BENEFITS OF TRANSVAGINAL SONOGRAPHIC ASSESSMENT OF EARLY PREGNANCY

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ABSTRACT

Objective: The aim of this study was to investigate the benefits of transvaginal sonographic assessment of early pregnancy.

Material and Methods: As a prospective observational study, 103 pregnant women were followed until delivery or completion of a failed pregnancy. Between 6 and 14 weeks of gestation 250 transvaginal ultrasonographic examinations were performed. During the examination, fetal viability and anatomy was evaluated, yolk sac diameter was measured and fetal biometry was established.

Results: Of the 103 pregnancies, 10 cases were diagnosed as missed abortion in which 40% had no complaint, 2 cases miscarried during follow up and one cystic hygroma case was terminated medically. The abortion rate after the determination of fetal cardiac activity was found to be 2.1 %. For the yolk sac diameter, two standard errors above or below the confidence limits, the sensitivity and specificity of predicting an abnormal outcome (abortion, anomaly, neonatal exitus) was found to be 75% and 95.5% respectively.

Conclusion: Sonographic assessment of early pregnancy is a very valuable tool for identifying fetal viability, early diagnosis of fetal anomalies and predicting pregnancy outcome.

Key Words: Transvaginal sonography, Early pregnancy, Yolk sac

INTRODUCTION

The natural history of early pregnancies has long been of great interest to clinicians. Transvaginal sonography allows the use of higher frequency transducers than with traditional abdominal ultrasound, thus providing superior resolution with earlier and more accurate identification of fetal structures. The increasing use of transvaginal ultrasound in obstetrics has provided us with a growing volume of data on the first trimester embryo. Normal ultrasonographic appearance of fetal structures has been described in early gestation (1). First trimester diagnosis of fetal malformations has recently been increasingly reported (2,3). The value of embryonic landmarks such as the yolk sac diameter and the fetal heart rate, identified with endovaginal ultrasound in predicting the outcome of pregnancies, has been evaluated (4,5). Thus transvaginal sonography is now being used in obstetrics for an increasing number of indications and serves as a valuable tool in pregnancy care.

The aim of this study was to investigate the value of transvaginal ultrasonography in pregnancy care of prospectively followed pregnant women and also to find out the value of this technique in predicting the outcome of pregnancies.

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MATERIAL AND METHODS

A total of 103 women attending the antenatal clinic between 6 and 12 weeks of gestation were followed prospectively until delivery or completion of a failed pregnancy. The perinatal outcome, abortion and fetal anomaly rates were evaluated. All were singleton pregnancies, had regular menstrual cycles, were certain of the first day of the last menstrual period and none had any known maternal pathology.

Between 6 and 14 weeks of gestation 250 transvaginal ultrasonograpic examinations were performed by two of the authors. Transvaginal sonography was performed with a woman lying in a dorsolitotomy position at a gynaecologic table. Scans were done with a Siemens Sonoline SL-2 (Siemens Medical Systems, Torrance, CA), with a 5 MHz vaginal probe. During the examination, the fetal anatomy was thoroughly evaluated, with special attention to any kind of fetal anomaly. Cardiac activity was determined visually, using the highest magnification available and deemed absent after at least 3 minutes of scanning time.

The mean yolk sac diameter was calculated by averaging the longitudinal and transverse diameters of the yolk sac. Regression analysis was performed to evaluate the relationship between mean yolk sac diameter and gestational age. A mean yolk sac diameter below or above 2 standard errors of the regression were considered abnormal and the sensitivity, specificity, positive predictive value and negative predictive value of abnormal yolk sac size in predicting abnormal outcome were determined.

RESULTS

Of the 103 pregnancies, 10 were found to have an absent cardiac activity at the initial transvaginal examination performed between 6 and 9 weeks of gestation. Vaginal bleeding was a presenting symptom in six of ten and the remaining four had no complaint. Ninety-three women, two of whom had miscarriages during the follow-up period showed fetal cardiac activity at initial sonography. The abortion rate in the study group was found to be 11.6 % (12/103). Whereas the abortion rate after the determination of fetal cardiac activity was found to be 2.1 % (2/93).

Considering vaginal bleeding in early pregnancy, 14 pregnant women had it initially and 5 developed it during follow-up. Of the 19 pregnancies with first trimester vaginal bleeding, 6 were found to have as absent cardiac activity and the remaining 13 were diagnosed threatened miscarriage. The ratio of threatened miscarriage in the study group was 13.9% (13/93). One out of 13 threatened miscarriage cases ended up with spontaneous abortion and the rest delivered at term.

Of the 93 cases followed during their pregnancies, one was found to have cystic hygroma. It constituted the only congenital anomaly seen in our study group. The rate of congenital anomaly in our study was found to be 1.07%. In this case, amniocentesis was performed at the 15 th gestational week and the karyotype result obtained was XX. After discussion with the family, medical abortion was performed at the 18 th week of gestation.

Of the 103 pregnancies, 10 cases were diagnosed as missed abortion at the initial examination and 2 cases miscarried during follow up. One cystic hygroma case was terminated medically. Out of the remaining 90 pregnancies, one delivered at the 27 th week of gestation and neonatal exitus occurred because of the RDS. The mean birth week of the study group was determined to be 38.46±2.10 weeks (27-41 weeks) and the mean birth weight 3185± 470 gm (900-3860 gm). Ten of the pregnancies ended before 38 weeks and preterm labour ratio was found to be 11.9 % (10/90).

