The concentration of second trimester maternal serum alpha fetoprotein in twin pregnancies: the impact of chorionicity and in vitro fertilization

Huang T, Meschino W
Genetics program, North York General Hospital, Toronto, Canada

Objective
To compare the concentration of second trimester maternal serum alpha fetoprotein (MSAFP) in singleton and twin pregnancies to validate the current adjustment factor for twin pregnancies. To compare the concentration of second trimester MSAFP in monochorionic (MC) and dichorionic (DC) twin pregnancies and in pregnancies conceived through in vitro fertilization (IVF) and non-IVF twin pregnancies.

Methods
The study was based on women who were screened between January 2003 and October 2013 at North York General Hospital. Pregnancies associated with maternal smoking or insulin dependent diabetes mellitus, or diagnosed with a chromosomal aneuploidy were excluded from the study. Information on chorionicity and IVF was obtained from screening requisitions. The study compared median MoM of MSAFP between singleton and twin pregnancies, between MC and DC twin pregnancies, and between IVF and non-IVF twin pregnancies. It also compared positive rates (PR) for open neural tube defects (ONTD) between the groups. The differences in the median MoM of MSAFP between the groups were assessed using Mann-Whitney U test. The differences in the PR for ONTD were assessed using Chi-square test.

Results
The study included 278, 369 singleton pregnancies and 2, 816 twin pregnancies. Of 1970 twin pregnancies where IVF status was known (recorded since 2007), 382 had IVF. Eighty-three of the twin pregnancies were MC and 715 were DC twins. Chorionicity was unspecified in the remaining twin pregnancies. The median MoM of MSAFP was 1.00 for singletons and 2.08 for twins. The median MoM of MSAFP was 2.09 for both MC and DC twin pregnancies, and was 2.06 for IVF and 2.08 for non-IVF twin pregnancies (p=0.60). With the current MSAFP adjustment factor of 2.13 for twin pregnancies, PR for ONTD was 1.4% for singletons and 1.8% for twins (p=0.06). Using the adjustment factor from this study (2.08), the PR for ONTD in twin pregnancies was 1.88%. The differences in the PR between MC and DC twins, and between IVF and non-IVF twins remained insignificant.

Conclusion
The adjustment factor (2.13) used in our program might have over-adjusted MSAFP in twin pregnancies. The adjustment factor generated in this study will not change the PR of ONTD but it more accurately reflects MSAFP level in twin pregnancies in our population. Similar to the study results on singleton pregnancies, IVF did not impact the concentration of MSAFP in twin pregnancies. Unlike first trimester pregnancy-associated plasma protein A and free-β-hCG which are influenced by chorionicity, no difference was seen in the levels of MSAFP between MC and DC twins although the sample size of MC twins was small (83) in our study. Because MSAFP is a potential marker for first trimester screening, the study results also provided useful information for future studies on first trimester MSAFP.

Second trimester maternal serum AFP in singleton and twin pregnancies

![Graph showing MSAFP MoM for singletons, twins, MC twins, DC twins, IVF twins, and non-IVF twins]