

A PROSPECTIVE OBSERVATIONAL STUDY OF ULTRASONOGRAPHY AND PREGNANCY OUTCOMES IN THREATENED ABORTION

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Abstract

Aim: The purpose of this study was to determine the role of ultrasound (US) as a predictor of pregnancy outcome in cases of threatened miscarriage. Introduction: First-trimester bleeding is a common medical concern. It may result in pregnancy loss or adverse maternal and fetal outcomes. Certain sonographic parameters, such as GSD, YSD, CRL, and FHR, may be able to predict these outcomes.

Material and methods: A prospective study of 500 women in their first trimester was divided into three groups: group I (130 women) with threatened abortion that resulted in abortion, group II (170 women) with threatened abortion that resulted in pregnancy completion, and group III (200 women) with normal pregnancy. Gestational Sac Diameter (GSD), Yolk Sac Diameter (YSD), Crown-Rump Length (CRL), and Foetal Heart Rate (FHR) were among the indicators used in the United States. These patients' pregnancy outcomes were assessed.

Results: A significant difference was found between group I and the other two groups regarding FHR and CRL ($P < 0.05$), while no significant difference was observed among the three groups regarding GSD or YSD. Compared to control group, the cases of group II had a higher incidence of premature rupture of membrane PROM (OR=9.9, $P < 0.05$), gestational hypertension (OR=5.4, $P < 0.05$), and placental abruption (OR=4.8, $P < 0.05$).

Conclusion: FHR and CRL are useful sonographic markers for predicting pregnancy outcome in women who are at risk of miscarriage. FHR at 115 beats per minute has the highest predictability, while CRL at 22 mm has the lowest.

Keywords: Vaginal bleeding; Threatened abortion; Pregnancy outcome; Ultrasonography.

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INTRODUCTION

Vaginal bleeding in the first trimester is a common medical problem that affects 15% to 25% of all pregnancies [1-3]. Any vaginal bleeding before 20 gestational weeks, with or

without abdominal pain, while the cervix is closed, is considered a threatened miscarriage [4]. Anxiety is frequently associated with a threatened miscarriage for the mother, family, and physicians [2]. More

than half of all pregnancies with first-trimester bleeding end in miscarriage. If the pregnancy is not terminated, maternal and fetal outcomes may be harmed [5-7].

Furthermore, first-trimester vaginal bleeding contributes to the development of late pregnancy complications [8-11]. Some studies have reported a 5% to 10% incidence of these complications, such as Premature Rupture of Membrane (PROM), Low Birth Weight (LBW), placental abruption, and pre-eclampsia [5-9]. Several sonographic signs have been described by various authors to predict the outcome of a pregnancy. A large, small, or irregularly shaped gestational sac, a low implantation site, a large or irregular yolk sac, a weak decidual reaction, and a slow embryonic heart rate were among the symptoms [10-14].

Other studies have been conducted using ultrasound criteria and biochemical markers to predict pregnancy outcomes [8,15]. Various biochemical markers have been studied in the past to predict the outcome of a threatened miscarriage, but the results have been contradictory [16]. A 2017 study [17] found that early pregnancy markers such as gestational sac size, yolk sac size and shape, and Foetal Heart Rate (FHR) are good predictors of pregnancy outcome in patients with threatened abortion.

Several studies have investigated the role of ultrasound parameters in threatened abortion and its predictive value in pregnancy outcome, but few such studies used the combination of these parameters.

In the clinical context of diagnostic algorithms on this subject, there is a perceived knowledge gap regarding the shortage of information and the significance of late pregnancy outcomes. We conducted a prospective study to evaluate the prognostic value of sonographic parameters Gestational Sac Diameter (GSD), Yolk Sac Diameter (YSD), Crown-Rump Length (CRL), and FHR and the impact of first-trimester vaginal bleeding on maternal and perinatal outcomes.

Methods

Study population

We examined patients diagnosed with a threatened miscarriage (vaginal bleeding with or without cramping during the first 20 weeks of gestation with a closed cervix and documented heartbeats during the ultrasonographic examination) over a one-year period in this prospective observational study.

Inclusion criteria

- Normal Body Mass Index (BMI); 18-25 kg/m²
- Sure for dates (previous regular cycles with a known 1st day of LMP)
- Previous regular cycles (inter-cycle variation ≤ 7 days)
- The absence of cervical pathology
- A single pregnancy

Exclusion criteria

- Pregnant females with chronic systemic disease (i.e. chronic hypertension, diabetes mellitus, and thrombophilia)
- Those on antiepileptic or antipsychotic drugs
- Multiple pregnancies
- History of trauma or surgery during the current pregnancy
- Smokers

The result was a final cohort of 300 pregnant women. We divided our patients into two groups: 130 women who threatened abortion and lost their pregnancies, and 170 women who threatened abortion but completed their pregnancies. In group III (the control group), we carefully selected 200 women who were pregnant normally. Table 1 shows the characteristics of the patients in each of the three groups.

