Nervous system: Trisomy 19 ependymoma

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Identity
Alias: Vascular ependymoma

Classification
Trisomy 19 ependymoma is a subtype of ependymal tumors. This entity includes clear cell ependymomas.

Clinics and pathology

Disease
Central nervous system tumor.

Clinics
Trisomy 19 ependymomas are mostly supra-tentorial lesions affecting adolescents (mean age: 14 years median: 18 years, range: 3 months to 30 years).

Pathology
Trisomy 19 ependymoma is a genetico-histological entity. It associates specific genetic alterations (see below) with characteristic histological features which include architectural findings shared by all tumours, and cellular characteristics that may vary. Calcifications are frequently encountered. In addition to these features areas of classical aspects of cellular ependymomas can be observed.

Shared architectural features
Trisomy 19 ependymoma is a compact tumour with a sharp brain-to-tumour interface (Figure A). It presents a rich network of branched capillaries, reminiscent of the one of 1p/19q-deleted oligodendroglioma (chicken-wire vessels, Figure B). Because of this feature, they are sometimes called “vascular ependymomas”. As in all ependymomas, perivascular pseudorosettes are observed, although they are sometimes rare (Figure C). Cellular characteristics: Cellular aspects of trisomy 19 ependy-momas may vary inside a tumour and in between tumours. Throughout each region of homogeneous cellular appearance, tumoral cells are regularly distributed given to the tumour a highly ordered aspect.

Tumoral cells of trisomy 19 ependymomas may appear ovoid, back-to-back associated, with ovoid nuclei, and with either an eosinophilic cytoplasm or a clear perinuclear halo (Figure D). When this clear cell appearance is seen, diagnosis of clear cell ependymoma or of 1p/19q-deleted oligodendroglioma may be evoked. Tumoral cells can also be almost devoid of cytoplasm, have round nuclei, and constitute enucleated areas not centred on a vessel. Such regions may give an initial impression of PNET (primitive neuro-ectodermal tumour, Figure E). Finally, in some tumours or regions of tumour, tumoral cells may have intermediate-to-large-size cytoplasm that is ovoid or fusiform (Figure F). In this situation, the differential diagnosis from an oligo-astrocytoma needs to be addressed.

The immuno-histochemical profile of trisomy 19 ependymomas is similar to the one of all ependymomal tumours. GFAP is always detected, although with intra and inter-tumoral variations: some tumoral areas show intense labelling (Figure G), while others are almost completely negative (Figure H). Minimally, GFAP positivity of perivascular cell end-feet is found. EMA immunopositivity, appearing as intracytoplasmic dots, is also always observed, at least focally (Figure I). Trisomy 19 ependymomas are often graded as WHO grade III tumours because they present nearly always endothelial cell proliferation, Ki-67 labelling index higher than 10% and frequent mitotic figures.
See pathology paragraph.
Trisomy 19 (which is partial in some cases) is the copy number alteration always observed in this subset of ependymomas. Therefore they were named: "trisomy 19 ependymomas" alias vascular ependymomas.

**Treatment**
Following general ependymal tumor treatment guidelines.

**Evolution**
Not established.

**Prognosis**
Not established.

**Cytogenetics**

**Cytogenetics Molecular**
Trisomy 19 ependymomas owe their name to partial trisomy 19 which was the common genetic alteration observed by array-CGH in a series of 9 ependymomas presenting the histological aspects described above. As no minimal altered chromosomal regions has been defined, chromosome 19 alterations can only be searched for by a technique which profiles the entire chromosome for copy number alterations. Other copy number changes are frequently associated: deletion on 9 (monosomy or smaller deletion often involving 9p), amplification of 11q13.3-13.4 and deletion of 13q21.31-31.2.

**References**

This article should be referenced as such: