

## Value of First Trimester Ultrasonographic Placental Localization in Prediction of Persistence of Low Lying Placenta in Cases of Previous Cesarean Section in a Tertiary Referral Center

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### ABSTRACT

**Introduction:** Placenta previa is a serious obstetric condition and a major cause of antepartum hemorrhage. When implanted over the scar of previous caesarian section scar it could lead to placenta accrete, another major cause of postpartum hemorrhage and obstetric hysterectomy. First trimester ultrasonography has not been studied thoroughly for prediction of these serious conditions.

**Aim of work:** To show the efficacy of first trimester placental localization in prediction of migration of low lying placenta in cases of previous cesarean section and the prediction of placenta accreta.

**Patients:** The study was performed on 75 cases with history of one or more cesarean sections, single fetus, with placenta either covering or within 20 mm from the internal cervical os. Maternal age group was from 20 to 40 years old.

**Methodology:** Patients were examined during the first visit at 11-14 weeks of gestation by trans-abdominal then transvaginal ultrasound. Direction of cord insertion to the placenta whether towards or away from the internal os was reported. Criteria of abnormal placental invasion were searched for using 2D and color Doppler ultrasound.

Patients were re-examined again during 24-32 weeks of gestation to report placental migration to the upper uterine segment. Cases that found in the lower segment within 20 mm or covering the internal os were reported as placenta previa.

**Results:** 87% of cases showed placental migration in third trimester. The direction of umbilical cord attachment to placenta showed highest sensitivity in prediction of placenta previa when recorded early in first trimester in comparison to the distance from the leading placental edge to the center of the internal os and placental position.

**Conclusion:** First trimester localization of placenta by ultrasonography could predict placenta previa in cases with a history of previous cesarean section and low lying placenta. Direction of cord insertion to the placenta and sonographic criteria of abnormal placental invasion are valuable criteria in predicting placenta previa. Ultrasonography in late first trimester could suspect abnormal placental invasion but it doesn't definitively diagnose placenta accreta because it is histopathological diagnosis.

## Keywords

Placenta previa, Accreta, Cord insertion, Ultrasound.

## Introduction

Low lying placenta is a one with lower edge less than 2 cm from internal cervical os. It occurs in 4% of pregnancies at 20 weeks gestation [1]. Persistence of this condition till third trimester is called placenta previa. The incidence of placenta previa at term is 0.5–2% [2]. One of the most dramatic risk factors for placenta accreta is clearly the presence of placenta previa over previous cesarean section scar [3-5].

Placenta accreta occurs when the chorionic villi invade the myometrium abnormally. In these cases, the decidua basalis that normally separates the chorionic villi and the myometrium is missing. The placenta does not separate properly from the uterus after delivery, which gives rise to maternal hemorrhage [6].

Placenta accreta is considered a severe pregnancy complication that may be associated with massive and potentially life-threatening intra-partum and postpartum hemorrhage and so it has become one of the most important leading causes of emergency hysterectomy which represents 40-60% of cases [7].

## Aim of the Work

The aim of this study was to show the efficacy of first trimester placental localization in prediction of migration of low lying placenta in cases of previous cesarean section and the prediction of placenta accreta.

## Patients

The study was performed on 75 cases attending Elshatby Maternity university hospital for antenatal care after approval of the ethics committee and signing the consent to participate in the study.

Patients selected with history of one or more cesarean sections, single fetus, with placenta either covering or within 20 mm from the internal cervical os. Maternal age group was from 20 to 40 years old.

## Methodology

75 Patients presented to Shatby Maternity university hospital from July to November 2016-with follow up till April 2017. Patients were examined during the first visit at 11-14 weeks of gestation by trans-abdominal ultrasound with partially full bladder then bladder was evacuated and trans-vaginal examination was carried for optimal measurement of the distance between the lower placental edge and the center of the internal cervical os. Three measurements were taken and the mean distance was reported and tabulated. Direction of cord insertion to the placenta whether towards or away from the internal os was reported. Criteria of abnormal placental invasion were searched for using 2D and color Doppler ultrasound.

