

# Ultrasound Assessments of Missed Abortion in Early Pregnancy

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## INTRODUCTION

A missed abortion is a pregnancy in which early fetal death occurs. It is defined by ultrasound as the fetal pole is visible but no fetal heart beat is seen. It is a major problem for ultrasonographers because an early detailed scan is beyond the accurate resolution of the ultrasound technique. A follow-up scan is necessary to assess the viability of the fetus in utero. The value of ultrasound assessment in a patient in early pregnancy is not only to define accurately the gestational age of the pregnancy, but also in assessing the viability of the pregnancy.<sup>1</sup> Moreover, we can easily detect some congenital uterine abnormalities or tumors which may be the cause of the missed abortion. It is important to have a follow up scan if there is no other evidence to help diagnose an early pregnancy loss.

Documentation of fetal cardiac activity is extremely important. Using transabdominal ultrasound, a living embryo is always detected when the mean gestational sac is greater than 25 mm in diameter whereas a yolk sac is seen when the mean sac diameter is greater than 20 mm.<sup>2</sup> A normal gestational sac grows by 1.1 mm/day,<sup>2</sup> therefore, if we find an embryonic sac, we can determine the time interval for a follow-up scan. The time interval is calculated by: time interval (in days) = 25 - initial mean sac diameter.<sup>2</sup> When ultrasound findings can not definitely detect a viable pregnancy, serial examinations should be undertaken. The criteria for a non-viable gestation based on ultrasound findings are a deformed and angular gestational sac, a decidual reaction surrounding the sac of less than 2 mm in width, and a sac located low in the uterus.<sup>3</sup>

There has been a study that showed that a single transvaginal ultrasound examination is useful in differentiating a viable from a non-viable gestational sac. The mean sac diameter (MSD) was found to be the most useful criterion for determining non-viability. An MSD of  $\geq 17$  mm that lacked an embryo and an MSD  $\geq 13$  mm without a visible yolk sac were reliable predictors of non-viable gestational sacs at a single examination with 100% specificity and 100% positive predictive value. An MSD  $\geq 13$  mm without a visible yolk sac was the most sensitive criterion. The conclusion of this study suggested that transvaginal sonographic criteria alone could distinguish viable from non-viable empty gestational sacs at a single examination.<sup>4</sup>

An echogenic ring that represents trophoblastic tissue surrounds the gestational sac. The normal gestational sac is located in the upper uterine body and has a smooth contour and a round shape. The yolk sac can be visualized when the gestational sac is 10 mm or larger. This shows that an echogenic area in the uterus represents a true gestational sac, and not the pseudogestational sac seen in an ectopic pregnancy.<sup>5</sup> The yolk sac gradually increases in diameter from 3 to 6 mm during 7-13 weeks.<sup>6-8</sup> However, detection of the yolk sac in the first trimester is not an early predictor of pregnancy outcome.<sup>9</sup> The amnion develops about the same time as the yolk sac, but because it is thinner, it is difficult to see. It surrounds the embryo and is opposite the yolk sac and grows rapidly during early pregnancy. It fuses completely with the chorion by 16 weeks of gestation.

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Although the gestational sac can be used to date an early pregnancy, the most accurate sonographic measure is the fetal crown-rump length (CRL).<sup>10,11</sup> During the first trimester, this method is accurate to within 4-5 days. The embryonic pole, a flat, echogenic structure, can be visualized since it is 2-4 mm at 7 weeks of gestation.<sup>12</sup> Transvaginal ultrasound (TVS) may provide significant advantages for the assessment of the early pregnant patient as well as the gynecological patient.<sup>13</sup> Because of the higher sound frequency (7.5 Mhz) used in TVS compared with abdominal ultrasound (3.5-5 Mhz), it permits greater resolution of the pelvic structures and good attenuation due to the fact that the probe is closer to the organs of interest.<sup>14</sup> Thus TVS is especially helpful in evaluating an obese patient and does not need to have a full bladder prior to the study. However, TVS can cause the patient some discomfort.

