

**MONTREAL NEUROLOGICAL INSTITUTE & HOSPITAL
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Name:	Banat, Mohammed	
Date of Birth:		Ref. MD: Dr. DelMaestro
Age:		MNH #
Date of Report:		Type of subject: Patient
Date of Testing:	11/11/2008	
Rhanded (performed task with Right hand)		
Reason for referral:	Evaluation of cognitive functions using an fMRI protocol pre-operatively to establish whether the temporal region surrounding the tumour is functional	

**Neuropsychology Unit
Imaging of Cognitive Functions using functional Magnetic Resonance Imaging (fMRI)**

Task: To evaluate the function of the posterior temporal lobe surrounding the tumour, we used a reading and writing task. During the 2 experimental trials, the patient was required either to copy down English words, or to write the names of objects, whereas, during the 2 control trials, the patient was required either to copy out non-meaningful words, or to simply name and draw loops. Thus, the 2 control trials enabled us to remove retrieval, naming, motor, and other miscellaneous processes not critical to the essence of reading and writing. There was also a control condition of copying African (nonsense) words. By comparing the signal in the brain between the experimental and control trials we were able to investigate the brain areas essentially involved in reading and writing. We compared the BOLD signal obtained during the experimental block of trials with that of the control block of trials and we computed t-statistical maps of the difference between a given set of two conditions.

Results of comparison – Writing-motor control: Activity differences were in the left hemisphere, well away from the tumor, in the superior parietal lobule. We present here the activity differences found on the side of the lesion, i.e. the left hemisphere:

- Left superior parietal lobule [MNI coordinates (x, y, z) -20, -56, 66, t-value = 3.31, Figure 1]

There were also a number of peaks that were also not close to the tumor, that constitute a circuit of areas involved in the task. We will not describe the peaks here.

Results of comparison – Reading(and then copying English words)-Writing the names of pictured objects: Activity differences were observed in the left hemisphere in the ventral posterior temporal lobe. The activity difference in the left hemisphere was at a distance from the caudal site of the lesion. We present here the activity differences found in the left hemisphere:

- Left ventral temporal lobe [MNI coordinates (x, y, z) -52, -64, 2, t-value = 3.11, Figure 2]

There were also a number of peaks that were also not close to the tumor, that constitute a circuit of areas involved in the task. We will not describe the peaks here.

Results of comparison – Writing(names of pictured objects)-Reading(and then copying English words): Activity differences were observed in the left hemisphere in the posterior ventral temporal lobe. The activity difference in the left hemisphere was close to the caudal site of the lesion. We present here the activity differences found in the left hemisphere:

- Left ventral temporal lobe [MNI coordinates (x, y, z) -36, -70, -16, t-value = 7.98, Figure 3]

There were also a number of peaks that were not close to the tumor that constitute a circuit of areas involved in the task. We will not describe the peaks here.

Conclusion: The goal of this fMRI protocol was to indicate what areas within the temporal lobe may be involved in the processes of writing and reading in this patient, and to use the information to help determine to what extent this area in this patient is involved in language.

Writing: The anterior superior parietal lobule, traditionally of the language dominant hemisphere, has been shown to be a critical region for this process. The patient's performance on the writing task was within the normal range.

Reading: The ventral temporal cortex generally has been implicated as an important region for processing visual forms (in the language dominant hemisphere, this may include words as they can be considered visual forms). As we know from lesion studies in the non-human primate, the inferior temporal lobe is specialized for the ability to process visual-objects, with there being a progression of more simple visual features being processed closer to primary visual areas in the occipital lobe, and more abstract/complex visual forms being processed further forward along the inferior temporal lobe.

Naming: The ventral temporal cortex generally has been implicated as an important region for processing visual forms, and visual processing enables the identification of an object which is one important and primary aspect of the process of naming. As we know from lesion studies in the non-human primate, the inferior temporal lobe is specialized for the ability to process visual-objects, with there being a progression of more simple visual features being processed closer to primary visual areas in the occipital lobe, and more abstract/complex visual forms being processed further forward along the inferior temporal lobe.

Recently investigators have proposed the existence of a visual area specifically dedicated to the processing of words. In our tasks, we found activation near the so-called visual word form area, during the comparison of 2 sets of conditions. First, in a writing condition where words were presented versus a writing condition where pictures were presented (see figure 2); Second, in the reverse comparison a writing condition where pictures were presented versus a writing condition where words were presented (see figure 3). Both revealed activation near the so called visual word form area. This seems to suggest that the area is a general visual area as it is involved in both processing word forms, as well as processing colored objects.

