Study on Ultrasonographic Parameters in Predicting Abortion in Patients between 6-12 Weeks of Pregnancy

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Abstract

Background: The introduction of ultrasound into the obstetrical practice has been extremely useful in providing better understanding of the etiology of the first trimester spontaneous abortion and a basis for its clinical classification and management. The aims and objective of this study is to study the ultrasonographic parameters between 6 to 12 week of pregnancy in predicting early abortion, to assess the predictive value of ultrasonographic parameters in predicting early pregnancy and to study the associated maternal factor in present pregnancy in predicting early pregnancy loss. **Subjects and Methods:** The study included 120 patients attending OPD/emergency within 6-12 weeks of gestation, fulfilling the exclusion and inclusion criteria. **Results:** Out of 120 pregnancies, 24 pregnancies were non viable, out of which 41.66% were >30years of age. 62.5% of abortions occurred at 8-12 weeks of gestation. 17.5% females had abnormal gestation sac diameter, 6.60% females had abnormal crown rump length, 9.70 % females had abnormal yolk sac and 1 % had abnormal fetal heart rate. **Conclusion:** This study demonstrated that sonographic parameters, such as abnormal gestational sac diameter, small or large yolk sac diameter, abnormal Crown rump length and decreased fetal heart rate are associated with an increased likelihood of miscarriage. Combining these parameters may provide improved prediction of miscarriage.

Keywords: Fetal heart rate, Gestational sac diameter, Miscarriage, Ultrasound, Yolk sac diameter.

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Introduction

Spontaneous abortion is defined as involuntary loss of pregnancy before the 20 weeks or below a fetal weight of 500 gm. Approximately 12-15% of all clinically recognized pregnancies end in early abortion.[1]

The gestational sac within the thickened decidua is first sonographic proof of pregnancy. Presence of yolk sac within the gestational sac authenticates an intrauterine pregnancy.[2] When the mean gestational sac diameter is 5 to 6 mm the yolk sac, is seen by transvaginal ultrasound and it should always be visualized when the mean gestational sac diameter is greater than or equal to 8 mm.[3]

Early pregnancy failure may present with vaginal bleeding / abdominal pain. When there is no cardiac activity in an embryo greater than 5 mm by transvaginal ultrasound or 9 mm by abdominal ultrasound, sonographic diagnosis of embryonic demise can be concluded.[4]

For the diagnosis and management of early pregnancy failure, the knowledge of the ultrasound appearances of normal early pregnancy development and a proper understanding of its pitfalls are most essential. All other techniques used to study normal development of embryo in the first trimester have been rapidly replaced by ultrasound imaging. Anatomical studies showing that the first structures to appear are the celomic cavity and the secondary yolk sac have been authenticated by ultrasound features of the early gestational sac. There is no single ultra-sonographic measurement of different anatomical feature in first trimester, which has been shown to have high predictive value in determining early pregnancy outcome.[5]

In this study, Singleton intra uterine pregnancy ranging between six to twelve weeks of gestation, appeared for initial scan and those who presented with bleeding p/v, spotting, pain abdomen ,with history of recurrent spontaneous abortions and in whom cause were not known were considered and ultrasonographic parameters were used in predicting pregnancy outcome.

Subjects and Methods

A prospective cohort study was done using ultrasound as a main modality in predicting early pregnancy loss.

Inclusion criteria

Singleton intra uterine pregnancy between 6-12 weeks of gestation who came for initial scan and those who presented with bleeding p/v, spotting p/v, pain abdomen and with history of recurrent spontaneous abortions were included in the study.

Exclusion criteria

Extrauterine pregnancy, multiple pregnancies, cervical incompetence, endocrine disorders, uterine anomalies and drop outs before 20 weeks of gestation were excluded from the study.

The study included women between 6-12 weeks of gestation, who presented with complaints of bleeding p/v or spotting p/v or pain abdomen or with history of recurrent abortions or those who came for regular antenatal scan to ultrasound section in radiology department of Rajindra Hospital, Patiala. Only intrauterine singleton pregnancies were included in the study and the following parameters were measured:

1. Mean gestational sac diameter
2. Yolk sac diameter
3. CRL
4. FHR

Patients were grouped as high and low risk groupand were followed up to 20 weeks, to compare the outcome in both the groups, as to whether they end up in early pregnancy loss or continue the pregnancy beyond 20 weeks.

Examination technique

Transabdominal ultrasound was performed with patient having full bladder. : A mid-low frequency transducer having frequency 2- 5 MHz was used. This was followed by transvaginal ultrasound if needed. Transvaginal ultrasound was performed with patient positioned in dorsal lithotomy positionA mid-high frequency probe (7.5 MHz) was used. The bladder was emptied before the exam.

