ORIGINAL ARTICLE

ULTRASOUND CHARACTERISTIC OF EMBRYO, FETAL EGG AND CHORIONIC STRUCTURES IN PREGNANT WOMEN WITH MISCARRIAGE

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ABSTRACT

The aim: The aim of the study was to assess the peculiarities of the formation and development of the fetoplacental system, to study the structures of the embryo, gestational sac, chorion in pregnant women with miscarriage.

Materials and methods: A comprehensive ultrasound examination of 50 pregnant women was carried out in the period from 5 to 16 weeks of pregnancy, of which 25 - with a history of miscarriage (main group), and 25 - with an unremarkable medical history (control group).

Results: We have identified the following echographic markers of adverse course and outcome of pregnancy in women with miscarriage in embryonic and early fetal periods:- lag of CRL of an embryo by 2 weeks and more at ultrasound examination in terms up to 9 weeks of gestation;- corporal or basal (near the stem of the embryo body) location of chorionic detachment with the formation of retrochorial hematoma with a volume of more than 25 ml;- pronounced progressive decrease in the volume of the gestational sac and amniotic cavity;- pronounced polyhydramnios with the presence of a coarse echopositive suspension in the amnioticcavity. The likelihood of spontaneous miscarriage and the formation of placental dysfunction is higher with the simultaneous detection of 2 or more echographic markers.

Conclusions: Ultrasound examination is necessary to assess the echographic parameters of the formation and development of the embryo and extraembryonic structures in the first trimester with a history of miscarriage in order to the subsequent choice of rational tactics of pregnancy management.

KEY WORDS: Pregnancy miscarriage, embryo, volume of fetal egg, chorion, placental dysfunction, abortion

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INTRODUCTION

Miscarriage is the most common serious complication of pregnancy, occurring in approximately 20% of pregnancies[1]. Despite a significant number of scientific works aimed at studying the dysfunction of the fetoplacental complex during miscarriage, this problem still remains one of the most difficult among obstetric pathology. The frequency of this pathology continues to grow, remaining one of the leading pathogenetic links in reproductive losses [2,3]. Moreover, 80% of early pregnancy loss occurs in the first trimester[4]. At present, very little attention is paid to the study of disorders in the formation of the fetoplacental complex. That is why the study of those complex and multisystem processes occurring in the body of women with miscarriage already in early gestational periods, the peculiarities of the formation of the fetoplacental complex, is relevant and will help to reduce the frequency of obstetric and perinatal pathology [5]. Ultrasound is essential in the evaluation of early pregnancy loss threat [6]. The study of echographic changes in the embryo, embryonic structures and chorion in pregnant women with miscarriage in the first trimester of pregnancy is of great prognostic value[7,8]. It is important to identify specific markers of impaired formation of the fetoplacental complex, which will allow in the future to prevent the development of primary fetoplacental dysfunction, and as a result of possible perinatal losses.

THE AIM

The aim of the study was to assess the peculiarities of the formation and development of the fetoplacental system, to study the structures of the embryo, gestational sac, chorion in pregnant women with miscarriage. We wanted to identify the main pathological changes, which are typical for pregnant women with miscarriage, to determine ultrasound markers of fetal disorders in early gestation terms, their correlation and impact on the subsequent course of pregnancy, as well as to identify adverse prognostic signs, including those that subsequently led to abortion or premature birth. This will allow creating a set of therapeutic and prophylactic measures aimed at correcting this condition at an early stage, before the appearance of morphological changes in the placenta and the launch of irreversible pathogenetic mechanisms. In the future, this will promote the full-fledged development of the fetus, the normal course of pregnancy and childbirth, and therefore will reduce perinatal losses.

MATERIALS AND METHODS

A comprehensive ultrasound examination of 50 pregnant women was carried out in the period from 5 to 16 weeks of pregnancy, of which 25 - with a history of miscarriage (main group), and 25 - with an unremarkable medical history (control group). All patients of the main and control groups underwent general clinical and special obstetric examination (clarification of complaints, collection of anamnesis, general medical examination, obstetric examination), ultrasound examinations. Ultrasound examinations were carried out in real time. Ultrasonic scanning was performed on a SONOACE 8800 "GAI MT" apparatus using a convex probe with a power of 3.5 to 7.5 MHz. The state of the embryo was assessed as normal, provided that the indicators of its biophysical activity, cardiac activity remained within the normal range. If the results of the study of one or several methods did not fit within the boundaries of the gestational norm, the state of the embryo was considered impaired.

