The Role of Routine Ultrasonography in the First Trimester of Pregnancy

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Introduction: In the early stages of pregnancy, ultrasound is an extremely specific method for examination. This article reviews how the normal development of a baby in the first trimester of pregnancy relates to ultrasound findings.

Aim: To highlight the importance of routine ultrasonography in the first trimester of pregnancy in detecting and dating gestation, its viability and early detection of anomalies and complications

Methods: This descriptive study involved 100 pregnant women within 12 weeks of gestation attending antenatal clinic at Saveetha Medical college, during the study period
Inclusion Criteria: Pregnant women with history of amenorrhea <12 weeks of gestation.
Exclusion criteria: Individuals with history of pain abdomen and bleeding per vaginum

Results: A total of 99 pregnancies were intrauterine of which 1 was anembryonic and 2 had early pregnancy failure, 15 pregnancies were redated. One ectopic and one fibroid complicating pregnancy were aslo found.

Conclusion: Ultrasonography is an effective method to detect and date pregnancy, identify nonviable pregnancies, fetal abnormalities and early trimester complications. Hence it is ideal to use it routinely as screening tool during the first trimester of pregnancy.

Keywords: Abnormalities; ultrasound; first-trimester; pregnancy.

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1. INTRODUCTION

In the early stages of pregnancy, ultrasound is an extremely specific method of examination with a specificity of 97.6% [1]. The introduction of ultrasonography has had an undeniable impact on clinical condition evaluation in the first trimester. Ultrasound can usually determine the location and viability of a pregnancy, as well as the gestational age, by 5 weeks of pregnancy [2]. In addition to pregnancy, uterine anomalies, adnexal diseases, and cervical length can all be accurately diagnosed in the first trimester [3]. All first-trimester problems can be detected even before they become clinically apparent. By allowing for the elective termination of malformed foetuses, antenatal identification of foetal abnormalities has been demonstrated to improve maternal and perinatal morbidity and mortality. The use of ultrasound assessment of foetal nuchal translucency (NT) in combination with other sonographic soft markers and serum markers for prenatal screening of down's syndrome and other aneuploidies has been proven to be very sensitive, resulting in better antenatal care [4].

The predictive usefulness of early pregnancy findings in detecting a normal or abnormal intrauterine pregnancy or an ectopic pregnancy is explored. The aim of this study was to evaluate the role of ultrasonography in the first trimester of pregnancy for confirmation of pregnancy, number of foetuses, chorionicity, amnionicity if multiples, viability, gestational age, structural malformations.

1.1 Aims and Objectives

To depict the importance of routine ultrasound in first trimester of pregnancy for detection of early gestation, its viability, and also early detection of complications by ultrasonography.

2. MATERIALS AND METHODS

This descriptive study involved 100 pregnant women within 12 weeks of gestation attending antenatal clinic at Saveetha Medical college, during the study period.

Inclusion Criteria:Pregnant women with history of amenorrhea <12 weeks of gestation.

Exclusion criteria: Individuals with history of pain abdomen and bleeding per vaginum.

At booking, a full history and a complete clinical examination were done after receiving informed written consent. Every routine first trimester investigation was done. After describing the technique to the patients, all of them were subject to transabdominal sonography (TAS) or transvaginal sonography (TVS) depending on the case. Patients who consented for TVS were given a transvaginal scan and patients who did not consent to TVS were given a transabdominal scan.

Study parameters considered were gestational sac location, presence of yolk sac, decidual reaction presence or absence of fetal pole, Fetal heart rate, crown-rump length (CRL) measurements, uterine anomalies and tumor, pelvic or adnexal mass, cervical length, internal os condition, study of nuchal translucency (NT) and nasal bone.

3. RESULTS

The study involved 100 pregnant women who were in the first trimester of which 12 % were between 17 and 20 years, 29% were aged between 21 and 24 years, 38 % between 25 and 29 years and the remaining 21% were between 30 and 36 years old.

Of all the pregnancies 39% were primigravida, 99% had a single embryo and 1% were anembryonic pregnancies.