Statistical analysis

Data are presented as the mean \pm standard deviation (SD) and were processed and

analyzed using the statistical software SPSS 10 (SPSS, Chicago, IL, USA). The significance of the difference between each parameter in patients and controls was assessed by the nonparametric Mann-Whitney test for unpaired samples. The diagnostic performance of sonographic parameters was estimated. The Odds Ratio (OR) with 95% Confidence Interval (CI) was calculated. A p-value ≤ 0.05 was considered statistically significant.

Results

Study population

There was no significant difference between the three groups studied in terms of age, parity, Body Mass Index (BMI), gestational age at bleeding onset, or number of previous abortions. In terms of heavy vaginal bleeding, there is a statistically significant difference between the three groups studied (Table 1).

	Group I		Group II		Group III		P value
	(n=130)		(n=170)		(n=200)		
	Mean	SD	Mean	SD	Mean	SD	
Maternal age (years)	28.9	4.2	29.8	6.5	30.5	6.7	> 0.05
BMI (kg/m²)	27.9	2.9	26.4	3.1	26.5	2.5	> 0.05
Parity							> 0.05
Nullipara	87	66.9	113	66.5	131	65.5	
Multipara	43	33.1	57	33.5	69	34.5	
Previous one pregnancy loss	18	13.8	25	14.7	27	13.5	> 0.05
GA at bleeding onset (weeks)	6.8	2.5	7.5	2.2	-	-	> 0.05
Vaginal spotting	5.9	1.9	4.8	1.6	-	-	< 0.05*
Heavy vaginal bleeding	7.5	2.1	1.4	0.3	-	-	< 0.05*

Table 1: Characteristics of studied groups at presentation.

Sonographic markers

The study of sonographic markers revealed a statistically significant difference between Group I and the other two groups in terms of FHR and CRL, but no significant difference between the three groups in terms of GSD or YSD (Table 2).

	Group I (n=130)		Group II (n=170)		Group III (n=200)		P value
	Mean	SD	Mean	SD	Mean	SD	
FHR (beats/min)	98.8	24.5	157.8	18.8	166.5	15.3	< 0.05*
GSD (mm)	48.3	28.8	52.5	29.1	57.8	32.2	> 0.05
YSD (mm)	33.2	21.2	45.5	22.1	45.4	22.9	> 0.05
CRL (mm)	14.2	15.5	13.5	16.6	9.2	15.7	< 0.05*

SD=standard deviation; GA=gestational age; BMI=body mass index; *=statistically significance

Table 2: Ultrasound markers of the studied groups.

Maternal pregnancy outcome in group II and III

The pregnancy outcome complications are summarized in Table 3. We found that the first trimester vaginal bleeding increases the risk of PROM by ten-folds (95% CI: 6.3% to 15.1%). There is a statistically significant difference ($P < 0.05$) between two groups as regard gestational hypertension, and placental abruption, and. On the other hand, the difference in Preterm labor (PTL), placenta previa, preeclampsia, and Cesarean section (CS) delivery between the two groups was not statistically significant.

Neonatal outcome in group II and III

The neonatal complications are presented in Table 3. We found that the risk of LBW infant increases by two times (OR=2; 95% CI: 1.3 to 3.2%) in pregnancy with the first trimester vaginal bleeding. There is a statistically significant difference ($P < 0.05$) between two groups as regard LBW and IUGR. The Apgar score at 5 min < 7 was more frequent in case groups (17%) than in the control groups (5.1%) ($P < 0.05$). The risk of Neonatal Intensive Care Unit (NICU) admission increases by five times in case groups.

	Group II		Group III		P value	Odd ratio	95% CI
	(n=170)		(n=200)				
	n	%	n	%			
PROM	40	23.5	7	3.5	$< 0.05^*$	9.9	6.3-15.1
Gestational Hypertension	10	5.8	3	1.5	$< 0.05^*$	5.1	2.6-10.5
Placental abruption	6	3.5	2	1	$< 0.05^*$	4.8	1.8-12.9
Pre-eclampsia	10	5.8	9	4.5	> 0.05	1.7	0.9-3.1
Placenta previa	3	1.8	2	0.1	> 0.05	3.8	9.1-12.3
PTL	32	18.8	34	17	> 0.05	1.4	0.8-1.5
CS delivery	87	51.1	107	53.5	> 0.05	1.3	0.8-1.4
Birth weight < 2 kg	20	11.7	14	7	$< 0.05^*$	2.1	1.2-3.2
IUGR	11	6.4	5	2.5	$< 0.05^*$	2.8	1.6-6.3
Apgar score at 5min < 7	29	17	10	5	$< 0.05^*$	4.2	2.5-6.6
NICU admission	32	18.8	9	4.5	$< 0.05^*$	5.1	3.4-7.8

Table 3: Maternal and neonatal outcome in Group II and III.

