse pregnancy outcome.

The results of our study show that the echocystic lesion on ultrasound is not a definitive evidence of presence of placental infarct. This is in accordance with the above studies.

In the present study out of total 48 cases in which Color Doppler was performed, 25 cases were found to have abnormal flow and their corresponding HPR findings proved abnormality in 76% cases. Thus the Color Doppler has the sensitivity of 76%, specificity 87%, positive predictive value 76% and negative predictive value 87%, in detecting abnormal placental pathology (Table-4).

Madazli R et al (2003)[5] in their study found that abnormal placental pathology (increased number of villous infarcts, cytotrophoblast proliferation, thickening of trophoblastic basement membrane) was significantly associated with abnormal color Doppler findings($p<0.001$).

Thus the findings of the present study that abnormal flow in the Color Doppler of uterine, umbilical and middle cerebral artery is associated with ischemic changes in the placental histomorphology is in accordance with the above study.

CONCLUSION: A number of placental pathologies adversely affect the perinatal outcome. Severe preeclampsia and IUGR are the two conditions which have significant placental pathology. Prenatal ultrasound is less sensitive but highly specific to detect the retroplacental clot. Echocystic lesions of the placenta are probably not the reliable predictors of the placental pathology. Abnormal flow in the Color Doppler is the better predictor of placental pathology

ACKNOWLEDGEMENT: After thanking the almighty, I take this opportunity to express my deepest feelings of gratitude to all those helping hands that made this endeavor of mine successful.

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I express heartily thanks to all the patients and nursing staff subjected to this study without whose cooperation and participation this work would have never been possible.

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Risk Factor	Frequency	Percent (%)
Severe Preeclampsia	30	39.0
Mild Preeclampsia	10	13.0
IUGR*	4	5.2
PROM# Preterm	6 4	7.7% 5.1%
Prolonged Pregnancy	5	6.5
Diabetes Mellitus Sickle Cell Disease	1 3	1.2% 3.8%
Twins	14	18.2
Total	**77**	**100.0**

Table – 1: Distribution of cases according to High Risk Factor

*Intrauterine growth restriction
#Premature rupture of membranes

Pathological Finding Retroplacental Clot	USG Findings Retroplacental Clot		
	Absent	**Present**	**Total**
Present	5	1	6
	83.3%	16.7%	100.0%
Absent	71	0	71
	97.2%	0%	100.0%
Total	**76**	**1**	**77**
	96.1%	**1.3%**	**100.0%**

Table -2: Correlation between USG findings and Pathological Findings of Retro- Placental clot

χ^2 = 2.83; P > 0.05

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Pathological Finding (Infarct)	USG Findings Echocystic Lesion		
	Absent	present	Total
Present	2	0	2
	100%	0%	100%
Absent	73	2	75
	97.3%	2.7%	100%
Total	**75**	**2**	**77**
	96.1%	**2.6%**	**100%**

Table -3: Correlation between USG findings and Pathological Findings of Placental Infarcts

χ^2 = 0.08; P > 0.05

Color Doppler (UA, Ut A, MCA)	HPR FINDINGS*		Total
	Positive	Negative	
Abnormal	19 76.0%	6 24.0%	25 100.0%
Normal	3 13.0%	20 87.0%	23 100.0%
Total	**22 45.8%**	**26 54.2%**	**48 100.0%**

Table – 4: Correlation between Color Doppler Findings (uterine artery, umbilical artery, middle cerebral artery) and Corresponding HPR Findings

