Ganglioglioma Pathology

Mixture of 2 types of neoplastic cells: neuronal (ganglion) and astrocytic (glial). Grossly: white matter mass, well-circumscribed, firm, with occasional cystic areas and calcified regions. Most dissect easily from brain, but the solid portion may show an infiltrative tendency.

Microscopically: ganglion cells demonstrate nerve cell differentiation, e.g. Nissl substance and axons or dendrites. Pitfall: differentiating neoplastic neurons from neurons entrapped by an invading astrocytoma may be difficult. Also, neoplastic astrocytes may resemble neurons on light microscopy. 2 of 10 patients had areas of oligodendroglioma. Aslo seen: necrotic areas, minimal calcification, and Rosenthal bodies.

Advances in the immunohistochemical detection of neuron-specific and neuronal-associated antigens have resulted in the discovery of neuronal elements in certain primary human brain tumors. The results have been not only to expand what neuropathologists commonly recognize as gangliogliomas, including the tumors now known as glioneurocytic tumor with neuropil rosettes and papillary ganglioneuroma, but also to expand the spectrum of tumor types to now include tumors such as central neurocytoma, dysembryoplastic neuroepithelial tumor, and desmoplastic infantile ganglioglioma.

Gangliogliomas are WHO grade I tumours most frequently found in the temporal lobes (70%) [1) 2)] but do occur anywhere in the central nervous system.

In a minority of cases (5%) these tumours show aggressive behaviour and histopathologic features and are then called anaplastic gangliogliomas (WHO grade III) [3) 4)]

At this stage, no criteria for WHO II gangliogliomas have been established [5)].

Microscopic appearance

Gangliogliomas, as their name suggests, are composed of two cell populations:

ganglion cells (large mature neuronal elements): ganglio- neoplastic glial element: -glioma primarily astrocytic, although oligodendroglial or pilocytic astroctytoma components are also enountered 9 The proportion of each component varies widely, and it is the grade of the glial component that determines biological behaviour.

Dedifferentiation into high-grade tumours does occasionally occur, and it is usually the glial component (into a Glioblastoma). Only rarely is it the neuronal component (into a neuroblastoma).

They are closely related to both gangliocytomas (which contain only the mature neural ganglion cellular component) and ganglioneurocytoma (which also have small mature neoplastic neurones).

Immunophenotype

Neuronal origin is demonstrated by positivity to neuronal markers:

Synaptophysin: positive

Neurofilament protein: positive

MAP2: positive

Chromogranin-A: positive (usually negative in normal neurones)

CD34: positive in 70-80%

The glial component may also show cytoplasmic positivity for GFAP.

Ganglioglioma and pleomorphic xanthoastrocytoma were the histologic types with the strongest association with CD34 positivity with an odds ratio of 9.2 and 10.4, respectively, compared with dysembryoplastic neuroepithelial tumors in Low-Grade Epilepsy-Associated Tumors [6].

Genetics

BRAFV600 mutations are frequently found in several glioma subtypes, including pleomorphic xanthoastrocytoma (PXA) and ganglioglioma and much less commonly in glioblastoma.

[1]
Rumboldt Z, Castillo M, Huang B et-al. Brain Imaging with MRI and CT. Cambridge University Press. (2012) ISBN:1139576399.

[2], [4], [5]
Louis DN, Ohgaki H, Wiestler OD, Cavenee WK “WHO Classification of Tumours of the Central Nervous System. 4th Edition Revised” ISBN: 9789283244929

[3]
Song JY, Kim JH, Cho YH et-al. Treatment and outcomes for gangliogliomas: a single-center review of 16 patients. Brain Tumor Res Treat. 2014;2 (2): 49-55. doi:10.14791/btrt.2014.2.2.49

[6]
Giulioni M, Marucci G, Cossu M, Tassi L, Bramerio M, Barba C, Buccoliero AM, Vornetti G, Zenesini C, Consales A, De Palma L, Villani F, Di Gennaro G, Vatti G, Zamponi N, Colicchio G, Marras CE. CD34 Expression in Low-Grade Epilepsy-Associated Tumors: Relationships with Clinicopathologic Features. World Neurosurg. 2018 Oct 9. pii: S1878-8750(18)32267-8. doi: 10.1016/j.wneu.2018.09.212. [Epub ahead of print] PubMed PMID: 30308344.