

## 外国語要旨

Genetic Counseling for Noninvasive Prenatal Genetic Testing:NIPT

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Rapid advances in high throughput genomic technologies and next generation sequencing are making medical genomic research more readily accessible and affordable, and expanded genetic testing is becoming more common. Noninvasive prenatal genetic testing (NIPT) is a new technology and will change the delivery of prenatal care for all women.

NIPT encompasses new methods and techniques, and all facilities using it are currently under a “trial and error” status. The present study was designed with the objective to obtain clues on whether the approach of the previous prenatal testing is appropriate as it stands, or whether a special scheme is necessary. We tried to study various aspects of genetic counseling for NIPT through conducting some detailed genetic studies and psychosocial researches. Then, we aimed to optimize the necessary content of genetic counseling for pregnant women who wish to undergo NIPT.

Since the discovery of the presence of cell-free fetal (cff) DNA in maternal plasma in 1997, the possibility of using this as the target for NIPT of fetal genetic conditions is being explored widely. The use of such procedures for determining the Rhesus factor status in RhD-negative pregnant women, sex determination for severe X-linked disease has been translated into clinical practice. In 2008, next generation sequencing technology was applied to cell-free DNA analysis in maternal plasma. It has been commercially approved for the prenatal screening of chromosomal aneuploidy such as Down syndrome, trisomy 18 syndrome, trisomy 13 syndrome and chromosomal structural aberrations .

First we conducted a genetic testing using cff-DNA in maternal blood, for a sex determination genetic test of severe X-linked hydrocephaly and a single gene disorder that suspected to be de novo Achondroplasia. Then we could to reveal to perform genetic testing for using cff-DNA and it could be a useful information in the setting of prenatal care and genetic counseling .Then we noticed that it involved the risk of being an easy test.

We conducted a survey in 2011 for the clinical application of NIPT, with the objectives of elucidating the awareness of genetic medical professionals and pregnant women in regard to NIPT. The results of this survey showed that pregnant women have a high expectation of NIPT

and that they do not view advance counseling to be important. And NIPT, because it is noninvasive and may not be adequately explained before administration; thus, increasing the number of individuals who readily opt to undergo NIPT. Then we conducted a semi-structured group interviews to pregnant women to explore more deeply what pregnant women think of NIPT and which factors may affect the understanding and acceptability of this test. Giving them a mini-lecture of NIPT, it indicated that adequate information of NIPT could help woman's decision making and create an opportunity for pregnant women to sufficiently consider prenatal testing.

From April 2013, we carried out a survey to initiate a social debate regarding this NIPT and a trigger to create a prenatal testing system more suitable for Japan for the implementation of comprehensive genetic counseling. From a one-year survey, responses from 7,292 women were analyzed. They expressed high satisfaction of the genetic counseling system of the NIPT consortium (94%), and their determination that NIPT is necessary for genetic counseling increased over time. In addition, they highly valued genetic counseling by a specialist. The vast majority (90%) responded that there was sufficient opportunity to consider the test ahead of time. In contrast, women who received positive test results had a poor opinion, low satisfaction, and poor understanding of NIPT. In this manuscript, we report and summarize one-year results from a survey of the awareness of genetic counseling.

In the future, it is postulated that not only chromosomal disorder and single gene disorder, but also adult-onset hereditary diseases or carrier diagnoses may also be included in this test. In other words, it is predicted that candidates for these tests will increase as additional disorders are included, and simultaneously, there is a concern that there will be an increase in ethical issues. Another consequence of this broad scope, however, is the increased amount, complexity, and variety of results a clinician may need to discuss with a patient.

An accurate picture of the current status, including pregnancy outcomes, has been revealed. Now, it would be desirable to build a social consensus for NIPT and to continue the debate to enable development of a system of prenatal testing appropriate to Japan.