1q21.1 microduplication

Subjects: Genetics
Submitted by: Catherine Yang
(This entry belongs to Entry Collection "MedlinePlus")

Definition

1q21.1 microduplication is a chromosomal change in which a small amount of genetic material on chromosome 1 is abnormally copied (duplicated). The duplication occurs on the long (q) arm of the chromosome at a location designated q21.1.

---

1. Introduction

Some people with a 1q21.1 microduplication have developmental delay and intellectual disability that is typically mild to moderate. Individuals with this condition can also have features of autism spectrum disorder. These disorders are characterized by impaired communication and socialization skills, as well as delayed development of speech and language. Expressive language skills (vocabulary and the production of speech) tend to be more impaired than receptive language skills (the ability to understand speech) in affected individuals. In childhood, 1q21.1 microduplications may also be associated with an increased risk of attention-deficit/hyperactivity disorder (ADHD) and other behavioral problems. Psychiatric disorders such as schizophrenia or mood disorders such as anxiety or depression occur in some affected individuals, usually during adulthood. Rarely, recurrent seizures (epilepsy) occur in people with a 1q21.1 microduplication.

Some individuals with a 1q21.1 microduplication are born with malformations of the heart, including a particular combination of heart defects known as tetralogy of Fallot. Less commonly, other physical malformations such as the urethra opening on the underside of the penis (hypospadias) in males, inward- and upward-turning feet (clubfeet), or misalignment of the hip joint (hip dysplasia) are present at birth. Individuals with a 1q21.1 microduplication may also have a larger than average head size or taller than average adult stature. Some have slightly unusual facial features such as wide-set eyes or low-set ears. As adults, individuals with a 1q21.1 microduplication may be prone to develop cysts, swollen and knotted (varicose) veins, or carpal tunnel syndrome, which is characterized by numbness, tingling, and weakness in the hands and fingers. However, there is no particular pattern of physical abnormalities that characterizes 1q21.1 microduplications. Signs and symptoms related to the chromosomal change vary even among affected members of the same family. Some people with the duplication have no identified physical, intellectual, or behavioral abnormalities.

2. Frequency

1q21.1 microduplications occur in about 3 in 10,000 individuals in the general population. Studies suggest that these chromosomal changes are 15 to 20 times more common in people with schizophrenia or tetralogy of Fallot. Many people with 1q21.1 microduplications are likely never diagnosed because the features of this condition can have a variety of causes. In addition, some people with this chromosomal change have no related health or developmental problems that would bring them to medical attention.

3. Causes

People with a 1q21.1 microduplication have a duplicated segment of genetic material at position q21.1 on one of the two copies of chromosome 1 in each cell. The length of the duplicated segment can vary. The most common duplication involves about 1.35 million DNA building blocks (also written as 1.35 megabases or 1.35 Mb), and is known as the recurrent distal 1.35-Mb duplication. In other cases, individuals have a shorter or longer duplicated segment within the q21.1 region of chromosome 1. Extra copies of genes in the duplicated segment likely contribute to the signs and symptoms that occur in some individuals with 1q21.1 microduplications; researchers are working to determine which specific genes are involved and how they relate to these features. Because some people with a 1q21.1 microduplication

have no apparent features of the condition, additional genetic or environmental factors are thought to be involved in the development of signs and symptoms.

3.1. The chromosome associated with 1q21.1 microduplication

- chromosome 1

4. Inheritance

1q21.1 microduplication is considered to be an autosomal dominant condition, which means that a duplicated segment on one copy of chromosome 1 in each cell is sufficient to increase the risk of the associated features. Many affected individuals inherit the duplication from one parent who has the chromosomal change, although not necessarily the same associated features. In other affected individuals, the 1q21.1 microduplication is not inherited. Instead, it occurs as a random event, usually during the formation of reproductive cells (eggs and sperm) before the individual is conceived. People with a new duplication typically have no history of related signs or symptoms in their family, although they can pass the duplication on to their children.

5. Other Names for This Condition

- 1q21.1 duplication
- 1q21.1 duplication syndrome

References

1. Brunetti-Pierri N, Berg JS, Scaglia F, Belmont J, Bacino CA, Sahoo T, LalaniSR, Graham B, Lee B, Shinawi M, Shen J, Kang SH, Pursley A, Lotze T, Kennedy G,Lansky-Shafer S, Weaver C, Roeder ER, Grebe TA, Arnold GL, Hutchison T,Reimschisel T, Amato S, Geragthy MT, Innis JW, Obersztyn E, Nowakowska B,Rosengren SS, Bader PI, Grange DK, Naqvi S, Garnica AD, Bernes SM, Fong CT,Summers A, Walters WD, Lupski JR, Stankiewicz P, Cheung SW, Patel A. Recurrentreciprocal 1q21.1 deletions and duplications associated with microcephaly ormacrocephaly and developmental and behavioral abnormalities. Nat Genet. 2008Dec;40(12):1466-71. doi: 10.1038/ng.279.
2. Dolcetti A, Silversides CK, Marshall CR, Lionel AC, Stavropoulos DJ, SchererSW, Bassett AS. 1q21.1 Microduplication expression in adults. Genet Med. 2013Apr;15(4):282-9. doi: 10.1038/gim.2012.129.
3. Mefford HC, Sharp AJ, Baker C, Itsara A, Jiang Z, Buysse K, Huang S, MaloneyVK, Crolla JA, Baralle D, Collins A, Mercer C, Norga K, de Ravel T, Devriendt K, Bongers EM, de Leeuw N, Reardon W, Gimelli S, Bena F, Hennekam RC, Male A, Gaunt L, Clayton-Smith J, Simonic I, Park SM, Mehta SG, Nik-Zainal S, Woods CG, FirthHV, Parkin G, Fichera M, Reitano S, Lo Giudice M, Li KE, Casuga I, Broomer A,Conrad B, Schwerzmann M, Räber L, Gallati S, Striano P, Coppola A, Tolmie JL,Tobias ES, Lilley C, Armengol L, Spysschaert Y, Verloo P, De Coene A, Goossens L,Mortier G, Speleman F, van Binsbergen E, Nelen MR, Hochstenbach R, Poot M,Gallagher L, Gill M, McClellan J, King MC, Regan R, Skinner C, Stevenson RE,Antonarakis SE, Chen C, Estivill X, Menten B, Gimelli G, Gribble S, Schwartz S,Sutcliffe JS, Walsh T, Knight SJ, Sebat J, Romano C, Schwartz CE, Veltman JA, de Vries BB, Vermeesch JR, Barber JC, Willatt L, Tassabehji M, Eichler EE. Recurrentrearrangements of chromosome 1q21.1 and variable pediatric phenotypes. N Engl JMed. 2008 Oct 16;359(16):1685-99. doi: 10.1056/NEJMoa0805384.
4. Rosenfeld JA, Traylor RN, Schaefer GB, McPherson EW, Ballif BC, Klopocki E,Mundlos S, Shaffer LG, Aylsworth AS; 1q21.1 Study Group. Proximal microdeletions and microduplications of 1q21.1 contribute to variable abnormal phenotypes. Eur JHum Genet. 2012 Jul;20(7):754-61. doi: 10.1038/ejhg.2012.6.

Keywords

genetic conditions