In all the cases of the present study the internal Os was closed and there was a yolk sac present in 99% of the pregnancies.

98% of the pregnancies had an adequate decidual reaction, 96% of the cases had a normal foetal heart rate and adequate foetal physical activity. Foetal pole was present in 99% of the cases.

In 15% of the participants, the discrepancy between gestational age by dates and by scans was observed to be greater than 5 days and were redated.

2% of the pregnancies showed embryonic demise whereas 1% were extrauterine and another 1% were complicated by uterine mass (fibroid). None of the study participants had any pelvic or adnexal mass.

Majority of the women in this study i.e. 31% were screened between 9 – 9 weeks 6 days. The mean cervical length of the participants was found to be 3.49 cm.

Table 1. Distribution of women by gestational age by LMP

Gestational age by dates (in weeks)	Number (n = 100)
6 – 6 weeks 6 days	1
7 – 7 weeks 6 days	1
8 – 8 weeks 6 days	26
9 – 9 weeks 6 days	23
10 – 10 weeks 6 days	19
11 – 11 weeks 6 days	15
12 – 12 weeks 6 days	15

Table 2. Nuchal translucency findings

Nuchal translucency(mm)	Number of patients (n = 97)	Percentage
Not done	72	74.23 %
0.1 to 1.0	9	9.28 %
1.1 to 2.0	16	16.49 %

Table 3. Ultrasonography findings

Scan findings	Number n =100 (%)
Normal	80 (80)
Blighted ovum	1 (1)
Embryonic demise	2 (2)
Wrong dates	15 (15)
Uterine mass (Fibroid)	1 (1)
Ectopic	1 (1)
Total	100 (100)

Table 4. Gestational age by USG and CRL

Gestational age (weeks)	Number of patients (n = 99)	Mean of Crown rump length (mm)	Standard deviation
6- 6 weeks 6 days	1	13.50	0
7 – 7 weeks 6 days	1	14.10	0
8 – 8 weeks 6 days	25	19.32	2.60
9 – 9 weeks 6 days	31	29.21	3.98
10 – 10 weeks 6 days	16	41.06	3.38
11 – 11 weeks 6 days	11	56.41	5.60
12 – 12 weeks 6 days	14	65.06	4.82
Total	99	36.46	16.71

Table 5. Mean yolk sac diameter according to gestational age

Gestational age (weeks)	Number of patients (n = 99)	Mean yolk sac diameter (mm)	Standard deviation
6- 6 weeks 6 days	1	2.12	0
7 – 7 weeks 6 days	1	2.36	0
8 – 8 weeks 6 days	25	3.47	1.98
9 – 9 weeks 6 days	31	4.21	2.17
10 – 10 weeks 6 days	16	4.68	1.57
11 – 11 weeks 6 days	11	3.43	1.99
12 – 12 weeks 6 days	14	2.97	1.78
Total	99	3.32	1.36

