Prenatal Diagnosis and Genetic Counseling of a Maternally Inherited Chromosome 15q11.2q13.1 Duplication in a Chinese Family

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ABSTRACT

Background • Maternally inherited chromosomal duplications in the region of 15q11.2q13.1 have been associated with neurodevelopmental disorders and other clinical manifestations. Prenatal diagnosis of such duplications is crucial for providing accurate genetic counseling and guiding clinical management decisions.

Objective • This study aims to present the prenatal diagnosis and genetic counseling of a maternally inherited 15q11.2q13.1 duplication.

Case Presentation • A 38-year-old gravida 1, para 0 woman underwent amniocentesis at 16 weeks of gestation due to advanced maternal age. Karyotype analysis was performed on cultured amniocytes, and chromosomal microarray analysis (CMA) was conducted on uncultured amniocytes.

Results • The karyotype analysis of the cultured amniocytes revealed a normal karyotype of 46, XX. CMA identified a 4.21 Mb maternally inherited chromosomal duplication in the region of 15q11.2q13.1 (arr[GRCh37]15q11.2q13.1(23,894,550_28,107,154)x3).

Conclusions • Copy number variants (CNVs) and unbalanced chromosomal abnormalities (UBCA) identified in prenatal cases require careful consideration and accurate interpretation to determine their potential harm or harmlessness compared to the norm. The combination of prenatal ultrasound, karyotype analysis, CMA, and genetic counseling proves helpful in the prenatal diagnosis of CNVs and UBCA. (Altern Ther Health Med. [E-pub ahead of print.])

INTRODUCTION

Copy number variants (CNVs) play a significant role in normal genetic variation and pathogenic genomic alterations. Unbalanced chromosome abnormalities (UBCA) involve the gain or loss of large genomic regions, often with minimal clinical impact on the affected individuals. While conventional karyotyping provides a comprehensive overview of the entire genome and identifies structural and numerical chromosome abnormalities, chromosomal microarray analysis (CMA) utilizes array technology to detect chromosomal abnormalities. CMA has the advantage of detecting rearrangements longer than 5Mb, which may be missed by conventional karyotyping, while conventional karyotyping remains the method of choice for detecting balanced translocations.

Clinical phenotypes associated with chromosome 15q11-1q13 duplications exhibit significant variability and are less well-defined. Affected individuals can present with a range of manifestations, including normal development, autism, developmental delay, mental retardation, or short stature. The phenotypic spectrum varies widely and is influenced by the parent of origin of the duplication. Maternal inheritance is more commonly associated with an abnormal phenotype, whereas paternal inheritance is often associated with a normal phenotype. This study presents the prenatal diagnosis and genetic counseling of a maternally inherited 15q11.2q13.1 duplication.

CASE PRESENTATION

A 38-year-old woman, gravida 1, para 0, underwent amniocentesis at 16 weeks of gestation due to advanced maternal age. Her husband was 37 years old, and there was no family history of congenital disabilities or genetic diseases. Prenatal ultrasound, chromosomal microarray analysis (CMA) on uncultured amniocytes, karyotype analysis of the cultured amniocytes, and genetic counseling were conducted.
Among the rearrangements, paternally inherited 15q11.2q13.1 duplications are commonly associated with paternal inheritance of the UBE3A gene, which is responsible for Angelman syndrome. However, it is important to note that not all carriers of these microduplications present with the typical clinical manifestations due to variable expressivity and incomplete penetrance. When considering UBCA and CNVs, it is crucial to consult databases and the latest literature to provide patients with up-to-date genotype-phenotype correlation information. The combination of prenatal ultrasound, karyotype analysis, chromosomal microarray analysis, and genetic counseling proves to be valuable in the prenatal diagnosis of chromosomal microdeletions and microduplications. Our findings contribute to the growing body of knowledge on the clinical implications and diagnostic approaches for chromosomal microdeletions and microduplications, emphasizing the importance of a multidisciplinary approach in prenatal care.
DECLARATIONS
The Ethics Committee of Shiyan Maternal and Child Health Hospital approved the research.

CONSENT FOR PUBLICATION
All patient guardians gave informed consent to the publication of this study.

AVAILABILITY OF DATA AND MATERIALS
Please contact the corresponding author for data requests.

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CONFLICT OF INTEREST
The authors have no conflicts of interest relevant to this article.

AUTHOR CONTRIBUTIONS
Long He Chun He contributed equally to this work.

REFERENCES