In this patient, the area (x= -43, y= -54, z= -12) would fall here:



The patient's performance on the reading tasks was within the normal range. He had no difficulty with the performance of the tasks. In this patient, activity was observed in the ventral temporal lobe in the left hemisphere near the site of the lesion.

Michael Petrides, Ph.D.

Emily Rubin Ferreira

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Writing

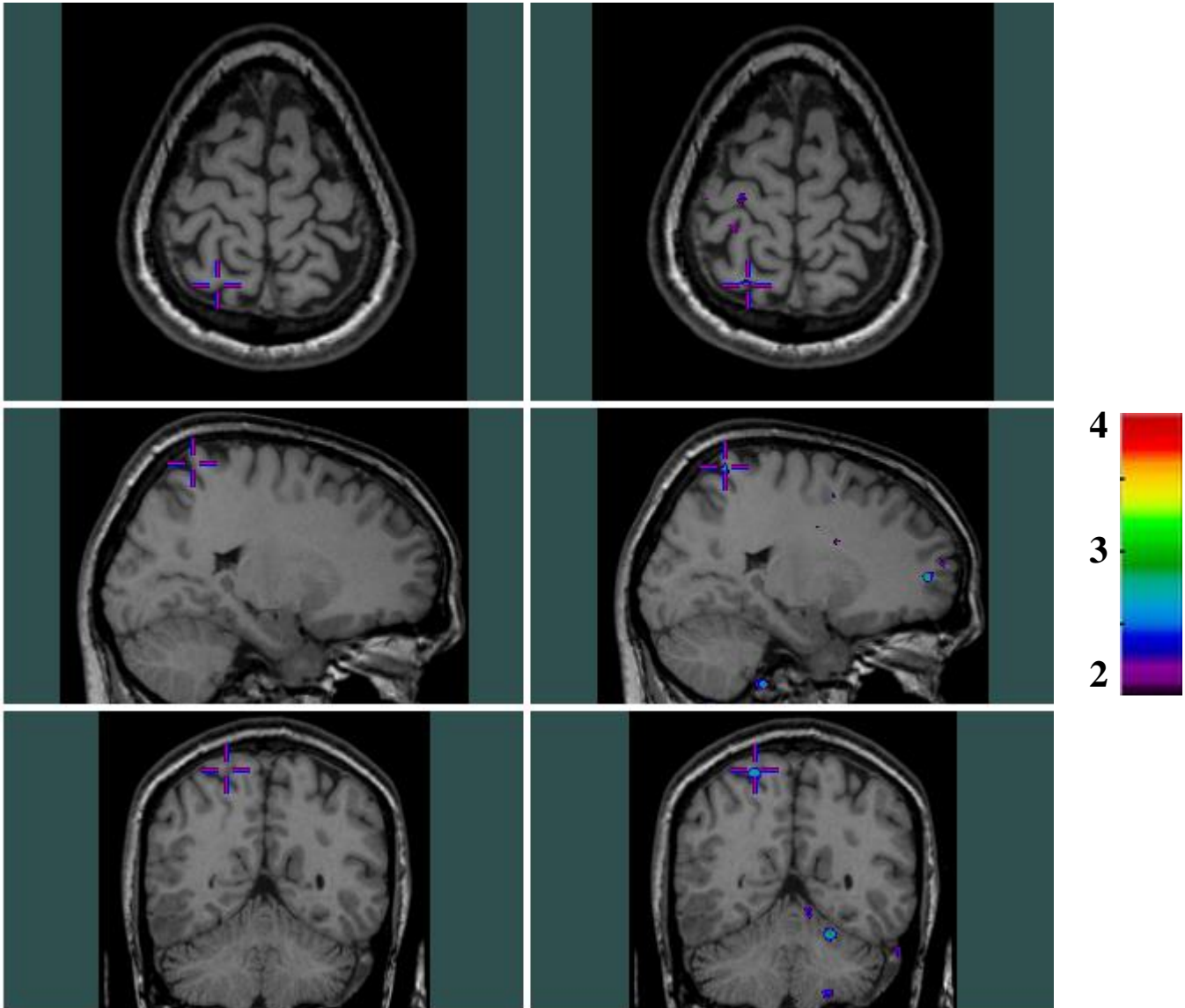
FIGURE 1

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fMRI scan: November 11, 2008

