

Autosomal Recessive Primary Microcephaly Syndrome

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Abstract

MCPH syndrome is a genetic disorder that causes changes in the size and form of the human head. The syndrome is caused by a gene mutation that is located in the long arm of chromosome [1].

Keywords: MCPH Syndrome; ASPM gene; Brain disorder; Microcephaly;

Generalizations of Autosomal recessive Microcephaly syndrome (MCPH)

MCPH syndrome is a genetic disorder in which babies born with a very small head and a small brain are born. The word "Microcephaly" is derived from the Greek word for "small head" [1].

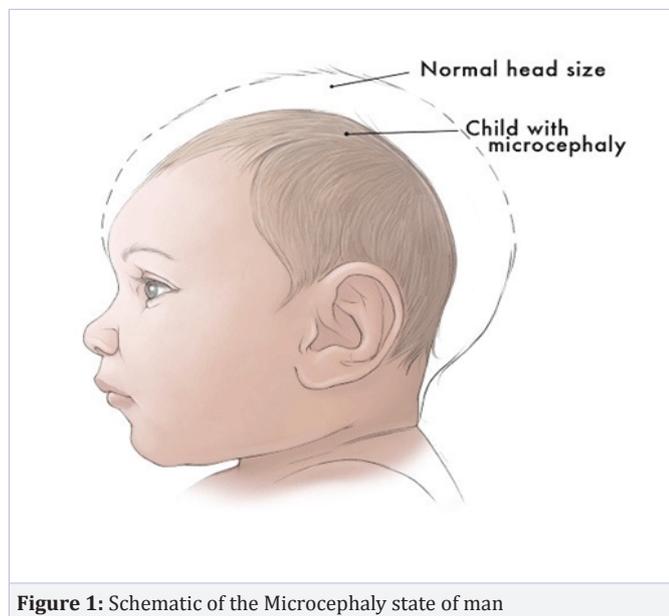


Figure 1: Schematic of the Microcephaly state of man

Clinical signs and symptoms of Autosomal recessive primary Microcephaly syndrome (MCPH)

Infants with MCPH syndrome have a smaller head than other infants of the same age and sex. The circumference of the

head is the distance around the broadest part of the head and is measured by placing a measuring tape above the eyebrows and the ear and around the back. Neonatal brain volume is also lower than usual, although there is usually no major disorder in the brain's structure. The head and brain grow during childhood and adolescence, but they are still much smaller than normal [2].

The MCPH causes intellectual disability, which is typically mild to moderate and does not aggravate the age. Most affected people delay speaking and language skills. Motor skills such as sitting, standing and walking may be slow and delayed [3].

People with MCPH syndrome often have other characteristics that are associated with these conditions. Some people have a narrow, steep forehead. Mild seizures; problems with attention or behavior; or short stature compared to others as well as symptoms of MCPH syndrome. This condition usually does not affect other systems or cause other health problems [4].

The Etiology of Autosomal recessive primary Microcephaly syndrome (MCPH)

Approximately half of the MCPH syndrome cases are due to the mutation of the ASPM gene, which is based on the long arm of chromosome 1 as 1q31.3. The genes associated with MCPH play an important role in the early development of the brain, especially in determining the size of the brain. Studies show that proteins produced from many of these genes help regulate cell division in the growing brain [5].

The mutation in any of the genes associated with MCPH causes a disturbance in the early development of the brain. As a result, neonates affected by the syndrome have neuromuscular (neuronal) cells less than normal and are born with an unusual brain [5].

MCPH syndrome follows an autosomal recessive hereditary pattern. Therefore, in order to produce this syndrome, two versions of the mutated gene of ASPM (one parent and one mother) are needed, and the chance of having a child with autosomal recessive syndrome is 25% for each pregnancy [6].

