Loss of heterozygosity

In Neurosurgery

- Genetic Analysis of Intracranial Schwannomas: Differential NF2 Alteration Frequencies in Nonvestibular Schwannomas Versus Vestibular Schwannomas
- Pathogenic Variants and Allele Loss of the NF2 and LZTR1 Gene in Sporadic Vestibular Schwannoma
- Chromosome 1p Loss and 1q Gain for Grading of Meningioma
- Characteristics, outcome, and prognostic factors of young patients with central nervous system World Health Organization grade 3 oligodendrogliomas IDH-mutant and 1p/19q codeleted: A French POLA network study
- Digenic impairments of haploinsufficient genes in patients with craniosynostosis
- Germline pathogenic variation impacts somatic alterations and patient outcomes in pediatric CNS tumors
- Association of pituitary neuroendocrine tumors and neurofibromatosis type 1: assessing causation versus coincidence. Case report
- The cortical high-flow sign in oligodendroglioma, IDH-mutant and 1p/19q-codeleted is correlated with histological cortical vascular density

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Genetic phenomenon that occurs when one of the two alleles at a specific gene locus is lost or deleted in a cell. In diploid organisms like humans, individuals inherit two copies (alleles) of each gene, one from each parent. Allelic loss typically results from the deletion or mutation of one of these alleles, leading to a situation where the cell or individual is left with only one functional copy of the gene at that locus. Here are key points about allelic loss:

Loss of One Allele: In a diploid organism, the presence of two alleles at a given gene locus provides redundancy and can mask the effects of mutations in one allele. However, when one of the alleles is deleted, mutated, or otherwise non-functional, it can lead to a loss of the gene's normal function.

Tumor Suppressor Genes: Allelic loss is particularly relevant in cancer research. Many cancer-related genes are tumor suppressor genes, and the inactivation of both alleles is often required for the loss of normal cell growth regulation. This biallelic inactivation can result from a mutation in one allele and allelic loss (deletion or mutation) in the other.

Molecular Mechanisms: Allelic loss can result from a variety of molecular mechanisms, including chromosomal deletions, gene mutations, and recombination events. These mechanisms can lead to the loss of one allele's function and can be associated with diseases, including cancer.

LOH in Cancer: Loss of heterozygosity in specific chromosomal regions is a common event in many cancer types. It can be a key step in the progression of cancer, as it can lead to the loss of normal tumor suppressor gene function and the acquisition of a growth advantage for cancer cells.

Genetic Testing: The analysis of allelic loss is often performed in genetic testing and cancer research to identify regions of the genome where one allele has been lost or mutated. This can be useful for understanding the genetic basis of diseases and for identifying potential therapeutic targets.

Understanding allelic loss is important in genetics and cancer research, as it can shed light on the genetic changes associated with disease development and progression. It also has implications for the development of targeted therapies in cancer treatment.

Either deletion or co-deletion of chromosomal arms 1p or 19q is a characteristic and early genetic event in oligodendroglial tumors that is associated with a better prognosis and enhanced response to therapy. Information of 1p/19q status is now regarded as the standard of care when managing oligodendroglial tumors for therapeutic options in anticipation of the increased survival and progression-free survival times associated with it. Keeping this in view, we first time attempted to establish the FISH-based detection of 1p/19q deletion in glioma tissue samples to evaluate its role and involvement in the disease.

Overall 39 glioma cases of different histologies were evaluated by fluorescence in situ hybridization (FISH) technique using specific FISH probes with Olympus BX43 fluorescent microscope to detect chromosomes 1p and 19q or co-deletions therein.

Of the 39 glioma samples, overall 27 (69.2%) were found to have deletion either in 1p, 19q, or both. Deletions were observed in 23.0%, 7.6% and 38.4% in 1p, 19q and 1p/19q co-deletions respectively. Overall oligodendroglioma presented with 53.8% (21 of 39) deletions, the astrocytoma group showed 12.8% and GBM accounted for 2.5% deletions. Overall survival and disease-free survival was seen significantly better in oligodendroglioma and astrocytoma with deleted tumors as compared to non-deleted ones ($p<0.05$).

Allelic losses on 1p and 19q, either discretely or shared, were more frequent in classic oligodendrogliomas than in either astrocytoma or Glioblastoma with better survival and response to therapy [1].

LOH in 1p & 19q occurs as a result of unbalanced whole-arm translocations between chromosome 1 & chromosome 19, [2] which occurs early in the pathogenesis of oligodendrogliomas.

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Pandith AA, Zahoor W, Manzoor U, Nisar S, Guru FR, Naikoo NA, Aein QU, Baba SM, Bhat AR, Ganai F, Shah P. Evaluation of chromosome 1p/19q deletion by Fluorescence in Situ Hybridization (FISH) as prognostic factors in malignant glioma patients on treatment with alkylating chemotherapy. Cancer Genet. 2023 Aug 10;278-279:55-61. doi: 10.1016/j.cancergen.2023.08.005. Epub ahead of print. PMID: 37625215.
2)
Jenkins RB, Blair H, Ballman KV, et al. A t(1;19) (q10;p10) mediates the combined deletions of 1p and 19q and predicts a better prognosis of patients with oligodendroglioma. Cancer Res. 2006; 66: 9852–9861