Ultrasound examination will allow the differentiation of a live pregnancy and a missed abortion, and it's therefore an important aid to the management of threatened abortion. Early studies have demonstrated that CRL, a measurement from the top of the fetal head to its rump, could define gestational age between 6-10 weeks with an error of about 3-5 days.<sup>10</sup> The fetus grows very rapidly, doubling its length each week of early life. This development is reflected in the varying ultrasound appearances found in the first trimester. In general, the gestational age of the pregnancy in weeks is equal to 6.5 - CRL of the fetus in centimeters. We must be careful to avoid confusing the yolk sac with the fetal head when performing a CRL measurement. The presence of a fetal pole together with a beating fetal heart will confirm a viable pregnancy.

A normal intrauterine pregnancy can be seen approximately 1 week earlier with TVS than with transabdominal sonography (TAS).<sup>13-15</sup> With TVS, an intrauterine gestational sac can be identified from about 4 weeks and a viable fetus from about 40 days (6 weeks) gestation, whereas with TAS, a gestational sac can be seen from 5 weeks and the fetal pole from 7 weeks gestation. The sac volume at 6 and 7 weeks gestation is about 0.5 and 3 ml, respectively.

TVS can identify a fetal pole and cardiac activity by 6 weeks gestation.<sup>13</sup> Cardiac activity is

usually first seen in the embryo at about 6 weeks with TVS and 7 weeks with TAS. Once the embryo is 5 mm, cardiac activity should be present; its absence indicates early fetal demise.<sup>16-18</sup> When cardiac activity is not present and the embryo is less than 5 mm, the findings are not conclusive. The normal heart rate can be low as 90 beats per minute (bpm) at 6 weeks of gestation and this increases during the first trimester.<sup>19</sup> Embryonic movements can be seen between 7 and 8 weeks of gestation.

It has been reported that the fetal heart rate correlated best with CRL. The mean fetal heart rate increased progressively from 110 bpm at a CRL of 3-4 mm to 171-178 bpm at a CRL of 15-32 mm. When the CRL was greater than 32 mm, the fetal heart rate remained stable at a mean of 170 bpm. This suggests that fetal heart rate measurement in early pregnancy may be useful in the prediction of first-trimester spontaneous abortion after ultrasound-proven viability.<sup>20</sup>

The identification of the fetal pole and an intermittent fetal heart beat at the first visit of the patient which indicates uncertainty of fetal viability, requires serial follow-up examination to make an accurate diagnosis and confirm fetal viability. If the pregnancy is a missed abortion, no fetal heart activity is detectable in the embryonic pole. The ultrasound findings vary from a normal sac and fetus without a heart beating to a crumpled sac and fetus as shown in figure 1.<sup>21</sup> It is possible that 40% of women will demonstrate findings that are inappropriate for their LMP, despite the women are certain in their last menstrual period and have a regular cycle. This can be explained by the fact that conception has not occurred exactly 14 days after her last period<sup>21</sup> or that there is a complication of early pregnancy.

The fetus will only be visualized in pregnancy with gestational sac volume of 1-3 mm with good equipment and an experienced sonographer. The woman should be rescanned in 1 week, therefore, if the gestational sac volume is less than 3 mm. At the follow-up scan, the sac volume should have doubled in size and a fetal pole with a beating heart should be demonstrated.<sup>21</sup> If a missed abortion is diagnosed, appropriate management should be performed. Evaluation of the retained products should be carried out.

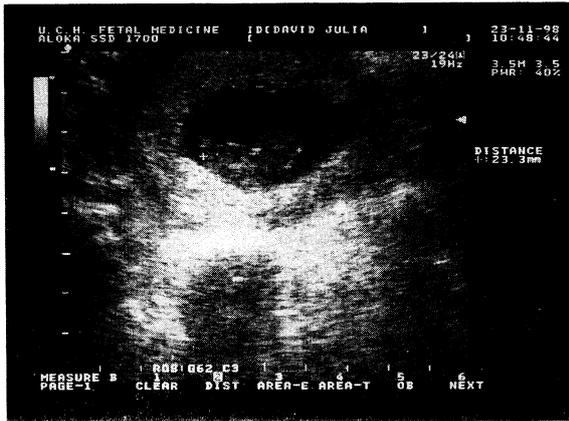


Figure 1. Transabdominal ultrasound scan. The CRL measurement was still 5 mm with no fetal heart beat.

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