ABSTRACT

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Functional MRI applications for intra-axial brain tumours: uses and nuances in surgical practise.

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PURPOSE: Functional MRI (fMRI) has well-established uses to inform risks and plan maximally safe approaches in neurosurgery. In the field of brain tumour surgery, however, fMRI is currently in a state of clinical equipoise due to debate around both its sensitivity and specificity.

MATERIALS AND METHODS: In this review, we summarise the role and our experience of fMRI in neurosurgery for gliomas and metastases. We discuss nuances in the conduct and interpretation of fMRI that, based on our practise, most directly impact fMRI's usefulness in the neurosurgical setting.

RESULTS: Illustrated examples in which fMRI in our hands directly influences the neurosurgical treatment of brain tumours include evaluating the probability and nature of functional risks, especially for language functions. These presurgical risk assessments, in turn, help to predict the resectability of tumours, select or deselect patients for awake surgery, indicate the need for neurophysiological monitoring and guide the optimal use of intra-operative stimulation mapping. A further emerging application of fMRI is in measuring functional adaptation of functional networks after (partial) surgery, of potential use in the timing of further surgery.

CONCLUSIONS: In appropriately selected patients with a clearly defined surgical question, fMRI offers a valuable complementary tool in the pre-surgical evaluation of brain tumours. However, there is a great need for standards in the administration and analysis of fMRI as much as in the techniques that it is commonly evaluated against. Surprisingly little data exists that evaluates the accuracy of fMRI not just against complementary methods, but in terms of its ultimate clinical aim of minimising post-surgical morbidity.

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