Intracranial Tumor Magnetic Resonance Imaging

Brain MRI, including T2 weighted image, T2-weighted fluid-attenuated inversion recovery (FLAIR) sequences and 3D T1-weighted sequences before and after application of a gadolinium-based contrast agent, is the diagnostic gold standard to detect a brain tumour [1].

However, the capability of brain MRI to depict brain tumor relapse and to assess treatment-induced changes (i.e. radiation necrosis or oedema) is limited. Indeed, contrast enhancement on MRI results from an increased blood–brain barrier permeability due to its breakdown is not specific of tumor invasion and can also be due to radionecrosis. The sensitivity of MRI is also not optimal as infiltration by high-grade glioma can be found beyond the contrast-enhancement limits

Conventional white matter (WM) imaging approaches, such as diffusion tensor imaging (DTI), have been used to preoperatively identify the location of affected WM tracts in patients with intracranial tumors in order to maximize the extent of resection and potentially reduce postoperative morbidity.

Neuroimaging plays an ever evolving role in the diagnosis, treatment planning, and post-therapy assessment of brain tumors.

The review of Villanueva-Meyer et al. provides an overview of current magnetic resonance imaging (MRI) methods routinely employed in the care of the brain tumor patient. Specifically, they focus on advanced techniques including diffusion, perfusion, spectroscopy, tractography, and functional MRI as they pertain to noninvasive characterization of brain tumors and pretreatment evaluation. The utility of both structural and physiological MRI in the post-therapeutic brain evaluation is also reviewed with special attention to the challenges presented by pseudoprogression and pseudoresponse [2].

Magnetic resonance imaging (MRI) has become the gold standard for the assessment of intracerebral lesions and is thus the primary tool for diagnosis and follow up examination of neurological cancers as it is more sensitive than CT for small tumors and offers better visualization of the posterior fossa. The contrast provided between grey and white matter make it the optimal choice for many conditions of the central nervous system including demyelinating diseases, dementia, cerebrovascular disease, infectious diseases and epilepsy.

Magnetic resonance imaging (MRI) is a method of choice for follow-up of irradiated brain metastases.

References

1)
Ellingson BM, Wen PY, Cloughesy TF. Modified Criteria for Radiographic Response Assessment in Glioblastoma Clinical Trials. Neurotherapeutics. 2017 Apr;14(2):307-320. doi: 10.1007/s13311-016-0507-6. PMID: 28108885; PMCID: PMC5398984.

2)

Villanueva-Meyer JE, Mabray MC, Cha S. Current Clinical Brain Tumor Imaging. Neurosurgery. 2017 May 9. doi: 10.1093/neuros/nyx103. [Epub ahead of print] PubMed PMID: 28486641.