χ^2 = 19.125; P > 0.001

*infarcts, poor vascularity of villi, prominent cytotrophoblastic layer

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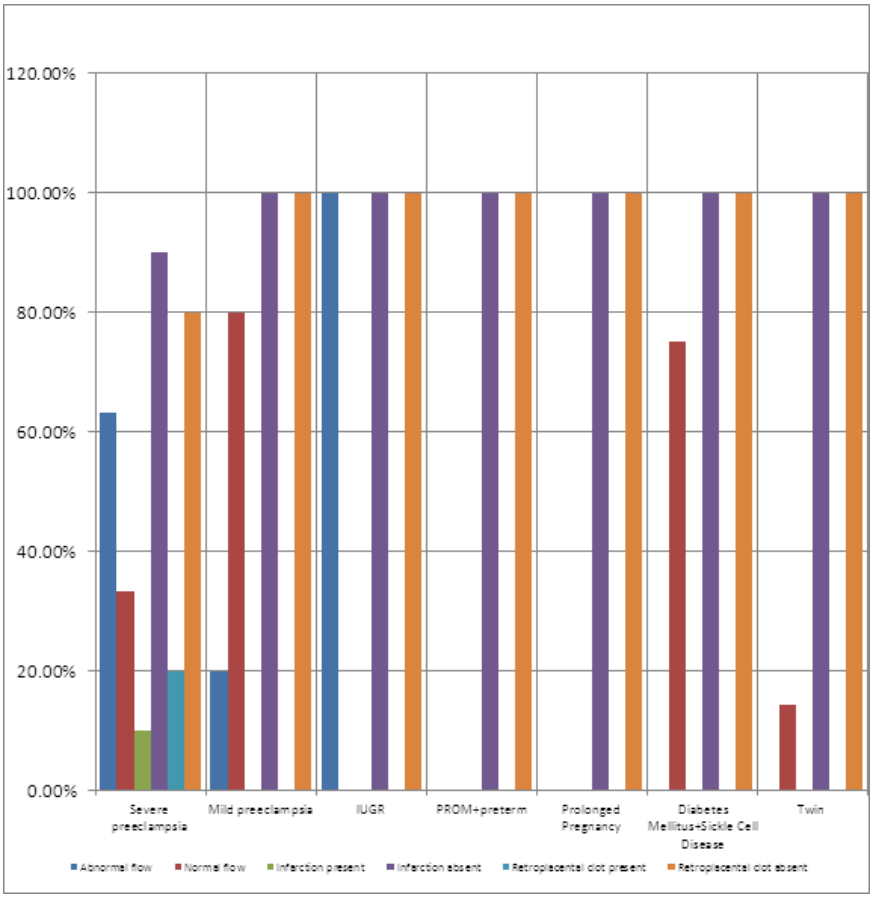

Fig. 1: Distribution of cases according to Color Doppler findings and placental pathology.

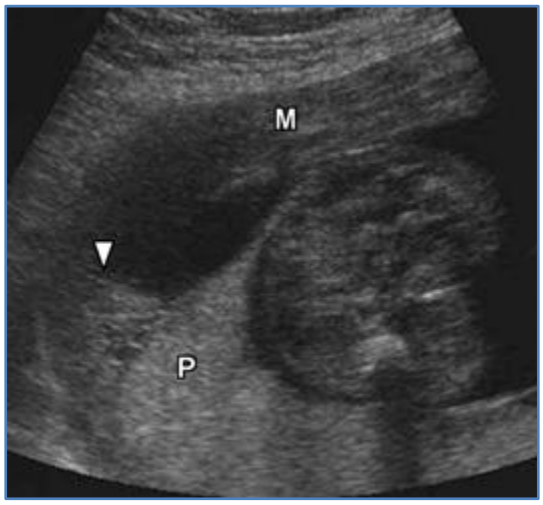

Fig. 2: Sonographic appearance of a retroplacental hematoma with hypoechoic areas between the uterine wall (M) and the placenta (P)

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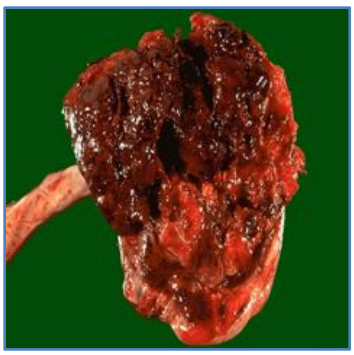

Fig. 3: Blood clots tenuously adherent to placental floor

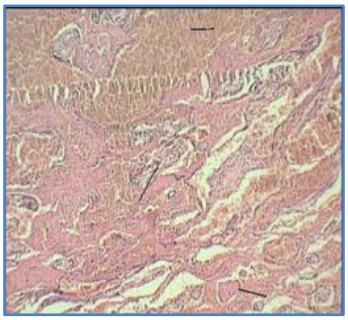

Fig. 4: Photo micrograph of the basal plate of the placenta following acute abruption showing retroplacental clot (H).

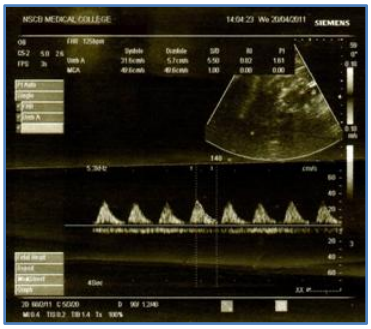

Fig. 5: (R) Abnormal right uterine artery Doppler flow velocity waveforms with an absent end diastolic component

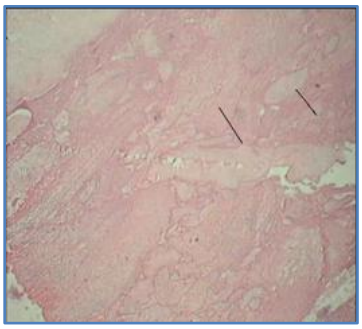

Fig. 6: Showing placental infarcts, the histological counterparts of severe uteroplacental vascular disease

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