Results

Table 1: Chief complaints of study subjects

Chief complaint	Normal pregnancy (n=96)	Percentage	Non viable pregnancy (24)	Percentage
Bleeding per vagina	8	8.33%	11	45.83%
Pain abdomen	19	19.79%	7	29.1%
Fibroid with pain abdomen	1	1.04%	-	-
Bleeding per vagina with pain abdomen	1	1.04%	3	12.5%
Irregular Menstruation	2	2.08%	-	-
Previous EP	1	1.04%	-	-
Recurrent abortion	3	3.12%	-	-
PID	-		1	4.16%
None	61	63.54%	2	8.33%
Total	96	100%	24	

Table 2: incidence of abnormal USG parameters

USG parameter	Number of cases (n)	Number of High risk pregnancies (%)	Number of Low risk pregnancies (%)
Gestation sac diameter	120	21 (17.5%)	99 (82.5%)
Crown rump length	106	7 (6.60%)	99 (93.39)
Yolk sac	103	10 (9.70%)	93 (90.29%)
Fetal heart rate	100	1 (1%)	99 (99%)

Out of 120 females in our study 24 females (20%) suffered from Non viable pregnancies and 96 females (80%) had normal pregnancy.

Table 3: inter-relationship of various parameters with pregnancy outcome

		Normal pregnancy	Non viable pregnancy
Gestation sac diameter(n=120)	Low risk	93 (77.5%)	6 (5%)
	High risk	4 (3.33%)	17 (14.16%)
Crown rump length(n=106)	Low risk	95 (89.62%)	4(3.77%)
	High risk	1(0.94%)	6(5.66%)
Yolk sac(n=103)	Low risk	88 (85.43%)	5(4.85%)
	High risk	5(4.85%)	5(4.85%)
Fetal heart rate(n=100)	Low risk	93 (93%)	6(6%)
	High risk	0(0%)	1(1%)
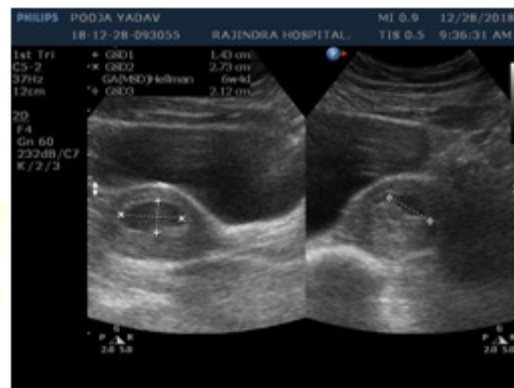
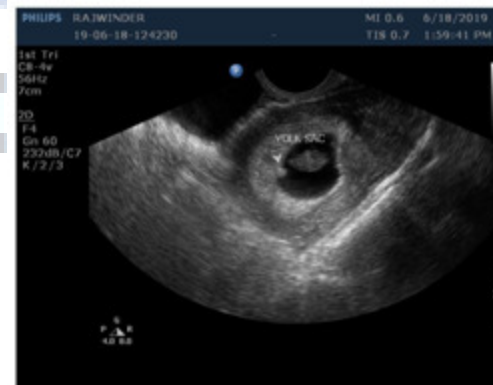**Figure 1: Only G. Sac. No yolk sac/ fetal pole seen**

Figure 2: Calcified Yolk sac with embryo

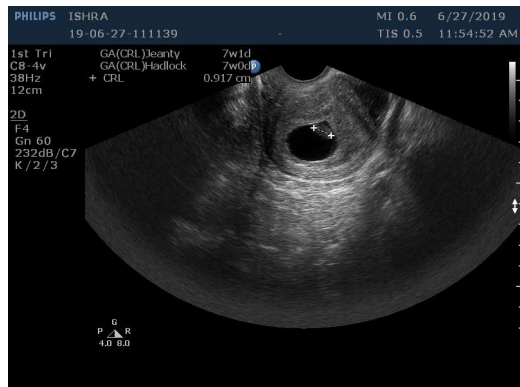**Figure 3: Subchorionic Hemorrhage**
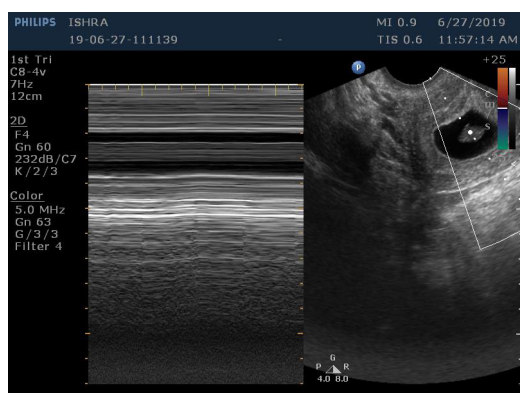
Figure 4: Embryo

Figure 5: No Cardiac Activity

Discussion

Majority of females were from the age group of 21-25 years, that is 51 females (42.5%). 43 females (35.83%) were between 26-30 years, 21 females (17.50%) were more than 30 years of age and the least common age group was ≤20 constituting 4 (4.16%) of females.

In our study also, Out of 120 pregnancies, 24 pregnancies were non viable, out of which 41.66% were >30years of age. Many studies have shown a higher risk of spontaneous abortion with increasing maternal age, possibly due to an increasing frequency of chromosomal aberrations and higher prevalence of chronic diseases with increasing age.[6-8]Kumari S[9] et al and Wie JH[10] in their studies also reported increase in the frequency of abortion with advanced maternal age.

