Atypical meningioma diagnosis

Radiographic features

Generally, it is impossible to confidently distinguish benign (WHO grade I) from atypical meningioma (World health organization grade 2 meningioma) and anaplastic meningioma (WHO grade III) based on general morphology. The most reliable feature is the presence of lower apparent diffusion coefficient values (reflecting higher cellularity) [1) 2)].

Importantly, the presence of vasogenic edema in adjacent brain parenchyma is not a predictor of atypical or anaplastic histology [3)].

Brain invasion, although by definition denoting at least a grade II tumour, is also surprisingly difficult to predict on MRI.

Diagnostic criteria

The World Health Organization Classification of Tumors of the Central Nervous System 2016 introduced brain invasion as a criterion for the diagnosis of atypical meningioma, WHO grade II. While it has long been recognized that the presence of brain invasion in a WHO grade I meningioma confers recurrence and mortality rates similar to those of a WHO grade II meningioma in general, prior WHO classifications had considered invasion a staging feature rather than a grading feature and opted to discuss brain invasion as a separate heading. In the 2016 classification, brain invasion joins a mitotic count of 4 or more as a histological criterion that can alone suffice for diagnosing an atypical meningioma, WHO grade II. As in the past, atypical meningioma can also be diagnosed on the basis of the additive criteria of 3 of the other 5 histological features:

spontaneous necrosis, sheeting (loss of whorling or fascicular architecture), prominent nucleoli, high cellularity and small cells (tumor clusters with high nuclear:cytoplasmic ratio).

Diagnostic criteria either:

4 - 19 mitotic figures/10 HPF OR

Brain invasion OR

Three of these histologic features:

Increased cellularity

Small cells with high N/C ratio

Large and prominent nucleoli

Patternless or sheet-like growth (loss of lobular architecture)

Foci of “spontaneous” or geographic necrosis

Note: Invasion of dura, bone or soft tissue does not affect grading

Pleomorphic or atypical nuclei do not affect grade

Ki67 is not a true diagnostic criteria, however it is usually greater than 4% and up to 20%.

References

[1)] [3)]
Toh CH, Castillo M, Wong AM et-al. Differentiation between classic and atypical meningiomas with use of diffusion tensor imaging. AJNR Am J Neuroradiol. 2008;29 (9): 1630-5. doi:10.3174/ajnr.A1170

[2)]
Filippi CG, Edgar MA, Uluğ AM et-al. Appearance of meningiomas on diffusion-weighted images: correlating diffusion constants with histopathologic findings. AJNR Am J Neuroradiol. 2001;22 (1): 65-72.