RESULTS

We studied the time of visualization of the embryo in the cavity of the gestational sac in pregnant women with miscarriage. In 21 (84.0%) cases, visualization of the embryo with a gestational sac diameter of 14 mm or more was observed, which corresponded to 6 weeks of pregnancy in the presence of a regular menstrual cycle. Upon further observation in 3 (12.0%) patients with a history of miscarriage revealed a lag of crown rump length (CRL) from the expected values by 6-10 days. At repeated ultrasound scan performed after 2 weeks, 2 (8.0%) observations showed a positive increase in embryometric parameters and their compliance with gestational age. In 2 (8.0%) pregnant women, the embryo's CRL lagged behind the gestational age by no more than 7 days.

At dynamic ultrasonic control and carrying out fetometry fluctuations of biometric parameters of a fetus within normative limits for term are noted.At the same time, in 1 (4.0%) patients, a progressive decrease in the CRL of the embryo in combination with a decrease in the gestational sac volume (GSV) allowed to diagnose growth retardation of the embryo, which was a clinical symptom of primary placental dysfunction. Subsequently, in these observations, various complications of the gestational process were diagnosed: miscarriage that did not occur in 2 (8.0%) and spontaneous miscarriage in up to 10 weeks 1 (4.0%). It should be noted that the delay in embryometric parameters (CRL) was twice as often diagnosed in the presence of threatened abortion than in the absence of a clinical picture of this complication. At the same time, there was a clear tendency to improve the growth of embryometric parameters after the relief of symptoms of miscarriage.

The next indicator under study was the volume of the gestational sac. Gestational Sac Volume (GSV) in 15 (60.0%) examined women met the parameters characteristic of the uncomplicated course of pregnancy. Deviations from the norm were detected in 10 (40.0%) observations. The decrease in GSV was observed in 7 (28.0%). As can be seen from the presented data (Fig. 1), the reduction of GSV is mainly due to a decrease in the volume of the amniotic cavity, while the decrease in the volume of the exocelome occurs to a lesser extent.

In all cases, the decrease in GSV and amniotic cavity (early oligohydramnios) was accompanied by clinical signs of threatened abortion. In 8 (32.0%) of 25 pregnant women with only pain in the lower abdomen there was an isolated decrease in amniotic volume, which on the background of antispasmodic therapy returned to normal values ($p > 0.05$). However, in the other 15 (60.0%) cases with a long-term persistent threat of abortion, which required the administration of hormone therapy, there was a decrease in the volume of the gestational sac and amnion. At repeated ultrasonic research in 2-3 weeks GSV continued to decline. However, in the isolated increase in myometrial tone in the absence of clinical manifestations of threatened abortion, there was a predominantly isolated decrease in the volume of the amniotic cavity, which was easily corrected by the administration of traditional antispasmodic therapy.

The structure of the chorion was also assessed by ultrasound. From 25 patients with a history of miscarriage, 21 (84.0%) had echographic features of the chorion, which relate to its structure. In 15 (60.0%) cases, a chorion of heterogeneous echogenicity with echo-negative inclusions of small sizes was visualized. In the other 10 (40.0%) pregnant women, the echographic features of the chorion consisted in an increase in echogenicity. In this case, its thickness throughout the study did not differ from the values of the standard indicators. A decrease in the thickness of the chorion was diagnosed in one pregnant woman at 7 weeks with pronounced signs of the threatened abortion and early toxicosis. Against the background of hormone therapy, the re-examination showed a normalization of the chorionic thickness.

A significant increase in the thickness of the chorion up to 15 mm and an uneven contour of its fetal surface were registered at 9 and 10 weeks of pregnancy in 2 patients with retrochorial hematoma, an increase in the yolk sac, and early oligohydramnios. Retrochorial hematoma was observed in 7 (28.0%) patients with miscarriage at 8 weeks gestation. At the same time, all pregnant women experienced spontaneous termination of pregnancy up to 10 weeks. Of these, in 5 (71.4%) observations with ultrasound scanning, a corporal location of the hematoma was noted, and in 2 (2.6%) patients - supracervical. The size of the chorionic separation site in 4 (57.1%) cases was no more than 20 ml (on average 16.5 ± 2.2 ml). The other 3 (42.9%) pregnant women were diagnosed with a large (more than 20 ml), the volume of retrochorial hematoma on average 25.1 ± 4.4 ml. Analysis of the course and outcome of the first trimester of pregnancy revealed an unfavorable prognostic value of detecting the corporal location of the hematoma in contrast to the supracervical.