Patients were re-examined again during 24-32 weeks of gestation to report placental migration to the upper uterine segment. Cases

that found in the lower segment within 20 mm or covering the internal os were reported as placenta previa.

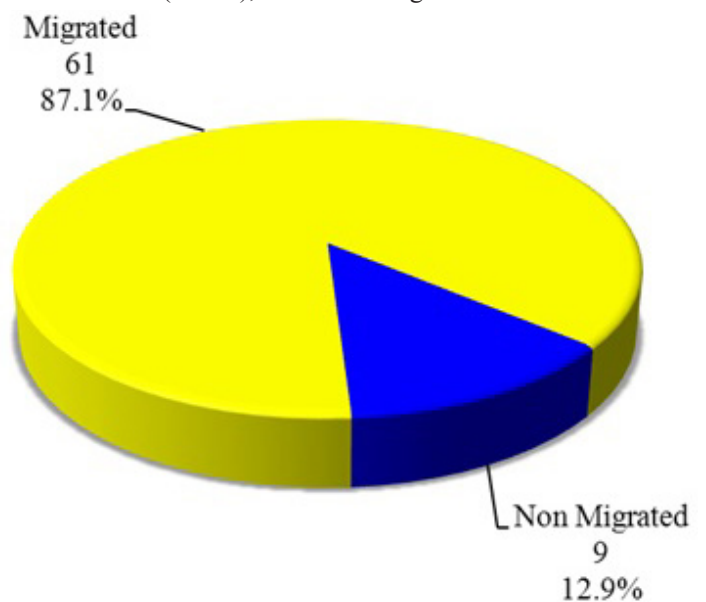
## Results

Statistical analysis was done on 70 cases because 3 cases had abortion after the first scan and two cases didn't come back for follow up.

Previous caeserian sections	Number	Percentage
1	14	20
2	35	50
3	17	24.3
4	4	5.7

**Table 1:** Descriptive analysis of the studied cases according to number of previous cesarean sections (n = 70).

In the study, from 70 cases with low lying placenta in first scan at 11-14 weeks, 61 cases migrated upwards away from the internal cervical os with migration rate 87.1% and 9 cases were still present in the lower uterine segment in the second scan as placenta previa at 24-32 weeks (12.9%); as shown in figure 1.



**Figure 1:** Percentage of placenta previa reported by the study in the third trimester.

The incidence of placenta previa at 28-32 weeks was 11.9% in anterior placenta, 7.7% in posterior placenta and 100% in placenta implanted mainly over the internal cervical os.

No placenta previa reported when the placenta located at 0- 20 mm from the internal os, 10% when placenta crossed internal os by 1-16 mm. The incidence raised to 55.6% with crossing by 17-30 mm and 100% when placenta crossed internal os by more than 30 mm. p less than 0.001.

The study showed absence of statistical significance of most of grayscale and Doppler criteria of abnormal placental invasion in

prediction of placenta previa when we searched for during first trimester except placental lacunae with turbulent blood flow.



**Figure 2:** TVU at 11 weeks shows anterior low lying placenta crossing the internal os by 16 mm . the placenta was reported as migrated during the second scan.

	Total (n = 70)		Migration				Test of sig.	P
			Non Migrated (n= 9)		Migrated (n= 61)			
	No.	%	No.	%	No	%		
<b>Placental position 1st</b>								
Low lying Anterior	42	60.0	5	11.9	37	88.1	$\chi^2=8.183^*$	$MC_p=0.016^*$
Low lying Posterior	26	37.1	2	7.7	24	92.3		
Over Internal OS (mainly anterior)	2	2.9	2	100.0	0	00.0		
Distance From IO 1st								
20 - 0 ml	39	55.7	0	00.0	39	100.0	$\chi^2=25.382^*$	$MC_p<0.001^*$
Cross by 1 - 16 mm	20	28.6	2	10.0	18	90.0		
Cross by 17 - 30 mm	9	12.9	5	55.6	4	44.4		
$\geq 31$ ml (mainly anterior)	2	2.9	2	100.0	0	00.0		
<b>Cord direction 1st</b>								
Away IO	63	90.0	3	4.8	60	95.2	$\chi^2=36.849^*$	$FE_p<0.001^*$
Towards IO	7	10.0	6	85.7	1	14.3		

**Table 2:** Relation between Migration and different grayscale ultrasound criteria reported during first scan.

$\chi^2$ : Chi square test.

