

Three-dimensional measurement of gestational sac, and amniotic fluid volume in pregnancies affected by homozygous α^0 -thalassaemia

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INTRODUCTION

Fetal homozygous α^0 -thalassaemia (Hb-Bart's disease) is prevalent in south-east Asia. When both members of a couple are carriers, there is a 25% chance of having a fetus with homozygous α^0 -thalassaemia. Affected fetuses suffer from deficient α -globin chain synthesis and cannot produce hemoglobin F, leading to severe fetal anemia from the first trimester of pregnancy. Because of severe anemia and hypoxia, the fetuses develop placentomegaly, cardiomegaly from first trimester as well as subcutaneous edema, ascites, pleural and pericardial effusions and polyhydramnios from second trimester. It is not clear whether the subtle changes of amniotic fluid can be detected in the first trimester. The objective of this study was to evaluate the use of three-dimensional measurement of gestational sac and amniotic fluid volume in predicting homozygous α^0 -thalassaemia.

METHODS

From June 2003 to May 2005, we invited all singleton pregnancies at risk of homozygous α^0 -thalassaemia to join this prospective study. Fetuses affected by homozygous α^0 -thalassaemia were predicted by two-dimensional ultrasonographic measurement of the fetal cardiothoracic ratio and placental thickness, and confirmed by an invasive test followed by DNA study. Those predicted to be unaffected by 2D ultrasound were confirmed by hematological analysis of cord blood at birth.

3D transabdominal ultrasound examinations performed using ACCUVIX XQ (MEDISON Co.,Ltd. Korea) were analyzed. The images were retrieved from the computer and examined. The volume of the gestational sac, including the amniotic and the celomic cavities, was measured using a multiplanar technique and were expressed in mL according to the gestational age in days. Parallel slices were identified at different parts of the objective in the B-plane. Each circumference of these parallel slices was marked manually. The system automatically kept track of the distance between the first slice and the last one and the volume was calculated by the computer (Figure 1). Fetal trunk (head, neck and body) volumes were measured using the similar methods (Figure 2). Amniotic fluid volume equals to the gestational sac volume minus the fetal volume.

RESULTS

46 pregnancies at risk of homozygous α^0 -thalassaemia were prospectively studied. 11 of them were affected and predicted by conventional 2D ultrasound because of an enlarged CTR at 12-13 weeks of gestation and these were confirmed by CVS and DNA analysis. The parents opted for termination of pregnancy.

The gestational sac volume and amniotic fluid volume increased with gestation and crown rump length. The

volume/CRL quotient was calculated to correct for differences in gestational age. Mean (\pm SD) gestational sac volume /crown rump length quotient and mean (\pm SD) amniotic fluid volume /crown rump length quotient in affected pregnancies were larger than those in unaffected pregnancies (1.72 ± 0.55 vs 1.65 ± 0.49 and 1.55 ± 0.51 vs 1.40 ± 0.44 , respectively). But the difference was not statistically significant ($P > 0.05$).

CONCLUSIONS

It seems that three-dimensional gestational sac or amniotic fluid volumetry is not predictive of homozygous α -thalassaemia.

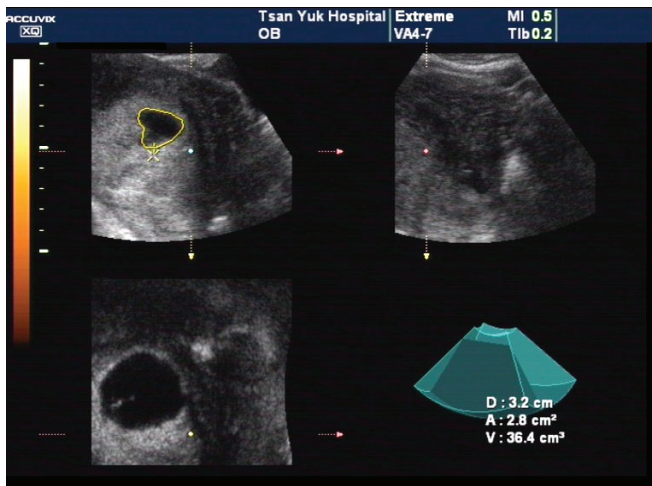


FIGURE 1. Multiplanar technique for the measurement of gestational sac volume. Parallel slices were identified at different parts of the object in the B plane. Each of these circumferences of parallel slices was marked manually around the boundary between the objects and surrounding tissues. A, sagittal plane; B, transverse plane; C, coronal plane.

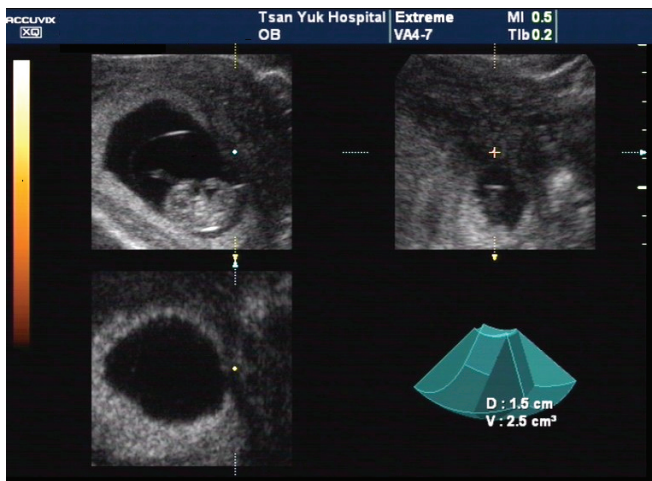


FIGURE 2. Multiplanar technique for the measurement of fetal volume.