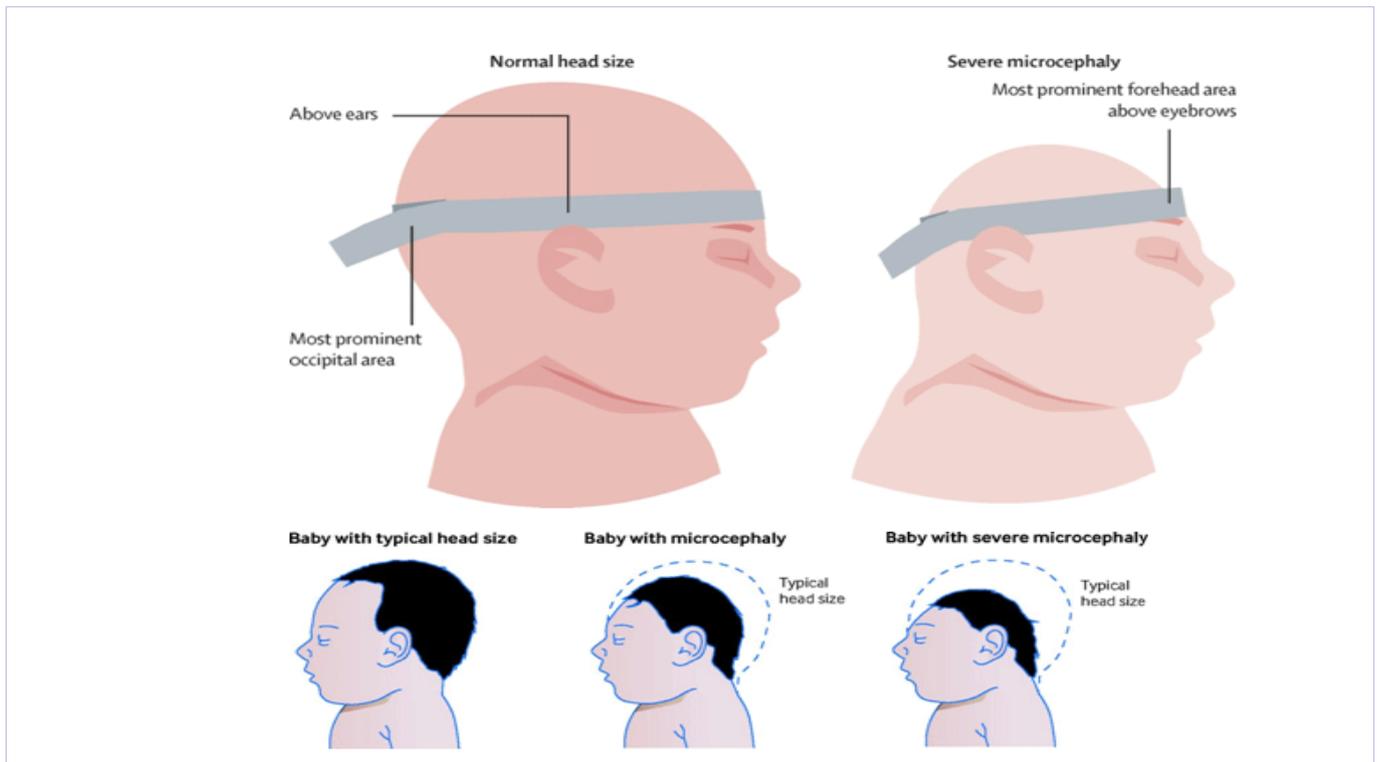


Figure 2: Schematic of normal head position (left photo), Microcephaly (middle image), and intense microcephaly (right photo)



Figure 3: Images of children with MCPH syndrome associated with microcephaly and facial features

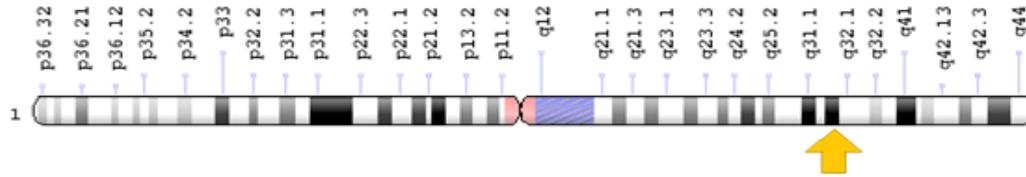


Figure 4: Schematic view of chromosome number 1, where the ASPM gene is located in the long arm of this chromosome as 1q31.3

Frequency of Autosomal recessive primary Microcephaly syndrome (MCPH)

MCPH syndrome is a genetic disorder with an estimated worldwide prevalence rate of about 1 in 30,000 to 1 in 250,000 live births. So far, about 200 neonates with this syndrome have been reported worldwide in medical literature. MCPH syndrome in the northern population of Pakistan has a prevalence rate of 1 in 10,000 live births [6].

Diagnosis of Autosomal recessive primary Microcephaly syndrome (MCPH)

MCPH syndrome is diagnosed based on the clinical and physical findings of the patients and some pathological examinations. The most accurate method for detecting this syndrome is the molecular genetic testing of the ASPM gene to investigate the presence of possible mutations [7].

Treatment routes of Autosomal recessive primary Microcephaly syndrome (MCPH)