Table 6. Nasal bone findings

Nasal bone	Number of cases n = 97 (%)
Not done	63 (64.94
Seen	34 (35.05)
Not seen	0
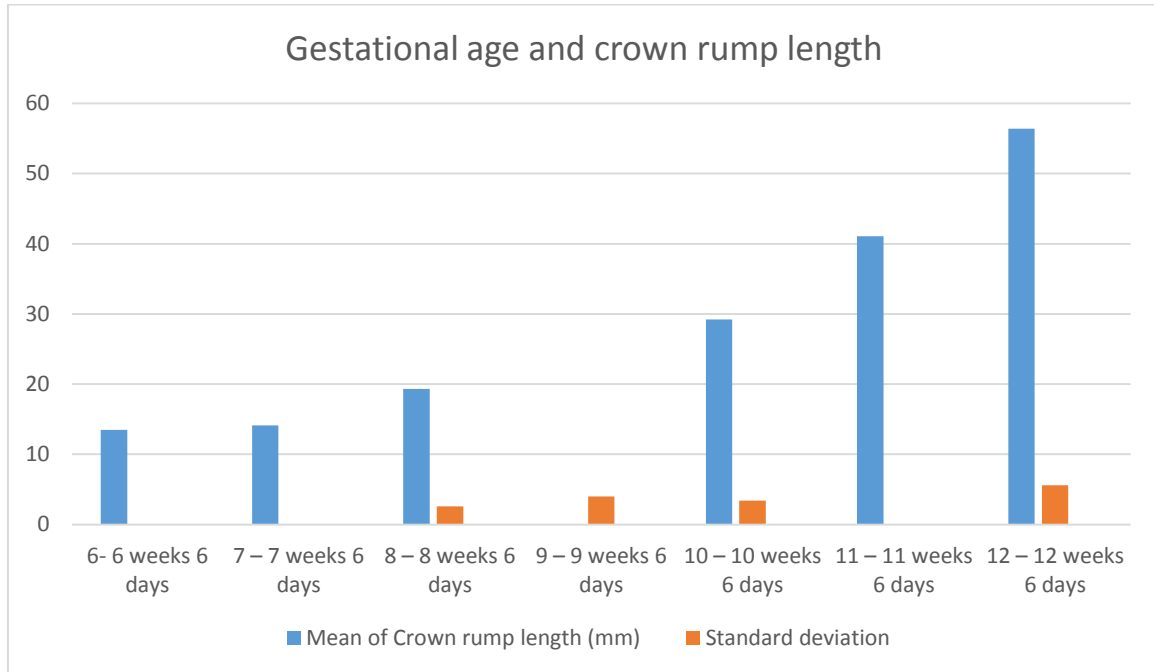
Graph 1. Gestational age and crown rump length
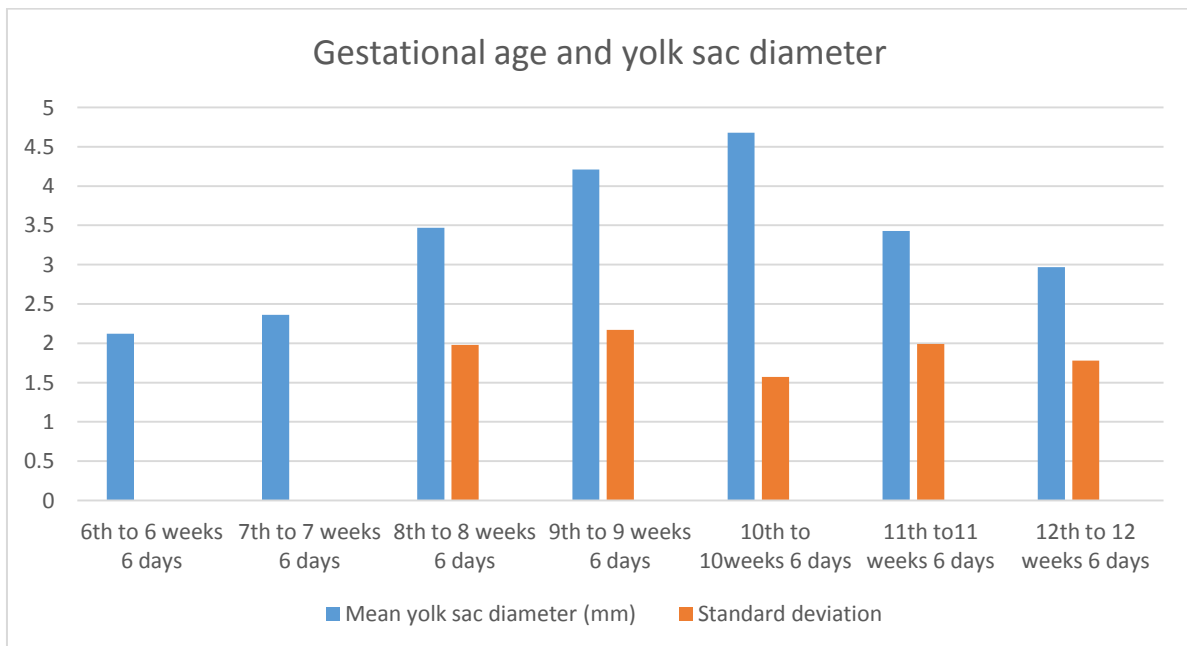
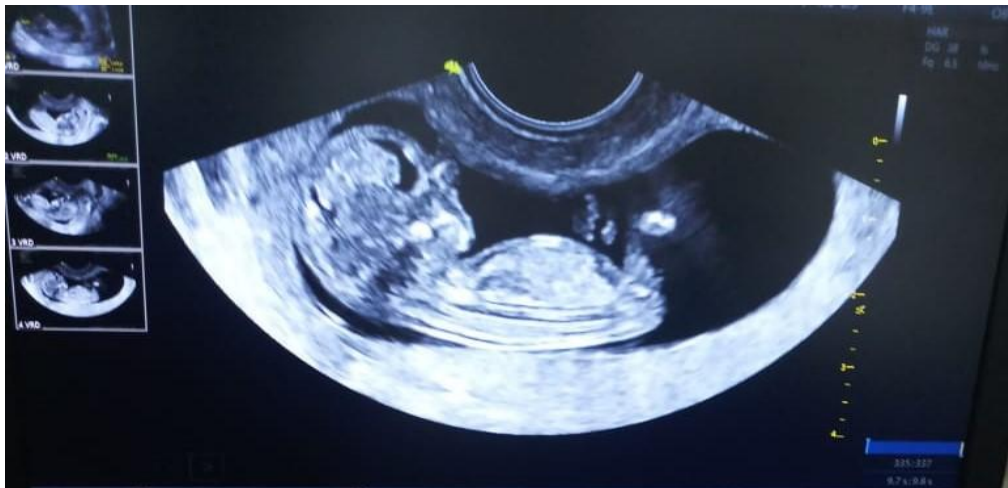**Graph 2. Gestational age and yolk sac diameter**