In the present study, 58.33% of females were Primigravida and 41.66% of the females were Multigravida. Amongst non viable pregnancies, 66.66% were primigravidia. Our Kumari S et al[9] and Warburton D et al[11] reported similar observations.

Initial period of conception is most vital, as majority of the abortions occur before 12 weeks gestational age and fewer than 5% occur after identification of fetal heart activity.[12]Second trimester loss, between 12-24 weeks, occurs less frequently.[13] In our study, amongst 120 cases studied, out of 24 abortion cases, 62.5%

occurred at 8-12 weeks of gestation.

In present study Gestation sac diameter had a sensitivity of 95.88%, Specificity of 73.91%, Positive Predictive Value of 93.94%, Negative Predictive Value of 80.95% and accuracy of 91.67% in diagnosing normal and non viable pregnancies with a very significant p value. Similar results had been reported by Levi CS et al[14],in their study of 59 patients with gestation sacs greater than or equal to 8 mm, in the absence of a yolk sac predicted a nonviable pregnancy with a sensitivity of 67% and a specificity of 100%.

Datta MR and Raut A[15], in their study of 800 patients predicted Gestation sac diameter in nonviable pregnancy with a sensitivity of 45.71% and a specificity of 96.97%, Positive Predictive Value of 76.19% and Negative Predictive Value of 89.39%. Richardson A et al[16], in a meta-analysis stated thatgestational sac on ultrasound examination was found to predict an intrauterine pregnancy with a sensitivity of 52.8% and specificity of 97.6%.

Crown rump length had a sensitivity of 98.96%%, Specificity of 60.00%, Positive Predictive Value of 95.96%, Negative Predictive Value of 85.71% and accuracy of 95.28 %, in diagnosing normal and non viable pregnancies with a very significant p value.Abuelghar WM et al[17] reported that 56.6% of women experienced abortion in their study and this variable predicted early abortion with a sensitivity of 56.6%, specificity of 81.9%, PPV of 36.6%, NPV value of 91.1% and likelihood ratio positive of 3.1. Previous studies done by Abuelghar WM[17] and Mukri F[18] et al have reported, that, many pregnancies with normal outcome were also found to have a CRL or GS size that was less than expected. Similar observations were seen in our study. It is known, that, reporting of last menstrual period is susceptible to bias, with a general tendency for women to overestimate their gestational age and thus be found to have a discrepancy between observed and expected fetal size measurements.[19]

Yolk sac had a sensitivity of 94.68%, Specificity of 50%, Positive Predictive Value of 94.68%, Negative Predictive Value of 50% and accuracy of 90.29%, in diagnosing normal and non viable pregnancies with a very significant p value.

The increase in yolk sac diameter during the first trimester and its correlation with advancing gestational age lie in agreement with most of the previous study done by Cepni I et al[20], although, some researchers support that the growth of yolk sac during the first trimester was not constant.[21]

In a previous study by Lindsay DJ et al[22], in their series with 486 cases, a YS diameter more than two standard deviations above the mean, when compared with the mean gestational sac diameter, allowed prediction of an abnormal pregnancy outcome with a sensitivity of 15.6%, a specificity of 97.4% and a positive predictive value of 60.0%. A YS diameter,

more than two standard deviations below the mean allowed prediction of an abnormal outcome with a sensitivity of 15.6%, a specificity of 95.3% and a positive predictive value of 44.4%.They concluded that, abnormalities in YS size or shape might be used as predictive indicators of first trimester outcome before any other sonographically recognizable abnormality was seen.

Fetal heart rate had a sensitivity of 100%, Specificity of 14.29 %, Positive Predictive Value of 93.94%, Negative Predictive Value of 100% and accuracy of 94 %, in diagnosing normal and non viable pregnancies with a very significant p value.Fetal heart rate had been studied extensively and numerous studies have demonstrated a strong association between pathological fetal heart rate and fetal loss.[23] Dede FS et al[24] found that fetal heart rate value below 130 bpm had 81.4% sensitivity and 85.1% specificity for predicting abortion. Chittacharoen A and Herabutya Y[25] reported that fetal heart rate R values below 120 bpm predicted early abortion with the sensitivity, specificity, positive and negative predictive value and accuracy were 54.2%, 94.8%, 72.2%, 89.2% and 86.7% respectively.

Out 120 cases, some additional findings like, subchorionic hemorrhage and Oligohydramnios were seen in 10 cases. In cases of normal pregnancy, mild subchorionic hemorrhage was present in 2 (2.08%) cases. In cases of non- viable pregnancies, subchorionic hemorrhage was present in 7 (29.1%) cases and Oligohydramnios in 1 (4.1%) case.

Conclusion

Our study of singleton pregnancies with documented embryonic cardiac activity demonstrated that sonographic parameters, such asabnormal gestational sac diameter, small or large yolk sac diameter,abnormal Crown rump lengthand decreased fetal heart rate were associated with an increased likelihood of miscarriage. Combining these parameters may provide improved prediction of miscarriage.

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