FE: Fisher Exact for Chi square test.

MC: Monte Carlo for Chi square test.

\*: Statistically significant at  $p \leq 0.05$

Umbilical cord direction from the internal os were more statistically significant, (P less than 0.001) in prediction of placenta previa than

placental location whether anterior or posterior (P equals 0.016).

Criteria of abnormal placental invasion looked for during late first trimester had very low sensitivity (not more than 22.2%) in case of placental lacunae , but highest specificity for prediction of placenta previa (100.0%).

criteria	1 <sup>st</sup> scan	2 <sup>nd</sup> scan
An irregular placental-myometrial interface.	1	2
Irregular or absent retro-placental vascular spaces.	1	4
Placental lacunae	2	3
Disruption of bladder line	0	1

**Table 3:** Distribution of the studied cases according to grayscale criteria of abnormal placental invasion detected during 1st and 2nd scan (n = 70).

Doppler signs	1 <sup>st</sup> scan	2 <sup>nd</sup> scan
Absence of subplacental vascular signals in the areas lacking the peripheral subplacental hypoechoic zone	1	2
Turbulent blood flow within lacunae	2	3
Dilated vascular channels with diffuse lacunar flow pattern scattered throughout the whole placenta	1	1
Hypervascular bladder serosa interface	1	2
Abnormal blood vessels linking the placenta to the bladder	0	1

**Table 4:** Distribution of the studied cases according to Doppler criteria of abnormal placental invasion in 1st and 2nd scan (n = 70).

	Migration				X <sup>2</sup>	FE <sub>p</sub>
	Non Migrated (n=9)		Migrated (n=61)			
	No.	%	No.	%		
<b>An irregular placental-myometrium interface</b>						
Negative	8	88.9	61	100.0	6.876	0.129
Positive	1	11.1	0	00.0		
<b>Irregular or absent retro placental vascular spaces</b>						
Negative	8	88.9	61	100.0	6.876	0.129
Positive	1	11.1	0	00.0		
<b>Placental lacunae</b>						
Negative	7	77.8	61	100.0	13.954*	0.015*
Positive	2	22.2	0	00.0		
<b>Disruption of bladder line</b>						
Negative	9	100.0	61	100.0	-	-
Positive	0	00.0	0	00.0		

**Table 5:** Relation between Migration and grayscale criteria of abnormal placental invasion reported during 1st scan (n=70).

	Migration				X <sup>2</sup>	FE <sub>p</sub>
	Non Migrated (n=9)		Migrated (n=61)			
	No.	%	No.	%		
<b>Absence of sub placental vascular signals</b>						
Negative	8	88.9	61	100.0	6.876	0.129
Positive	1	11.1	0	00.0		

Turbulent blood flow in placental lacunae					13.954*	0.015*
Negative	7	77.8	61	100.0		
Positive	2	22.2	0	00.0		
Dilated vascular channels with diffuse lacunar flow pattern scattered throughout the whole placenta					6.876	0.129
Negative	8	88.9	61	100.0		
Positive	1	11.1	0	00.0		
Hyper vascular bladder serosa interface					6.876	0.129
Negative	8	88.9	61	100.0		
Positive	1	11.1	0	00.0		
Abnormal blood vessels linking the placenta to the bladder					-	-
Negative	9	100	61	100.0		
Positive	0	00.0	0	00.0		

**Table 6:** Relation between Migration and Doppler criteria of abnormal placental invasion reported during 1st scan (n=70).

$\chi^2$ : Chi square test.

FE: Fisher Exact for Chi square test.

MC: Monte Carlo for Chi square test.

\*: Statistically significant at  $p \leq 0.05$ .

