Post-mortem verification of first trimester cardiac ultrasound findings by micro-computed tomography of the fetal heart

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Objective
To compare fetal cardiac findings on obstetric ultrasound and post-mortem micro-computed tomography (micro-CT) in patients undergoing surgical termination of pregnancy (TOP) before 17 weeks' gestation.

Methods
Fetal heart specimens were retrieved from suction material in 14 patients after TOP for chromosomal or structural abnormalities diagnosed before 17 weeks' gestation. In all cases, a detailed assessment of the fetal heart was carried out by ultrasound before TOP. Heart specimens were soaked in iodine contrast solution and scanned using a commercially available micro-CT with an isotropic resolution of 18μm. Ultrasound videoclips and micro-CT images were compared and analysed.

Results
The median gestational age at ultrasound was 13.1 (range 12-16) and the median gestational age at TOP was 14.2 (range 13-17) weeks. In all cases there was concordance between ultrasound and micro-CT in the diagnosis of a normal or abnormal fetal heart. Abnormal cardiac findings were reported on both technologies in 7 (50%) of 14 cases. Micro-CT confirmed the ultrasound diagnoses of corrected transposition of the great arteries (n=1), truncus arteriosus (n=1), hypoplastic left heart (n=1) and overriding aorta (n=1). In 2 cases, complex abnormalities of the great arteries were reported on both examinations but micro-CT was not able to provide additional information due to sub-optimal image quality. In 1 case, ventricular and great arteries disproportion was reported on ultrasound and micro-CT demonstrated a partial atrio-ventricular septal defect.

Conclusion
Micro-CT provides highly accurate imaging of ex-vivo isolated fetal hearts retrieved after surgical TOP before 17 weeks' gestation. Micro-CT technology can be used in a clinical setting for non-destructive post-mortem confirmation of early fetal cardiac ultrasound findings, which are only rarely verified by anatomic dissection at these gestational weeks.