Using transvaginal sonography; embryo, amniotic sac and extraamniotic cavity were visualised at early pregnancy. Extraamniotic cavity was observed to close at 11 weeks and 4 days at the earliest and 13 weeks and 5 days at the latest. Extraamniotic cavity was observed in all cases until the 11th week of gestation.

The mean yolk sac diameter was measured with 165 consecutive sonographic examinations between the 6th and 13th weeks of gestation. The best description of the relation between

mean yolk sac diameter and gestational age was achieved by quadratic function ($y= 0.0024x^2 + 0.3499x - 5.3733$, $r=0.363$, $p=0.001$) and illustrated in (Fig. 1). An abnormal yolk sac measurement was defined as being more than two standard errors above or below the mean. Two cases were found to have values below the 95% confidence limits, the cystic hygroma was detected in one of these. Mean yolk sac diameters measured above the 95% confidence limits were visualised in five cases, which one of had an abortion in the ninth week and another had preterm delivery at the twenty ninth week (neonatal death). The remaining cases delivered at term. For the yolk sac diameter, two standard errors above or below the confidence limits, the sensitivity of predicting an abnormal outcome (abortion, anomaly, neonatal exitus) was 75%, the specificity was 95.5%, the positive predictive value was 42.8% and the negative predictive value was 98.8%.

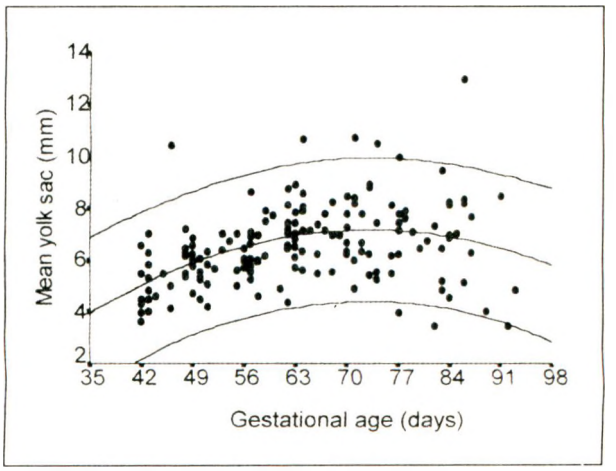

Fig. 1 : Individual measurements of mean yolk sac diameter and reference ranges (mean and 95% data intervals) plotted against gestational age.

DISCUSSION

The first trimester of pregnancy is a dynamic period, during which changes in human development occur at a more rapid rate than at any time during human life. With the advent of high-resolution endovaginal sonography it is possible to visualise normal and abnormal embryonic development earlier and with better resolution than ever before. One of the goals of first trimester sonography is the early identification of nonviable pregnancy. The single most important feature for the detection of embryonic life is the identification of cardiac activity. It is likely that most equipment should be able to identify cardiac activity in normal embryos greater than 5-mm crown-rump length by transvaginal route (6,7). In our study group, 40% of unviable pregnancies were diagnosed as a part of routine transvaginal examination at 6 to 9 weeks of gestation without any complaint from the patient. On the other hand, after the demonstration of fetal cardiac activity sonographically, the risk of pregnancy loss declines to 2 - 6.1% (8,9). We also noted a 2% abortion rate after detecting fetal heart motion. These findings highlight the value of early ultrasound examination even for pregnancies without any complaint. Vaginal bleeding is a common complication that occurs in approximately 20-25 % of pregnancies. In this study, 19 of 103 patients (18%) were found to have vaginal bleeding at the first trimester and six were diagnosed as having missed abortion (42.8 %). This finding signifies the benefit of embryonic well-being assessment by vaginal scanning at the first trimester of pregnancy, especially for those with vaginal bleeding.

With the advent of high-resolution endovaginal sonography, first trimester diagnosis of most of the fetal anomalies may be possible. Early identification of fetal anomalies should be the primary aim in fetal anomaly management. Among all the pregnancies we followed, the rate of fetal abnormality was 1.07%. Since early diagnosis of fetal anomalies would appear to be possible by understanding normal and abnormal anatomy in the first trimester, detailed assessment of fetal anatomy at 11-12 weeks of gestation is indicated.

The human yolk sac has nutritive, endocrine, metabolic, immunologic, secretory and haematopoietic functions during the early stage of embryo development and organogenesis (10). Therefore, abnormalities in its size suggest an impairment of these functions and may predict abnormal fetal outcome. The association of abnormal human yolk sac size, with structural and chromosomal abnormalities and poor fetal outcome has been reported (11-13). The predictive value of yolk diameter above or below

the confidence limits for abnormal pregnancy outcome was reported to have a sensitivity of 26.9%, the specificity of 92.7% and the positive predictive value of 51.1% (11). In that study abnormal outcome was defined as abortion or demonstrable fetal anomaly. In our group, we had 4 abnormal outcomes as two abortions, one fetal anomaly and one premature delivery which died in the neonatal period. When we take all these abnormal outcomes into consideration, the predictive value of yolk sac diameter two standard errors above or below the confidence limits, the sensitivity was 75%, the specificity was 95.5%, the positive predictive value was 42.8 % and the negative predictive value was 98.8%. These findings are higher than stated in the literature and if we exclude the neonatal exitus case, sensitivity drops to 66.6%. According to our findings, yolk sac diameter has a fairly good predictive value for abnormal pregnancy outcome.

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