Oligodendroglial tumors diagnosis

Oligodendroglioma is diagnosed based on histology of infiltrating glioma together with IDH-mutation AND 1p/19q co-deletion.

They need molecular work up with readily available techniques like immunohistochemistry and Fluorescence in situ hybridization [1)]

Imaging

Oligodendroglioma Magnetic resonance imaging

Calcifications: seen in 28–60% of ODGs on plain radiographs [2)], and on 90% of CTs.

A Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) scan is necessary to characterize the anatomy of this tumor (size, location, heter/homogeneity). However, final diagnosis of this tumor, like most tumors, relies on histopathologic examination (biopsy examination).

Histology

Tumors show moderate cellularity. Cells with monotonous round nuclei (often in cellular sheets) with an eccentric rim of eosinophilic cytoplasm lacking obvious cell processes are the most consistent features [3)].

73% of tumors have microscopic calcifications [4)].

Isolated tumor cells consistently penetrate largely intact parenchyma; an associated solid tumor component may or may not be present.

When a solid portion is present, permanent (paraffin) pathology demonstrates lucent perinuclear halos, giving a “fried egg” appearance (actually an artifact of formalin fixation, which is not present on frozen section and may make diagnosis difficult on frozen). A “chicken-wire” vascular pattern has also been described. [5)]. These features are variable.

Nuclear atypia and an occasional mitotic figure are compatible with the diagnosis. Compare to WHO grade III anaplastic oligodendroglioma, IDH-mutant 1p/19q codeleted.

16% of hemispheric ODGs are cystic58 (cysts form from the coalescence of microcysts from microhemorrhages, unlike astrocytomas, which actively secrete fluid). GFAP staining: Since most ODGs contain microtubules instead of glial filaments, ODGs usually do not stain for GFAP, although some do. In mixed gliomas, the astrocytic component may stain for GFAP.

The purpose of a study was to assess the value of dynamic susceptibility contrast MRI imaging (DSC-MRI) and diffusion weighted imaging (DWI) to characterize oligodendrogliomas and to distinguish

them from astrocytomas.

Seventy-one adult patients with untreated WHO grade II and grade III diffuse infiltrating gliomas and known 1p/19q codeletion status were retrospectively identified and analyzed using relative cerebral blood volume (rCBV) and apparent diffusion coefficient (ADC) maps based on whole-tumor volume histograms. The Mann Whitney U test and logistic regression were used to assess the ability of rCBV and ADC to differentiate between oligodendrogliomas and astrocytomas both independently, but also related to the WHO grade. Prediction performance was evaluated in leave-one-out cross-validation (LOOCV).

Oligodendrogliomas showed significantly higher microvascularity (higher rCBVMean ≥ 0.80, p = 0.013) and higher vascular heterogeneity (lower rCBVPeak ≤ 0.044, p = 0.015) than astrocytomas. Diffuse gliomas with higher cellular density (lower ADCMean ≤ 1094 × 10-6 mm2/s, p = 0.009) were more likely to be oligodendrogliomas than astrocytomas. Histogram analysis of rCBV and ADC was able to differentiate between diffuse astrocytomas (WHO grade II) and anaplastic astrocytomas (WHO grade III).

Histogram-derived rCBV and ADC parameter may be used as biomarkers for identification of oligodendrogliomas and may help characterize diffuse gliomas based upon their genetic characteristics [6].

Oligodendroglioma 1p/19q co-deletion

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1)
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