The links between late pregnancy complications and early abnormal sonographic parameters. Patients with abnormal early sonographic markers, particularly large YSD and foetal tachycardia, were found to have a higher incidence of complications such as PROM, PTL, IUGR, placental abruption, or preeclampsia (Table 4).

	FHR (n=16)		CRL (n=7)		GSD (n=2)		YSD (n=7)	
	n	%	n	%	n	%	n	%
PROM	8	50	2	28.5			2	28.5
Gestational hypertension	1	6.5	1	14.28			1	14.28
Placental abruption			1	14.28			1	14.28
Pre-eclampsia							1	14.28
Placenta previa	5	31						
IUGR	2	12.5	3	42.8	2	100	2	28.5
CS delivery	4	25	2	28.5			4	57.2
PTL	12	75	5	71.5	2	100	3	42.8

Table 4: Late pregnancy complications in relation to early abnormal sonographic parameters.

Discussion

The outcome of first trimester vaginal bleeding is debatable. Early sonographic measures of FHR, CRL, GSD, and YSD are good sonographic parameters for predicting pregnancy outcome in women with threatened abortion, according to HLs study of singleton pregnancies with documented embryonic cardiac activity and should be routinely documented in all early pregnancy scans. Based on various combinations of early pregnancy sonographic parameters, we created a risk assessment table. The table will aid in predicting the outcome of the pregnancy.

Several previous studies have investigated whether different sonographic parameters measured in early pregnancy play a significant role in pregnancy outcome prediction, but few studies have addressed the combination of these parameters. In our study, we discovered a statistically significant difference in sonographic markers such as FHR and CRL between threatened miscarriage cases who ended with pregnancy loss or completed their pregnancy and those who had a normal pregnancy. The sensitivity and specificity of these markers, particularly FHR with a cutoff value of 115 bpm, can help us determine which women with threatened miscarriage will continue their pregnancy and which will abort. Thus, helping to modify management given to both

groups of patients. HLs result was similar to the result of [22] which reported that the first elevation of the FHR from 115 bpm at the 5th week of gestation to 170 bpm at the 9th week of gestation coincides with the morphological development of the heart. Also, similar to the result of Leyelek [23] which documented the higher incidence of abortion in cases with low FHR reflecting poor cardiac development. However, some other previous studies had higher cutoff values: [24] showed the best cutoff value of FHR for the continuation of pregnancy was 128 bpm. Dede et al. [25] found that an FHR value below 130 bpm had 81.4% sensitivity and 85.1% specificity for predicting abortion. Chitachoen and Herabutya [26] reported that FHR values below 120 bpm predicted early abortion with a sensitivity of 54.2% and false-positive rate of 5%. In our study, the best cutoff for FHR in the prediction of abortion was 115 bpm with 98.5% sensitivity and 99.2% specificity.

In a study of 188 pregnancies, Wie et al. [27] concluded that GSD below the 5th percentile and YSD below the 2.5th percentile or above the 97.5th percentile had an OR of 4.87 ($P=0.018$) and 15.86 ($P<0.001$) respectively for abortion. These findings are parallel to our results. In the current study, the CRL cutoff value of 22 mm was obtained with a sensitivity of and specificity of 46.9% and 42.3%, respectively. On the other hand,

Abuelghar et al. [28] found that 56.6% of women who experienced abortion had CRL below the 5th percentile with a sensitivity of 56.6% and specificity of 81.9%. In our study, we did not find a significant difference between the three study groups regarding GSD or YSD. HLs finding contradicts the result of the study performed by Bamniya et al. [17], which found that the incidence of pregnancy loss with large YSD and smaller GSD was 78.57% and 14.28% respectively. Moreover, Oh et al. reported that mean GSD was significant smaller in pregnancies ending in abortion (4.5 mm vs 8.2 mm; $P < 0.001$). Also, Tan et al. [14] established that the pregnancies with $YSD \geq 5$ mm had a significant higher risk of miscarriage ($p = 0.005$).

In this study, none of the demographic factors provided significant assistance in predicting pregnancy loss. The discovery of HLs could be attributed to minor age differences among the women studied. As a result, the statistical analysis was unable to assess the impact of demographic factors on pregnancy outcomes.

Papaioannou et al. reported that first trimester bleeding increased the risk of PTL. Other previous studies showed that the possibility of PTL is more in pregnant women with the first trimester bleeding due to many placental disorders. Thus, such pregnancies developed IUGR and LBW newborn. In our study, we found that the first trimester bleeding increases the risk of PROM by ten-fold (95% CI: 6.3–15.1%).

Conclusion

Finally, the CRL and FHR are good sonographic indicators for predicting outcome in women who are at risk of miscarriage. Among the studied markers, the FHR at 115 bpm has the highest predictive accuracy, while the CRL at 22 mm has the lowest. In cases of threatened miscarriage who completed the pregnancy, the incidence of maternal and foetal complications increased.

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