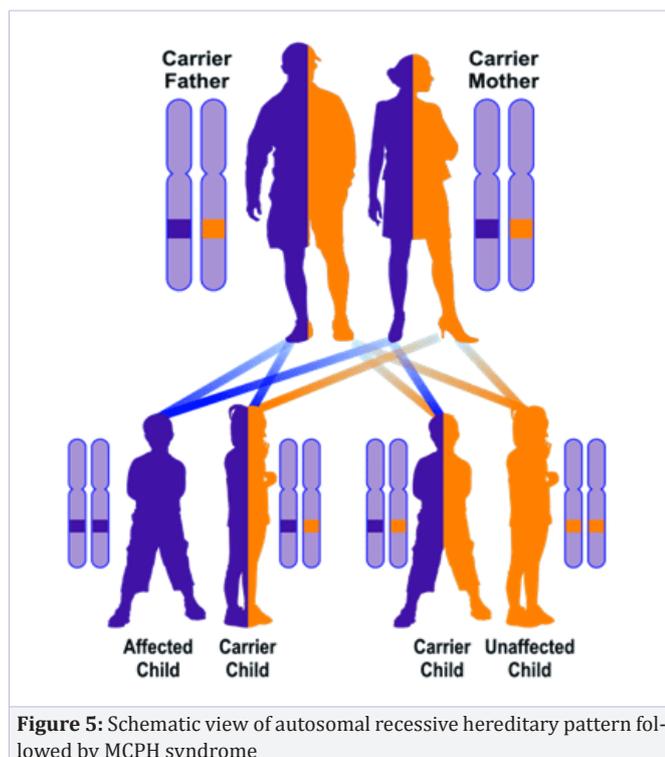


Figure 5: Schematic view of autosomal recessive hereditary pattern followed by MCPH syndrome

The MCPH syndrome treatment and management strategy is symptomatic and supportive. Treatment may be done by a team of experts, including orthopedic surgeons, neurologists, brain surgeons, physicians, and other healthcare professionals. There is no definitive treatment for this syndrome and all clinical measures are needed to reduce the suffering of the sufferers. Genetic counseling is also needed for all parents who want a healthy baby [7]. [Figure-6]

Conclusion

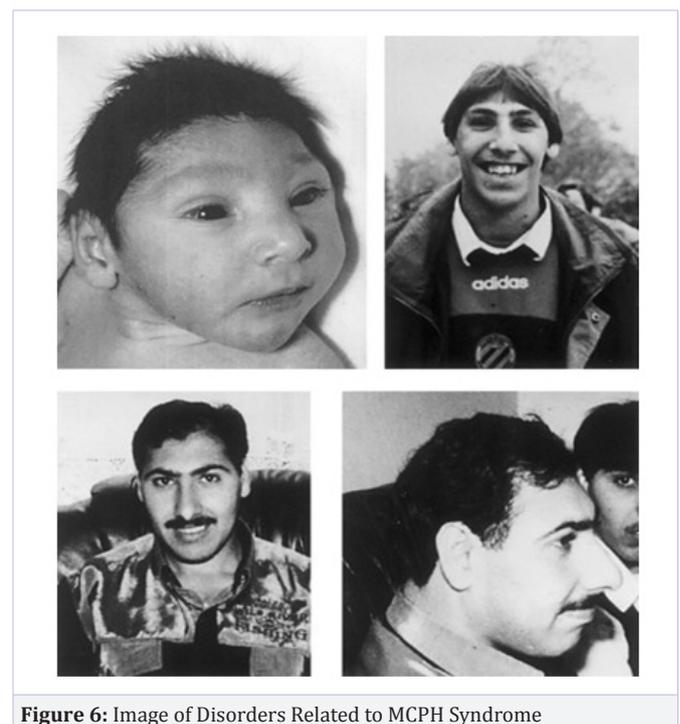


Figure 6: Image of Disorders Related to MCPH Syndrome

Regarding the symptoms of MCPH syndrome, it can be concluded that genetic disorders, even in single gene, can lead to malignant and marvelous symptoms. It is not yet clear exactly why the mutation in the ASPM gene is induced and induces this syndrome, but researchers are trying to determine how the mutation in this gene can alone induce an MCPH syndrome.

References

1. Cox J, Jackson AP, Bond J, Woods CG. What primary Microcephaly can tell us about brain growth. *Trends Mol Med.* 2006;12(8):358-366. Doi: 10.1016/j.molmed.2006.06.006
2. Kaindl AM, Passemard S, Kumar P, Kraemer N, Issa L, Zwirner A, et al. Many roads lead to primary Autosomal recessive Microcephaly. *Prog Neurobiol.* 2010;90(3):363-383. Doi: 10.1016/j.pneurobio.2009.11.002
3. Passemard S, Titomanlio L, Elmaleh M, Afenjar A, Alessandri JL, Andria G, et al. Expanding the clinical and neuroradiologic phenotype of primary Microcephaly due to ASPM mutations. *Neurology.* 2009;73(12):962-969. Doi: 10.1212/WNL.0b013e3181b8799a
4. Roberts E, Hampshire DJ, Pattison L, Springell K, Jafri H, Corry P, et al. Autosomal recessive primary Microcephaly: an analysis of locus heterogeneity and phenotypic variation. *J Med Genet.* 2002;39(10):718-721.
5. Thornton GK and Woods CG. Primary Microcephaly: do all roads lead to Rome? *Trends Genet.* 2009;25(11):501-510. Doi: 10.1016/j.tig.2009.09.011
6. Verloes A, Drunat S, Gressens P, Passemard S. Primary Autosomal Recessive Microcephalies and Seckel Syndrome Spectrum Disorders. *GeneReviews®* [Internet]. 2009.
7. Woods CG, Bond J, Enard W. Autosomal recessive primary Microcephaly (MCPH): a review of clinical, molecular, and evolutionary findings. *Am J Hum Genet.* 2005;76(5):717-728. Doi: 10.1086/429930