

# Placental laterality as a predictor of pre-eclampsia - An ultrasonic prospective study

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## Abstract :

Background placentation abnormality is one of the initial events seen in patients who are destined to develop PIH . In preeclampsia there is a failure in the secondary wave of Trophoblastic invasion, so that the musculo-elastic media of the spiral arteries in the myometrium is retained. The inadequacy of trophoblastic invasion, results in decreased choriodecidual blood flow. This results in the establishments of relative ischemia in the placental bed. At this point, probably starts a most undesirable cycle of imbalance between antioxidants and oxidants.

**Objectives:** To study whether Ultrasonically identified, placental laterality , can be used as a predictor for development of preeclampsia.

**Materials and methods** Five thousand seven hundreden thirty (5730) antenatal patients from one year from Jan 2012 to Dec 2012 at Chigateri General Hospital, Davanagere, were studied for placental lateral location and development of pre eclampsia. Ultrasound placental location was studied from 20-24 weeks of gestation and the patients were closely followed up .Patients who developed PE, were analysed for the association with placental lateralisation .The end point of the study was development of preeclampsia as per ACOG criteria. Those who developed PE were further analysed. Through ultrasonography placental location was determined.

**Results:** Out of 5730 antenatal out pts , 485 patients developed preeclampsia at different gestational ages. Of these 485 PE pts , 286 pts (59%) had unilateral location of placenta and 199 (41%) patients had central location of placenta. Though the lateral placental location was associated with proteinuria, it was to a lesser degree as found in 64% of cases with traces or 1+ or 2+ proteinuria. However more number patients i e 119 (60%) with fundal placental location had more degree of (3+ or loaded) of proteinuria.

**Conclusion:** In case of unilateral placenta, the absence or insufficient trophoblastic invasion of arteries on contralateral side , make them retain their sensitivity to vasoactive substance during pregnancy. Ultra sonography is simple, non invasive, easy to perform, cost effective, diagnostic method to identify high risk cases. By identifying such patients appropriate treatment can be initiated and the patient be regularly followed up.

**Key words:** placenta location, ultra sonography, pre eclampsia, proteinuria

## Introduction:

APreeclampsia is the disease of placenta.

Placentation abnormality is one of the initial events seen in patients who are destined to develop PIH subsequently.

The abnormality starts with failure of trophoblast to invade the myometrial segments. In preeclampsia there is a failure in the secondary wave of trophoblastic invasion, so that the musculo-elastic media of the spiral arteries in the myometrium is retained. The vessels fail to dilate and remain responsive to vasoconstrictor stimuli, resulting in a decreased chorio decidual blood flow. This is regarded as the unique and essential feature of

preeclampsia. The inadequacy of trophoblastic invasion, results in decreased choriodecidual blood flow. and results in the establishments of relative ischemia in the placental bed. At this point, probably starts the most undesirable cycle of imbalance between antioxidants and oxidants.

**Materials And Methods :** Five thousand seven hundreden thirty (5730) patients attending the antenatal clinics for one year from Jan 2012 to Dec 2012 at Chigateri General Hospital, Davanagere, were studied for placental lateral location and development of pre eclampsia. Through ultrasound, placental location was studied from 20-24 weeks of gestation and the patients were closely followed up .Those patients who developed PE, were analysed for the association with placental lateralisation .The end point of the study was development of preeclampsia as per ACOG criteria. those pts who developed pe were further analysed till term.

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**Inclusion criteria**

Patients with Singleton pregnancy

- BP  $\geq$  140/90 mm of Hg with edema and proteinuria
- Patients with previous history of preeclampsia, eclampsia.

**Exclusion criteria :**

- Patients with chronic hypertension,
- Patients with multiple gestation,
- Patients with diabetes mellitus
- Patients with uterine anomalies,
- Patients with previous caesarean section.

Through ultrasonography placental lateral location was determined. The placenta was classified as central when it is equally distributed between the right and left side of the uterus irrespective of anterior, posterior or fundal position.

When more then 75% of placental mass, was to one side of the midline, it is classified as unilateral, right or left placenta.

**Results**

**Table No 1 Age wise distribution**

Age group (Years)	Placenta Location		Total
	Lateral n(%)	Fundal n(%)	
<20	68 (23.8%)	55 (27.6%)	123
21-25	136 (47.6%)	110 (55.3%)	246
26-30	69 (24.1%)	15 (7.5%)	84
>30	13 (4.5%)	19 (9.5%)	32
Total	286(100%)	199 (100%)	485
Mean Age	23.9 $\pm$ 3.9	23.4 $\pm$ 4.3	

**t=1.21 P>0.23, Not significant**

younger the age, higher the incidence of fundal location, where as with more than 25 years of age about 29% of cases had lateral placental location .How ever the relation was found to be insignificant.