Fig. 1. A dating scan

Fig. 2. A scan measuring the crown rump length

Table 7. Distribution of participants according to maternal age

Maternal age	Number of participants n = 100 (%)
17 to 20	12
21 to 24	29
25 to 29	38
30 to 36	21

Table 8. Number of primigravidae and multigravidae

Primigravidae or Multigravidae	Number of participants n = 100 (%)
Primigravida	39 (39)
Multigravida	61 (61)

Fig. 3. Nuchal translucency scan

Fig. 4. Gestational SAC seen on a sonogram

Nuchal translucency tests were done only for 25% of the women. All the participants who underwent the test were found to have normal NT values (less than 2mm).

Out of all the participants 80 % were found to be normal according to the ultrasonogram.

4. DISCUSSION

Ultrasonography is one of the most important aspects of antenatal care which is the preventive arm of obstetric medicine. According to recent studies ultrasonography is a crucial component in both high risk and low risk pregnancies during the first trimester i.e. the diagnosis of causes of first trimester vaginal bleeding [5] and in the detection of first trimester anomalies during routine ultrasound scans [6].

Ultrasonography plays a vital part in the detection of early gestation. The earliest sign of intrauterine gestation is an echogenic area within the thickened decidua and it can be seen as

early as 25-days menstrual age [7]. Detection of a pregnancy that early can greatly improve the outcome of the pregnancy through a lot of ways, for example avoidance of practices that are harmful to a pregnant woman such as radiation, smoking, alcohol, use of certain drugs or through early initiation of supplements such as folic acid which help in preventing neural tube defects.

The application of first trimester ultra sound screening to a low risk obstetric population results in a significant reduction in the rate of induction of pregnancies [8]. In our study 15 % of the study population had to be redated due to unreliable LMP dates. This observation further emphasizes the importance of routine ultrasound scans in order to avoid complications of unwarranted induction of labour such as prolonged labour and increased morbidity.

Most of the pregnancies i.e. 99% were intrauterine with 1% being an ectopic pregnancy. Ultrasonography as the first step is the most efficient and accurate method of diagnosing ectopic pregnancies [9].

