involving the use of indwelling catheters or transvenous pacing leads and cardiopulmonary bypass operations[8].

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Cell-free fetal DNA in celomic fluid

Pregnancy is associated with high levels of cell-free DNA (cfDNA) in the maternal circulation, and around 5% of the DNA is fetal in origin[1]. The exact source of cfDNA is uncertain, with some evidence supporting a placental[2,3] and other a fetal[4] origin. We further investigated the possible source of fetal cfDNA in maternal blood by comparing its concentration in maternal serum, amniotic fluid and celomic fluid.

Celocentesis was performed immediately before elective termination of pregnancy for psychosocial reasons in 11 singleton pregnancies with live fetuses at 7–9 weeks of gestation, as previously described[5]. Maternal blood (2 mL) was also obtained before the procedure. All participants were examined at the Department of Obstetrics and Gynaecology, University Hospital of Ioannina, Greece. The study was approved by the Hospital Ethics Committee, and written consent was obtained. Male cfDNA was quantified by the SRY and the DYS14 gene sequences as previously described[6,7]. The 'housekeeping' β-globin sequence was used to detect and quantify total free DNA[1], levels of which were expressed in genome equivalents (GE) per mL.

The analysis was restricted to the four male fetuses for which amniotic fluid was also available. Fetal cfDNA was demonstrated in all four samples of celomic fluid (*SRY*: median 71.5, range 3.0–75.1 GE/mL; *DYS14*: median 31.0, range 6.1–69.3 GE/mL) and amniotic fluid (*SRY*: median 96.6, range 79.0–279.1 GE/mL; *DYS14*: median 221.2, range 131.9–434.3 GE/mL), in all four maternal serum samples with the *DYS14* marker (*DYS14*: median 5.8, range 5.5–7.4 GE/mL) and in two of the four sera using the *SRY* marker (Figure 1). No fetal cfDNA was demonstrated using the Y-chromosome specific markers

