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Homogeneously Staining Regions or Double Minute Chromosomes in Leukemia

Abolfazl Movafagh
PhD, Associate Professor

Corresponding Author:Department of Medical Genetics, Shahid Beheshti University of Medical Sciences ,Tehran, Iran, Fax +98(21) 2240067 +98-21-23872572; E mail: Movafagh_a@yahoo.com

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Homogeneously Staining Regions (HSRs) or Double Minute Chromosomes (DMs) are the cytogenetic hallmarks of genomic amplification in cancers and derive from the breakpoint region of translocation event. The relationship of DMs/HSRs and malignancies seems to be well established and indeed DMs/ HSRs have not, so far, been observed in non malignant cells. DMs/ HSRs were first described in a direct preparation of cells from a patient with untreated bronchogenic carcinoma (DMs originating from chromosome 19). DMs are small chromatin particles that represent a form of extra chromosomal gene amplification and a mechanism for unregulated oncogene expression which is generally associated with a poor prognosis. Gene amplification causes an increase in the gene copy number and, subsequently, elevates the expression of the amplified genes, which modify normal growth control and survival pathway. Their role in leukemogenesis is not clear but they have been reported to be associated with rapid progression and short survival time. DMs are characteristically varying in number from cell to cell and are thought to be involved in tumorgenesis and in drug resistance. The C-myc is the most frequently amplified gene, but cases with MLL gene amplification have also been reported elsewhere. The semi conservative replication of DNA in DMs has been demonstrated to occur in both human and mouse cell lines.

Although found in a variety of human tumor cells, their presence in hematologic malignancies is rare. This type of gene amplification has been found in various solid tumors, such as Colon, Pancreatic, Breast carcinoma, brain tumors, and Neuroblastoma. Here we present two cases with leukemia associated with double minute chromosomes. The presence of DMs among leukemia patients in our laboratory has also been observed in other parts of the world.

The identification of two new cases of DMs presented here together with large Mitelman database (http://cgapanci.nih.gov/chromosomes/Mitelman) and other pertinent website reports suggest an association with leukemia. However, further studies and accumulation of new cases are needed in the hope of defining it as a specific abnormality in the field of leukemia.

References

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