The accuracy of first trimester diagnosis of fetal cardiovascular system anomalies by 2D and 4D ultrasound methods

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Objective
The aim is to assess the accuracy of two-dimensional ultrasound (2D US) and four-dimensional ultrasound (4D US) in major congenital heart diseases (CDHs) and anomalies of great arteries within the first trimester screening and to compare the diagnostic accuracy between the two methods.

Methods
The prospective study consecutively enrolled pregnancies referred for nuchal translucency scan, with crown–rump length (CRL) 60–84 mm. We used 4-8 MHz convex transabdominal high-frequency transduce. Digital clips and spatial-temporal image correlation (STIC) datasets of each fetus were obtained and stored from the initial scan for offline analysis. The color-flow mapping was applied (using a standard fetal protection protocol) and STIC datasets were acquired and postprocessed (also by a standard protocol). We used 2D re-examination by a team of specialists, pathological examination, and subsequent re-examination (second trimester and postpartum) as the reference standard methods.

Results
1456 fetuses (median crl 66 mm) were examined during the study period. Postnatal confirmation of the prenatal diagnosis was obtained in 1321 cases (lost to follow-up rate 9.3%). Out of the 13 fetuses screened as positive on 2D US, 11 cases were confirmed by follow-up or by pathology. We had 2 false-positive cases for 2D US and 5 for 4D US. Screen positive cases on 2D US and 4D US could diagnose major CDH with high accuracy (specificity 99.85% vs 99.70%). Fetuses without heart abnormalities were screen negative with equal accuracy as above (sensitivity 84.62%).

Conclusion
Both 2D and 4d ultrasound are highly accurate methods to diagnose major CHDs and great arteries anomalies at less than 14 weeks gestation in low-risk population. There were no difference in the accuracy of diagnosis between 2D and 4D method. Therefore, we should probably use 2D US as an early screening tool for CHDs, being the traditional and widely used method, also cheaper and simpler if compared with 4D US.