The three-vessels and trachea view as part of screening of congenital heart defects in the first trimester

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Objective
To evaluate the feasibility of three vessels and trachea view (3VTV) in an unselected population during the first-trimester screening for chromosomal abnormalities and to analyze its role in the detection of CHD with abnormal 3VTV at the mid-trimester scan.

Methods
This was a prospective cohort study of an unselected population undergoing routine first and second trimester screening between January 2013 and September 2014. In all cases, evaluation of the fetal heart in the first trimester by 3VTV with gray scale, color Doppler and high definition power Doppler, was performed by sonographers who are certified by the FMF for NT and additional markers assessment. When an abnormality of 3VTV was suspected, it was classified as abnormal vessel number, vessel size or vessel spatial relationship. In all cases of abnormal findings, fetal echocardiographic evaluation by a fetal cardiologist was offered within the 16th week of gestation and follow-up at 19-21 weeks. All patients underwent second trimester scan.

Results
There were 4350 first-trimester screenings in the study period. It was possible to examine the 3VTV in 94% (4110) of cases. In all cases we performed a transabdominal US examination; 7% required an additional TV scan. In 26 cases (0.6%) an abnormal 3VTV was suspected. In 10 cases (38%), the parents opted for termination of pregnancy within 14 weeks because of chromosomal or additional extracardiac anomalies. In 16 (62%) of the remaining cases, an anomaly of 3VTV was suspected as follows: 8 (50%) of the vessel number, 3 of the vessel size (18%) and 5 (31%) of the vessel spatial relationship. In 15/16 (93%), the fetal cardiologist confirmed the presence of CHD within the 16th week. In particular an abnormal vessel size was confirmed in 2 of 3 suspected cases (1 aortic coarctation (CoA) and 1 critical pulmonary stenosis). An abnormal vessel number was confirmed in all 8 cases: 2 tetralogies of Fallot (ToF), 1 truncus, 2 hypoplastic left heart syndromes (HLHS), 2 transpositions of the great arteries (TGA), 1 critical aortic stenosis). An abnormal vessel spatial relationship was confirmed in all 5 cases: 1TGA, 1DORV, 3 right aortic arch. Five apparently normal cases in the first trimester (0, 1%) were otherwise abnormal at the second-trimester scan (1 aortic coarctation, 1 ToF, 1 right aortic arch, 1 common arterial trunk, 1 pulmonary stenosis). When a normal or abnormal 3VTV was detected at 11-13 weeks of gestation by the obstetrician, the finding was confirmed by the cardiologist in 75% of cases, with a positive predictive value (VPP) of 93% and a negative predictive value (VPN) of 99%.

Conclusion
3VTV is feasible in an unselected population during the first-trimester screening for chromosomal abnormalities. An abnormal 3VTV during the first trimester scan allows to detect with a good reliability an important group of critical heart defects involving the outflow tracts and the aortic arch.