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Meningiomas: Sex-Specific Differences and Prognostic Implications of a Chromosome X Loss

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Abstract

Background: Meningiomas are the most common primary intracranial tumours in adults. Several studies proposed new stratification systems with a more accurate risk prediction than the WHO grading, e.g. based on methylation and copy number variations (CNVs). Yet, common shortcomings in these analyses are either a lack of stratification by sex of patients or excluding the gonososmes from CNV assessment.

Methods: Within this study, DNA methylation array data from 7,424 meningioma samples as well as targeted sequencing, clinical annotations and morphology subtyping of 796 samples were examined for differences between females and males regarding mutations, methylation classes, copy number variations and histology.

Results: Meningiomas from females accounted for about 53 % of the malignant tumours and present a loss of one X chromosome in 57 % of these malignant cases. In the group of benign tumours, females comprised about 75 % of the patients. Therein, a loss of one X chromosome was detected in only about 10 % of the cases but was associated with a significantly worse progression free survival.

Conclusion: Although genomic instability is a common feature of malignant meningiomas, particularly loss of the X chromosome in tumours of female patients in otherwise histologically and molecularly low-risk tumours confers higher risk. Hence, the gonosomal copy number status can be leveraged for increased diagnostic accuracy.

Keywords: Copy Number Variations; Meningioma; X chromosome.