DISCUSSION

According to our results, the CRL value of the embryo is the most informative for predicting the course and outcome of the gestational process in the first trimester of pregnancy. Using three-dimensional ultrasonography, small gestational sac volume (below the 5th percentile) is associated with risk

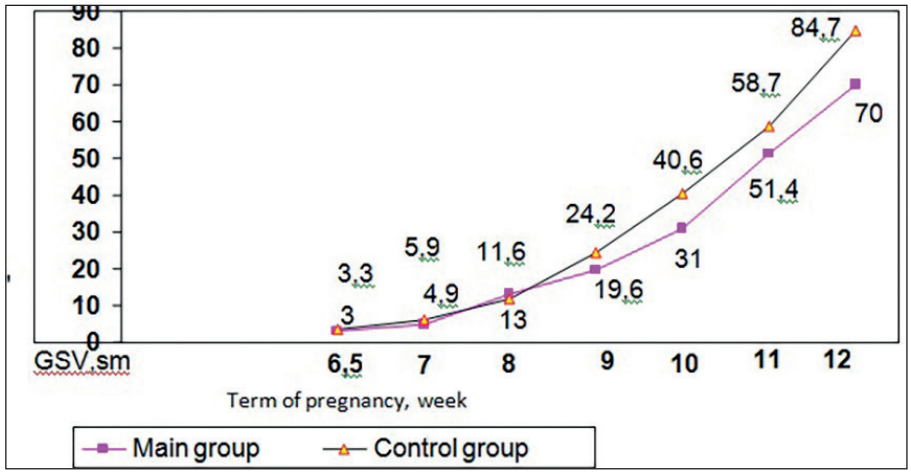

Fig. 1. Gestational Sac Volume (in cm^3) in the normal course of pregnancy and in women with miscarriage

of miscarriage with odds ratio of 5.25[9]. Reduction of GSV and amniotic cavity was characteristic of echographic signs for pregnant women with miscarriage. When clinical manifestations of threatening miscarriage are pronounced, the most sensitive echographic signs were a decrease in GSV, which is a marker of further unfavorable course and outcome of pregnancy. The data obtained by us are confirmed by the results of a study conducted by Abdallah Y, where CRL and GSV were the main criteria of early miscarriage diagnostic [10].

A more recent study provided by Devilbiss EA found that the combination of low fetal heart rate and small CRL increases the risk of subsequent pregnancy loss, from 5.0% to 21%[11].

Echographic features of the chorion, as a rule, correlate with other changes in the gestational sac and do not have an independent prognostic value. Correlation analysis between the echographic parameters of the gestational sac in pregnant women with miscarriage revealed a number of reliable dependencies. So, up to 10 weeks, there was a decrease in the relationship between the volumes of the amniotic and chorionic cavities with the CRL of the embryo, which in turn probably increased the risk of spontaneous miscarriage (r1 = 0.67; r2 = 0.63). In the course of therapy, after 10 weeks, against the background of improvement in clinical symptoms, the ratio between amnion and CRL corresponded to the normal course of pregnancy (r1 = 0.92). Early re-monitoring of CRL and GSV is needed not only for early misscarriage diagnosis. It will also helpful for preventing the potential termination of a viable pregnancy, as confirmed by A Pexsters` research [12]. The lag of CRL and GSV from normal in the early stages is a clear criterion for miscarriage. Repeated scans performed by J Preisler showed that the size of the gestational sac ≥25 mm and were 100% specific for early miscarriage CRL ≥7 mm [13]. Studies conducted by Vovk et al confirm the effectiveness of early diagnosis of miscarriage[14].

Further study of the ultrasound features of the structures of the embryo, gestational sac and chorion in pregnant women with miscarriage has an important prognostic value. In the future, it is planned to conduct a full range of examinations of pregnant women (in particular, the level of hormones that characterize the state of the feto-placental complex, genetic and morphological studies of the placenta) to form criteria for a comprehensive assessment of fetal disorders in early pregnancy.

CONCLUSIONS

The size of the amnion and gestational sac are prognostically significant criteria for complicated pregnancy. We have identified the following echographic markers of adverse course and outcome of pregnancy in women with miscarriage in the early embryonic and early fetal periods:

- lag of CRL of an embryo by 2 weeks and more at ultrasound examination in terms up to 9 weeks of gestation;
- corporal or basal (near the stem of the embryo body) location of chorionic detachment with the formation of retrochorial hematoma with a volume of more than 25 ml;
- pronounced progressive decrease in the volume of the gestational sac and amniotic cavity;
- pronounced polyhydramnios with the presence of a coarse echopositive suspension in the amniotic cavity.

The likelihood of spontaneous miscarriage and the formation of placental dysfunction is higher with the simultaneous detection of 2 or more echographic markers. Based on the above, it can be concluded that an ultrasound examination is necessary to assess the echographic parameters of the formation and development of the embryo and extraembryonic structures in the first trimester with a history of miscarriage in order to identify markers of a complicated course of gestation and the subsequent choice of rational tactics of pregnancy management.

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