Letter to The Editor: A new start with fMRI

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Dear Editor,

Neurotechnology, which involves information obtained from magnetic and electrical based images, is at its growing phase in Malaysia. The article titled "Coping with Brain Disorders using Neurotechnology", published in the *Malaysian Journal of Medical Sciences*, Volume 19, Issue 1, 2012 (1), has caught our interest. Although functional magnetic resonance (fMRI) is not a new tool in neuroimaging, it is relatively new in our Hospital Universiti Sains Malaysia, which has begun to use the technology for patients' care and research. This particular technology is used solely in nervous system diseases for either medical or surgical-related purposes. Two of the major applications in neurosurgery are pre- and post-operative assessments of diseases (2–4). The pre-operative assessment is essential to obtain best operative results, especially when the eloquent areas of the brain are involved.

The fMRI has been in place for more than a decade; until now, it is used more in the research field. However, there are many useful clinical applications of fMRI, although they are not done routinely. The minimal machine strength for an fMRI study is 1.5 Tesla. In Malaysia, even though there are many centres with fMRI system of either 1.5 or 3.0 Tesla, the application of fMRI is still minimal and at an early stage.

The fMRI examination requires proper training for both radiographers and radiologists: the usage technique is important, and so is the result interpretation. Interpretation of fMRI images requires knowledge of radiology, neurology, as well as some technical MRI physics and its limitations.

Pre-operative localisation of eloquent cortices adjacent to the brain tumours is the most common clinical application of fMRI along with diffusion tensor imaging. In most assessment, there are paradigms to assess for motor, sensory, visual, and auditory functions.

The Philips Achieva 3 Tesla MRI was recently installed in the Department of Radiology. With the incorporation of the fMRI software and paradigms, at least 10 functional assessments can be performed. It is also incorporated with high intensity focused ultrasound system. We are pleased, as at this moment our machine is equipped with full fMRI facility.

Initial clinical assessments determine which functional assessments are required. The patient should be able to stand the long examination period.The patient should also understand how the examination is carried out and should be able

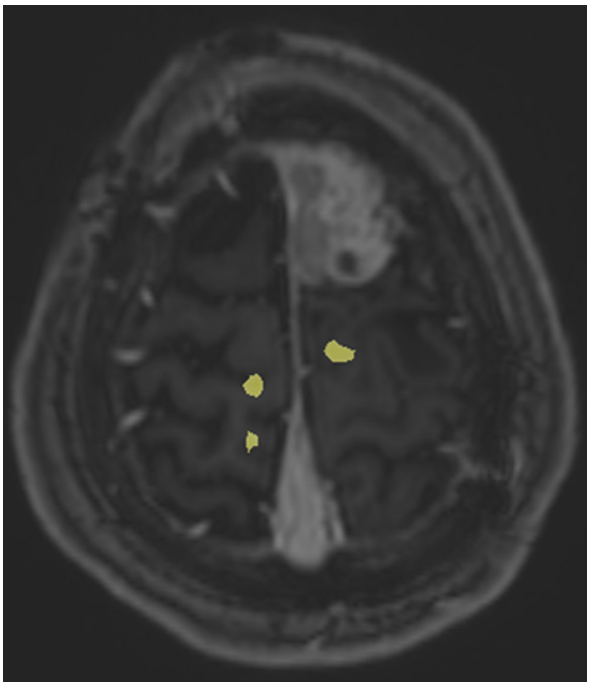

Figure 1: Functional magnetic resonance image of the foot motor task showed cortical activation in the medial part of left precentral gyrus (yellow colour). Residual enhancing tumour is seen in the left frontal region.

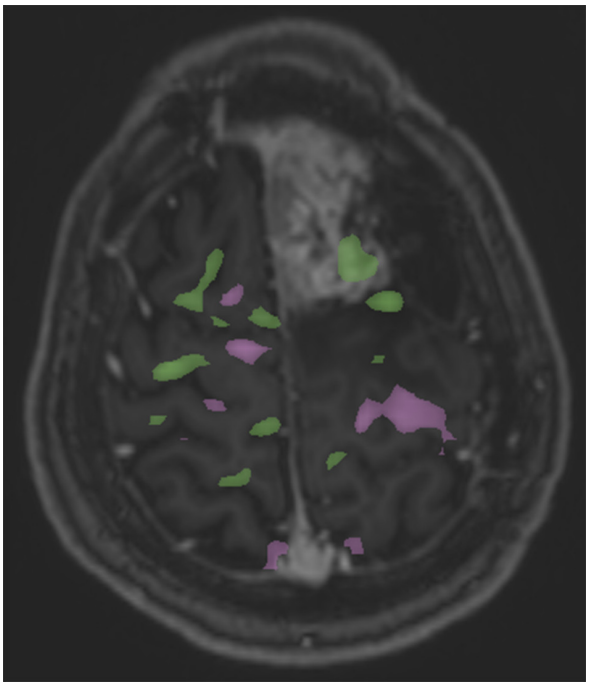

Figure 2: Functional magnetic resonance image of the hand motor task showed cortical activation in the middle part of left precentral gyrus (purple colour).

to complete the fMRI paradigm appropriately. There is an MR simulator machine where the patient can do practical sessions with the planned paradigms. Paradigms can be modified according to the patient's clinical assessment and ability.

Recently, we have done fMRI with several paradigm tasks performed on a meningioma patient who had undergone surgery and radiotherapy. Figures 1 and 2 depict the patient's fMRI findings in foot and hand motor tasks, respectively.

With this advanced facility, we are aiming to boost our centre to become a centre of excellence in neuroimaging.

Authors' Contributions

Conception and design, drafting, critical revision, and final approval of the article: WMSJ, AHAK, MSA, AIAH
Analysis and interpretation of the data: WMSJ, AHAK, MCA, MSA, CMCA, SAH, WNAH, ALA, NSEMN, AIAH, HC
Provision of study materials or patients: CMCA, SAH, WNAH

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References

1. Valdes-Sosa PA. Coping with brain disorders using neurotechnology. *Malays J Med Sci*. 2012;**19(1)**: 1–3.

2. Smits M, Visch-Brink E, Schraa-Tam CK, Koudstaal PJ, van der Lugt A. Functional MR imaging of language processing: An overview of easy-to-implement paradigms for patient care and clinical research. *Radiographics*. 2006;**26**:S145–158.

3. Wood JM, Kundu B, Utter A, Gallagher TA, Voss J, Nair VA, et al. Impact of brain tumor location on morbidity and mortality: A retrospective functional MR imaging study. *AJNR Am J Neuroradiol*. 2011;**32(8)**:1420–1425.

4. Haberg A, Kvistad KA, Unsgard G, Haraldseth O. Preoperative blood oxygen level-dependent functional magnetic resonance imaging in patients with primary brain tumors: Clinical application and outcome. *Neurosurgery*. 2004;**54(4)**:902–914.