80% of the pregnancies belonged to the normal category. An ultrasound scan can be considered as normal when the following criteria are met

- Presence of a yolk sac within the gestational sac denoting a intrauterine pregnancy
- embryo should be visualized when the MSD is at least 25 mm otherwise considered an anembryonic pregnancy
- Gestational age by CRL is within 5 days of Gestational age calculated by LMP method.
- Presence of a fetal heart rate
- Nuchal translucency value is less than 4mm and nasal bone is visualized from the 11th week
- Absence of pelvic or adnexal pathology

All the embryonic pregnancies in our study had a yolk sac. The mean yolk sac diameter was 3.32 ± 1.36 mm. The yolk sac diameter increased steadily from 6 weeks to 10 weeks and then declined from the 10th week till the 12th week although *P* value was not significant (0.162).

Thus along with the absence of the foetal pole and foetal heart rate, the absence of the yolk sac also points towards an anembryonic pregnancy although an irregular, large, empty yolk sac

without an embryo may also be seen in anembryonic pregnancies [10].

All the Crown rump length (CRL) values of the participants were adequate for their respective gestational age. CRL was measured in 99 cases as one of the cases had an anembryonic pregnancy. CRL is the most crucial parameter in assessing the gestational age in a pregnancy [11].

Using a one-way analysis of variance (ANOVA) statistical test it was found that the correlation between gestational age and CRL was extremely significant with a *P* value of < 0.001.

The total of the mean of CRL and standard deviation give the average crown rump length of the participants in the study which came out to be 36.46 ± 16.71 mm. CRL values increase as the gestational age of the fetus increases and it is an accurate parameter to use in determining the age of the fetus.

Foetal heart rate was absent in 2 embryos in the presence of a foetal pole pointing towards a diagnosis of embryonic demise. In such cases of miscarriages where symptoms such as bleeding or spotting per vaginum or abdominal pain are absent ultrasonography plays a vital role in diagnosing these missed abortions and reduces complications of missed abortions like infections.

Nuchal translucency and nasal bones can be seen on an ultrasound scan from the 11th week of gestation and are important indicators of chromosomal abnormalities like Trisomy 21 [12,13]. All the nuchal translucency and nasal bone scans that were done in the current study came back with normal values, this could be attributed to the fact that only one of the participants in the study was 35 or above and the incidence of downs syndrome is high in that age group [14].

98% of the pregnancies in our present study had an adequate decidual reaction whereas the remaining 2% had an inadequate decidual reaction indicating either an anembryonic pregnancy or an ectopic pregnancy. A thin decidual reaction of less than 2 mm is considered one of the features suggestive of anembryonic pregnancy [15].

The mean cervical length in the present study was found to be 3.49 cm with a standard deviation of 0.352 cm which falls within the

normal range for women in the first trimester of pregnancy. A short cervical length predisposes to preterm labour or spontaneous abortion due to cervical insufficiency [16]. Hence a routine ultrasonography in the first trimester is essential to identify women with short cervix and manage the pregnancy appropriately with a cerclage, pessary etc.

Ultrasonography is very useful in detecting any uterine anomalies or pelvic or adnexal masses. In our study one case of fibroid complicating pregnancy was diagnosed with ultrasonography. Uterine tumors like fibroids can complicate pregnancy by increasing chances of preterm birth [17] and also increase the likelihood of an LSCS.

Ultrasound is a reliable method for detecting nonviable pregnancies before they present clinically, allowing for scheduled termination rather than emergency surgery and the physical trauma of vaginal bleeding.

Ultrasound also precisely dates the pregnancy, lowering the rate of induction, and accurately detects multiple pregnancies and chorionicity. Accurate NT measurement is a successful technique of screening for foetal abnormalities and imaging of the uterus and adnexal structures, as well as cervical length, can identify some structural problems beforehand.

5. CONCLUSION

Ultrasonography is a noninvasive, nonradioactive, effective, highly accessible and relatively cheap method to date pregnancy, identify nonviable pregnancies, fetal abnormalities and early trimester complications. Hence it is ideal to use it routinely as screening tool during the first trimester of pregnancy.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline Patient's consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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