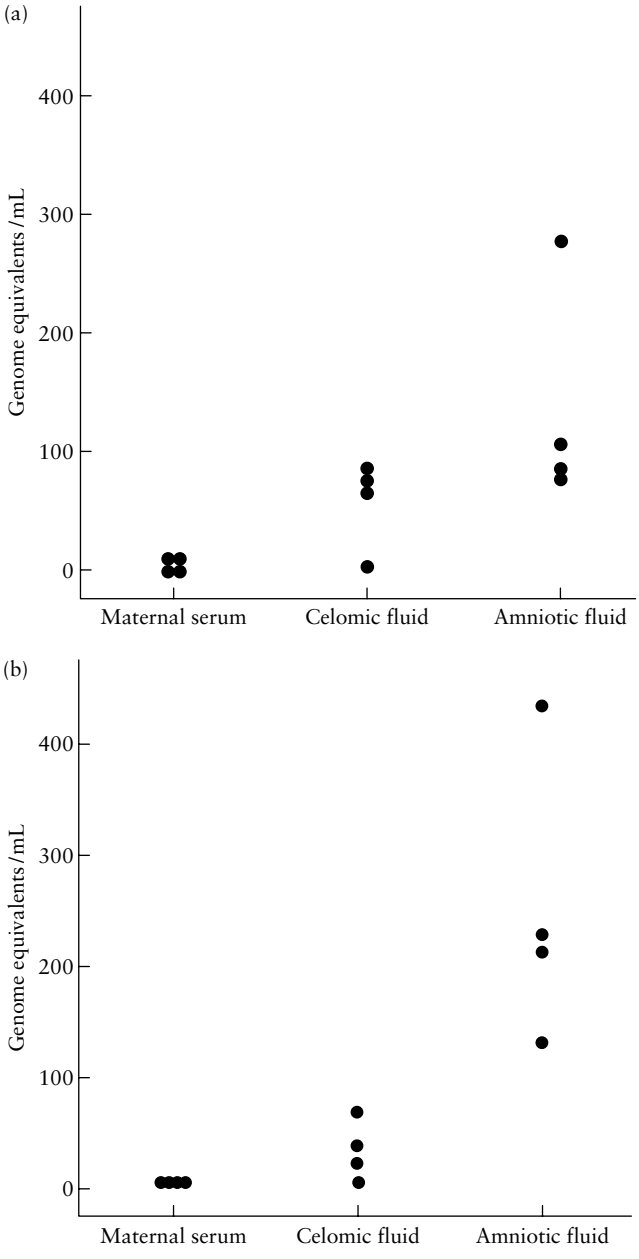

Figure 1 Concentrations of *SRY* (a) and *DYS14* (b) in maternal serum, celomic fluid and amniotic fluid (male fetuses).

in either the celomic fluid or the maternal serum in four female fetuses that served as controls. Total cfDNA (β-globin DNA) was consistently found in all samples.

The concentration gradient of fetal cfDNA between the amniotic fluid (highest), celomic fluid (lower) and maternal serum (lowest) would seemingly indicate that the fetus itself is the source of fetal cfDNA in the maternal serum. However, it is very unlikely that fetal cfDNA from the early amniotic fluid could reach the maternal circulation because exchange at the level of the yolk sac is mainly unidirectional *towards* the fetus and the amniotic membrane is practically impermeable to large molecules[8]. Given that the estimated size of fetal cfDNA in maternal circulation is 100–300 base pairs[9], which is equivalent to about 30–90 kDa, and the transfer through the amniotic membrane is negligible for molecules of similar size (e.g. human albumin), it appears that the source of cfDNA in the amniotic fluid is the fetus and the source in the maternal serum is the placenta. The alternative mechanism of direct transfer of fetal cfDNA between the fetal and maternal circulations is also unlikely because the uteroplacental circulation is established only after 10 weeks' gestation[10]. In support of this, a recent study found that the concentration of cfDNA in maternal serum was similar in normal and anembryonic pregnancies, indicating that the trophoblast is the source of cfDNA in maternal blood, even in the absence of a fetus or fetoplacental circulation[3].

The robustness of our results is restricted by the small sample size, which mostly arose from the exclusion of most of the samples of the initial pool (female fetuses, $n = 4$; male fetuses without amniotic fluid, $n = 3$).

In summary, the *SRY* and *DYS14* markers are detected in the fluid compartments of very early pregnancy. Their distribution in the maternal serum and fetal fluid compartments provides preliminary evidence that the most likely source of fetal cfDNA in the maternal circulation is the trophoblast. A larger sample would be required in order to draw definite conclusions.

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Sonographic findings of uterine sacculation during pregnancy

Uterine sacculation is a rare complication of pregnancy that occurs in about 1 in 3000 pregnancies[1]. It is defined as a sac-like structure that develops from an abnormal rotation of the uterine fundus[2–4]. Without diagnosis and treatment, this can cause spontaneous miscarriage, intrauterine fetal death, uterine rupture, preterm delivery, placenta accreta, retained placenta and postpartum hemorrhage[5]. However, this condition can easily be misdiagnosed as uterine septum on ultrasound examination. We describe a case of uterine sacculation in a pregnancy which was further complicated by the presence of a large uterine myoma.

A 28-year-old primigravida presented with vaginal leakage and urinary retention at 17 weeks' gestation. Her medical history was unremarkable except for a known uterine myoma. On physical examination, we were unable to visualize the cervix with a speculum but bulging membranes were seen. A nitrazine test showed a positive result, indicating rupture of membranes. On ultrasound examination the fetus was found to be in breech-oblique presentation with a normal heartbeat and of normal size. However, precise evaluation of the fetus was limited owing to severe oligohydramnios. Ultrasonography showed probable uterine folding and a huge mass measuring around 10×8 cm in the upper portion of the uterus (Figure 1a). The anterior wall of the uterus was thin and stretched, but the posterior