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Recommendations Versus Practice Patterns: The Uptake of Chromosomal Microarray Testing in Prenatal Patients With Fetal Structural Ultrasound Abnormalities

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I. Background

The use of chromosomal microarray in the prenatal setting has been well established since the release in 2012 of the NIHCD study regarding the efficacy of chromosomal microarray (CMA) compared to traditional karyotype analysis. One of the key findings in this large multicenter study was that CMA identified significant findings in 6% of patients with ultrasound abnormalities who previously had a normal karyotype. Since the NIHCD study, there have been several society guidelines released regarding the use of CMA in a prenatal setting. CMA was clearly recommended for patients with one or more major fetal structural ultrasound findings in both ACOG Committee Opinion #581 (2013) and ACOG Committee Opinion #682 (2016). Furthermore, the 2013 recommendations state that CMA can be used instead of traditional fetal karyotype while the 2016 recommendation states that CMA can "typically" replace the need for karyotype. The purpose of this study was to determine whether ordering patterns and decisions in patients with findings of major fetal structural ultrasound abnormalities are consistent with the ACOG recommendations to utilize CMA instead of traditional karyotype analysis.

II. Study Design

This study evaluated the testing decisions of patients who were seen for genetic counseling from 2016-2017 and who had at least one major fetal structural abnormality identified on ultrasound. A total of 5,791 pregnancies were identified with major structural abnormalities during this time period. The genetic counseling appointment involved a review of the findings and the associated risks for genetic disorders. At the physician's direction and based on gestational age, all patients were offered diagnostic procedures. Testing options included traditional karyotype, CMA or both. Overall, a total of 33.2% of patients chose to pursue either CVS or amniocentesis at the time of the genetic counseling appointment. Based on society recommendations, these patients were informed that CMA was recommended but were also informed, at physician direction, of other diagnostic testing options such as traditional karyotype. The benefits and limitations of the testing options were discussed.

III. Results

When evaluating the cohort of patients who pursued prenatal diagnosis, 69.4% of patients elected testing that included CMA analysis. Overall, 16.6% of patients had CMA as a stand-alone test while 47% of patients requested that CMA be performed concurrently with karyotype analysis. A very small subset of patients, 6.34%, chose to have CMA as a reflex test only if karyotype analysis was normal (**Figure 1**). The decisions regarding testing were also evaluated for the specific ultrasound findings of congenital heart defect (CHD) and increased nuchal translucency (NT). The decision patterns were similar in this subset of patients with CHD when compared to the overall cohort, with 69.2% of patients having testing with CMA (either alone or in combination with chromosome analysis) and 19.5% of patients pursuing CMA as a stand-alone test. Similar findings were seen with the subset of patient identified with increased NT compared to the overall cohort (**Figure 2**).

Figure 1. Microarray decisions for all patients with fetal structural abnormalities

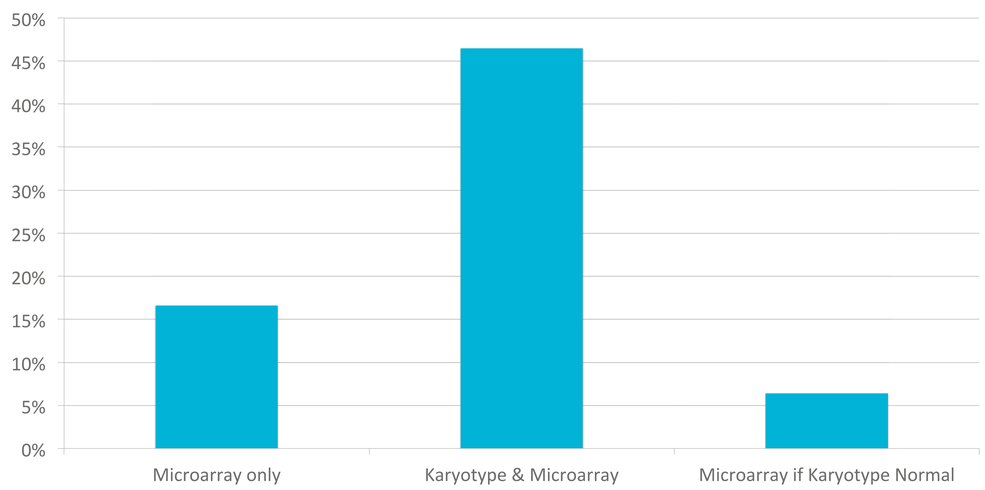
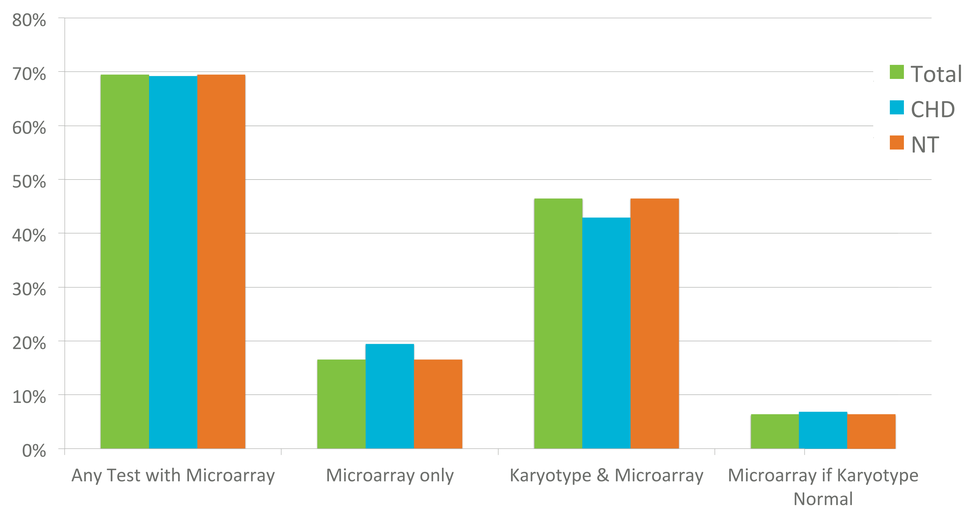


Figure 2. Comparison of microarray decisions across ultrasound findings



IV. Discussion

Changes in practice patterns typically evolve over time due to shifts in society recommendations followed by shifts in patient decisions and physician perspectives. In the case of patients with structural fetal ultrasound abnormalities, there was still a significant use of traditional karyotype analysis over 4 years after the initial recommendations to preferentially use CMA. While recommendations made by the ordering physicians were not evaluated in this study, one possible explanation for low CMA uptake is that providers were still directing that both CMA and karyotype be ordered for these patients. Despite education and published recommendations, the complete transition to newer technology may still be met with resistance. While 69.4% of patients had testing that included CMA, a significant percentage of these patients also had potentially inferior testing in the form of a traditional karyotype. Furthermore, a smaller subset of patients (30.6%) had testing that did not include CMA testing, potentially leading to a missed diagnosis of chromosome abnormalities. The decisions of patients regarding their prenatal diagnosis and testing options may be influenced not only by society recommendations but also by considerations such as alternative testing options, insurance coverage and personal preference. A continued focus on education to providers and ongoing publication on the utility of CMA testing for patients with major structural ultrasound abnormalities may still be needed to fully effect a change in the ordering patterns of physicians and the decisions of patients.

V. References

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