Case No.	Age (years)	Previous caesarian	Placental position 1st	Placental position 2nd	Distance from IO	Cord direction
1	34	2	Low anterior	Previa lateralis	cross by 15 mm	Away from IO
2	30	3	Low anterior	Previa marginalis	cross by 23 mm	Away from IO
3	26	1	Low anterior	Previa lateralis	Cross by 25 mm	Near IO
4	28	2	Low posterior	Previa lateralis	Cross by 19 mm	Near IO
5	35	4	Low anterior	Previa lateralis	cross by 16 mm	Away from IO
6	31	3	Low posterior	Previa lateralis	cross by 17 mm	Near IO
7	35	4	Low anterior	Previa marginalis	cross by 26 mm	Near IO
8	37	3	Over IO	Incomplete centralis	cross by 33 mm	Near IO
9	36	3	Over IO	Incomplete centralis	cross by 34 mm	Near IO

**Table 7:** Descriptive analysis of the non-migrated cases according to study criteria during 1st scan (n = 9).

## Discussion

The study reported increased incidence of placenta previa in cases with history of previous cesarean section and low placental implantation from 0.5% in general population to 12.9% in our tertiary referral center.

In comparison with other studies in literature, Sowjanya Kumari et al. [8], reported placenta previa incidence of 65% is studied ca(24/37). He studied placental migration in cases with previous cesarean section. The first scan was done during the second

trimester (18-23 weeks of gestation) then cases were followed up by ultrasound during the third trimester.

The difference in migration rate between the two studies may be related to the time of ultrasonographic scan. The study reported 11.9% incidence of placenta previa in anterior placenta, 7.7% in posterior placenta and 100% in placenta implanted mainly over the internal cervical os.

In agreement with our study, Sowjanya Kumari et al. reported 42.4% (11/26) incidence of placenta previa in anterior placenta, and 38.5% (5/13) in posterior placenta.

In our study, low cord insertion was reported in 66.7% (6/9) in placenta previa and 1.6% in migrated placenta (1/61). This was compared to 33.3% (7/21) in placenta previa and 6.7% (7/104) in migrated placenta in Junichi Hasegawa et al. study [9].

The study showed that, criteria of abnormal placental invasion looked for during first trimester had very low sensitivity, (22.2%) in case of placental lacunae, but highest specificity for prediction of placenta previa (100.0%).

Jerasimos Ballas et al. [10], in his retrospective study on 10 cases of placenta accreta diagnosed on histopathological examination after cesarean hysterectomy, placental lacunae with or without turbulent blood flow by color Doppler ultrasound were detected in 80% of cases at 8 weeks and 4 days to 14 weeks compared to 22.2% in our study. 90% of cases showed irregular placental myometrial interface, (11.1% in our study).

In the literature, most studies of placental migration were started in the second trimester, so we started our work as early as first trimester to predict the future of placenta which appears low in uterus during first trimester scan, would it migrate or not, this was the question. In our study, when the following criteria detected in low placenta in the first trimester, this placenta is liable to be placenta previa:

- Low implantation with leading placental edge crossing the internal os by more than 16mm.
- Anterior placenta with one or more cesarean section scar.
- Low umbilical cord insertion in the lower third of the uterus.
- Low placenta with absent or irregular retroplacental vascular spaces with grayscale scan and absent sub-placental vascular signals with color Doppler.
- Irregular placental-myometrial interface.
- Placental lacunae with or without turbulent blood flow with color Doppler.
- Hypervascular bladder serosa interface.

## Conclusion

- First trimester localization of placenta by ultrasonography could predict placenta previa in cases with a history of previous cesarean section and low lying placenta.
- Direction of cord insertion to the placenta and sonographic

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criteria of abnormal placental invasion are valuable criteria in predicting placenta previa.

- Ultrasonography in late first trimester could suspect abnormal placental invasion but it doesn't definitively diagnose placenta accreta because it is histopathological diagnosis.

### Recommendations

- Ultrasonography could be used as early as late first trimester to localize the placenta that implanted low in the uterus in order to predict placenta previa in cases with a history of previous cesarean section.
- Future studies are needed about relation of cord direction to placental migration later in pregnancy.

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