Oligodendroglioma Magnetic resonance imaging

The MRI appearances also vary depending on whether a histological diagnosis or a molecular definition is used.

Oligodendrogliomas NOS, or those tumors that histologically show oligodendroglial features but are 1p/19q intact show more homogeneous signal on T1 and T2 images and have sharper borders than 'true' oligodendroglioma, those with 1p/19q co-deletion. In fact, a lesion being well-circumscribed homogeneously T1 hypoattenuating with high T2 signal and T2/FLAIR mismatch without calcification is predictive of not having 1p19q codeletion [1)]

Calcification and hemorrhage are difficult to distinguish on MR, appearing as areas of signal loss on T2* sequences, although the phase component of SWI may help. Peritumoral vasogenic edema is minimal in grade 2 tumors.

T1

Typically hypointense

T2

Typically hyperintense (except calcified areas)

T1 C+ (Gd)

Contrast enhancement is common but it is not a reliable indicator of tumor grade, with only 50% of oligodendrogliomas enhancing to a variable degree, and usually heterogeneously

Fewer than 20% enhance with gadolinium (compared to > 70% with grade III anaplastic ODG).

GRE/SWI

Calcium can be seen as areas of “blooming”

DWI

Typically no diffusion restriction

DWI can be used to help differentiate oligodendrogliomas (generally lower grade) from astrocytomas (generally higher grade); astrocytomas have higher ADC values probably because of their lower cellularity and greater hyaluronan proportion [2)]

MR perfusion (PWI)

Iincreased vascularity “chicken wire” network of vascularity results in elevated relative cerebral blood volume (rCBV)

older literature [3)] suggested that this was useful in predicting histological grade of tumor, however, how this relates to modern classification systems based on molecular markers is unclear

1)
Johnson DR, Diehn FE, Giannini C, Jenkins RB, Jenkins SM, Parney IF, Kaufmann TJ. Genetically Defined Oligodendroglioma Is Characterized by Indistinct Tumor Borders at MRI. AJNR Am J Neuroradiol. 2017 Apr;38(4):678-684. doi: 10.3174/ajnr.A5070. Epub 2017 Jan 26. PMID: 28126746; PMCID: PMC7960254.
2)
Tozer DJ, Jäger HR, Danchaivijitr N, Benton CE, Tofts PS, Rees JH, Waldman AD. Apparent diffusion coefficient histograms may predict low-grade glioma subtype. NMR Biomed. 2007 Feb;20(1):49-57. doi: 10.1002/nbm.1091. PMID: 16986106.
3)
Law M, Yang S, Wang H, Babb JS, Johnson G, Cha S, Knopp EA, Zagzag D. Glioma grading: sensitivity, specificity, and predictive values of perfusion MR imaging and proton MR spectroscopic imaging compared with conventional MR imaging. AJNR Am J Neuroradiol. 2003 Nov-Dec;24(10):1989-98. PMID: 14625221; PMCID: PMC8148904.