**Table No: 2 showing Parity wise distribution**

Parity	Placenta Location		Total
	Lateral n(%)	Fundal n(%)	
Nullipara	196( 68.5)	120 (60.3)	316
Primipara	73 (25.5)	59 ( 29.6)	132
Multipara	17 (5.9)	20 (10.1)	37

**X<sup>2</sup>=4.55 P> 0.10 Not Significant**

Lateral location of placenta was slightly more common among nulliparous compared to multiparous. The relationship was insignificant.

**Table No : 3 showing Timing of ultrasound location of placenta**

Gestational age (weeks)	Placenta Location		Total
	Lateral n(%)	Fundal n(%)	
16-20	73( 25.5)	35 ( 17.6)	108
21-24	76 (26.6)	60 (30.2)	136
25-29	86 (30.1)	50 (25.1)	136
30-34	51 (17.8)	54 (27.1)	105
Total	286 (100%)	199(100%)	100

Mean SD (wk) 24.4 4.7 25.14.3,  
t = 2.87 P>0.01 , significant

Lateral location of placenta was more common (52%) with gestational age of 16-24 weeks.

As gestational age increased, higher incidence of fundal location (52%) was observed.

Mean gestational age for fundal location was 25.6 years ,which was higher compared to lateral location ,with mean age of 24.4 years.

This difference was found to be significant.

**Table No : 4 Showing Proteinuria and placental location**

Urinary albumin	Placenta Location		Total
	Lateral n(%)	Fundal n(%)	
Loaded	45 (15.7)	75 (37.7)	58
3+	58 (20.3)	44 (22.1)	102
2+	74 (25.9)	30 (15.1)	104
1+	61 (21.3)	35 (17.6)	96
Traces	48 (16.8)	15 (7.5)	63
Total	286 (100)	199 (100)	100

X<sup>2</sup>=37.98 P<0.001 Highly Significant

There seems to be a good relationship between urinary albumin levels with Placental location .

Higher level of urinary albumin indicated more fundal placental location where as low levels of urinary albumin level associated with lateral Placental location.

**Table No : 5 Showing Gestational age of development of preeclampsia**

Timing of ultrasound (weeks)	Gestational age of development of preeclampsia (weeks)					Total
	20-24n (%)	26-28n (%)	30-32n (%)	34-36n (%)	Full termn (%)	
16-20	20(18.5)	5(4.6)	-	25(231)	58( 53.7)	108(100)
21-24	-	10(7.4)	15(11)	5(3.7)	106(77.9)	136
25-29	-	10(7.4)	20(14.7)	30(22.1)	76(55.9)	136
30-34	-	9(8.6)	20(19)	5( 4.8)	71(67.6)	105
Total	20	34	55	65	311	485

$\chi^2=128.4$ ,  $p<0.05$ , significant

From the observations it can be seen that as high as 174 (36%) cases developed Pre eclampsia , before 36weeks which indicates an earlier scan for prediction of pre eclampsia and lateralization of placenta.

**Discussion :** Preeclampsia is a complex clinical syndrome involving multiple organ systems and still remains the principal cause of maternal and perinatal mortality and morbidity. It has been shown that in humans , both uterine arteries have a significant number of branches and each supply the corresponding side of the uterus. Although anastomoses between the two uterine arteries exist, there is no proof that these are functional. When the placenta is laterally located, the uterine artery close to the placenta has lower resistance than the one opposite from it. In patients with centrally located placenta, both uterine arteries demonstrate similar resistance. When the placenta is centrally located, the uteroplacental blood flow needs are met by equal contribution from both uterine arteries. However, when the placenta is laterally located, in the majority of the patients, the uteroplacental blood flow needs are to be met primarily by one of the uterine arteries, with some contribution by the other uterine arteries, with some contribution by the other uterine artery via collateral circulation. This degree of collateral circulation, however, may not be the same in all patients and deficient contribution may facilitate the development of pre-eclampsia, IUGR or both. The existence of major vascular anastomoses in some patients may explain the normal uterine flow velocity waveform and absence of preeclampsia and IUGR despite the presence of a unilateral placenta. In normal pregnancies, the spiral arterioles that supply the placental bed undergo trophoblast induced conversion to uteroplacental arterioles. The significance of normal placentation for this cytotrophoblastic invasion is high and the cytotrophoblasts fail to adopt a vascular adhesion phenotype in preeclampsia. In preeclampsia conversion of the spiral arterioles is incomplete. It involves only the subplacental venous. If there were no functional

anastomoses between right and left uterine arteries, in cases with unilaterally located placentas, one would expect the ipsilateral uterine artery systolic/ diastolic ratios to change more than the contralateral ratios in hypertensive pregnancies. This may explain the reduced trophoblastic invasion in laterally situated placenta when the uteroplacental blood flow need are mainly met by one side uterine artery. In our study about 59% of preeclampsia patients had unilateral location of placenta.

**Conclusion :** In case of unilateral placenta, the absence or insufficient trophoblastic invasion of arteries on contralateral side would make them retain their sensitivity to vasoactive substance during pregnancy. Ultrasonography is simple, non invasive, easy to perform, cost effective, diagnostic method to identify high risk cases. By identifying such patients appropriate treatment can be initiated and the patient be regularly followed up.

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