Non-invasive prenatal testing of trisomy 21 and 18 by DNA massively parallel sequencing in maternal plasma DNA in twin pregnancies

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Objective
With the increasing trend of twin pregnancies in the last decades, the need to seek an accurate approach for non-invasive prenatal testing becomes urgent. Our study aimed to evaluate the performance of non-invasive prenatal testing of Trisomies 21 and 18 in twin pregnancies by maternal plasma sequencing.

Methods
Pregnant women with live twin fetuses were recruited, with careful pre-test counseling, from six hospitals from April to December 2012 for this study. Written informed consent was obtained from each participant. All MPS-based tests were performed prior to the recording of karyotyping information and the sequencing lab was blinded. Karyotyping was performed for the following indications: i) positive results in maternal serum screening tests, ii) increased nuchal translucency (NT), iii) absence of fetal nasal bone, iv) abnormal ultrasound findings in second trimester, v) twin pregnant women by IVF. 5ml of peripheral venous blood was obtained 30 minutes before invasive procedures. Maternal plasma was isolated within eight hours by a double-centrifugation protocol and stored at -80°C. DNA was extracted from 600ul maternal plasma and sequenced on Illumina HiSeq 2000 platform. For each sample, the report was delivered within 12 days after blood sampling.

Results
128 samples were collected and processed immediately. The maternal age ranged from 21 to 40 years of age and the gestational age from the 11th to the 27th week. We correctly identified two cases with discordant fetal Trisomy 21 and one case with discordant fetal Trisomy 18. The remaining 125 samples were classified as negative. Compared with the results of full karyotyping, the estimated sensitivity and specificity for trisomies 21 and 18 were 100%.

Conclusion
Our study suggested that NIPT for Trisomies 21 and 18 by maternal plasma DNA sequencing is of high sensitivity and specificity in twin pregnancies. It has the potential to be used as an alternative option of prenatal test for twin pregnancies.