Writing names of pictured objects – motor control

Left superior parietal lobule [MNI coordinates (x, y, z) -20, -56, 66, t-value = 3.31]



Reading

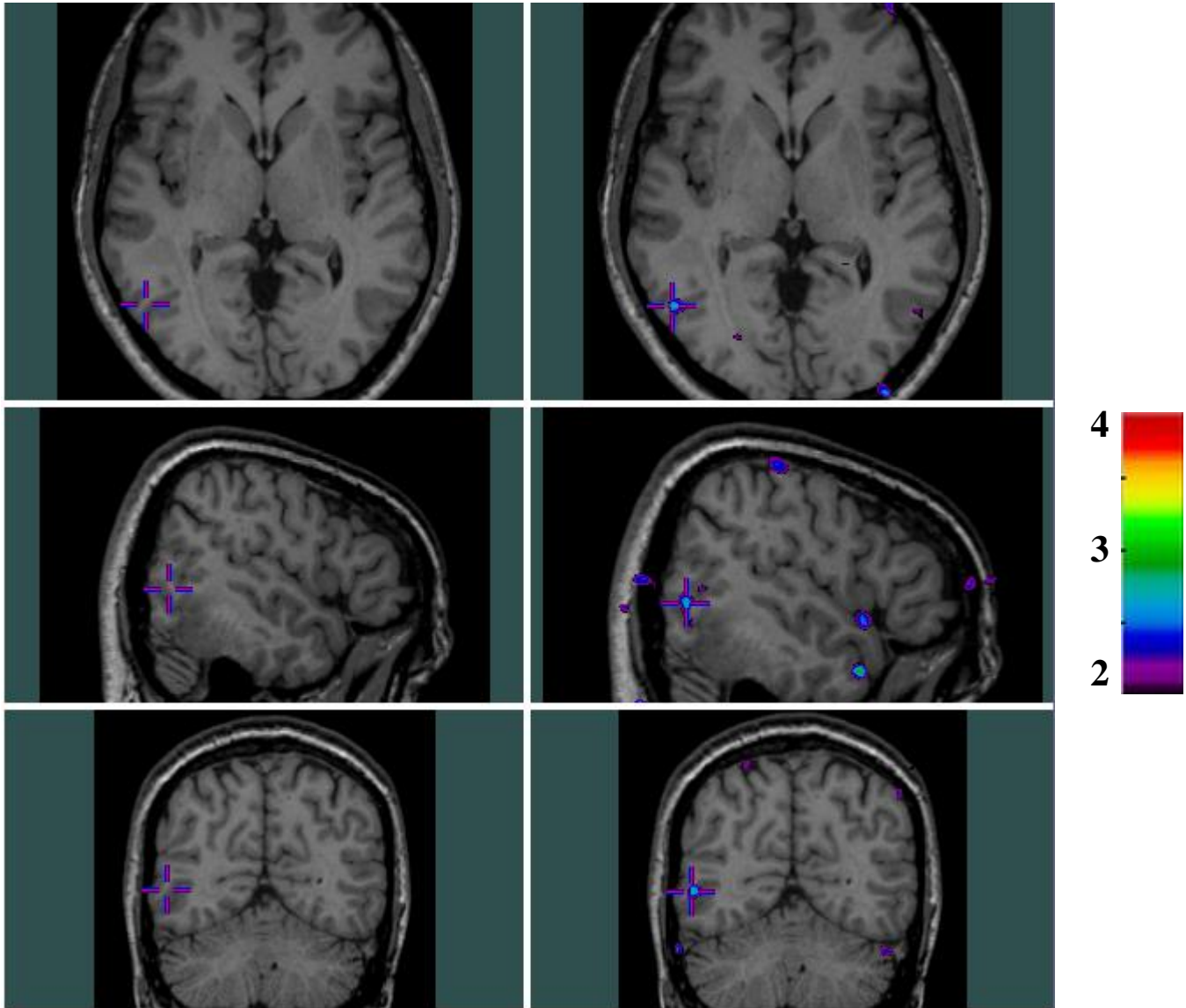
FIGURE 2

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fMRI scan: November 11, 2008

Copying English words – Writing names of objects

Left ventral temporal lobe [MNI coordinates (x, y, z) -52, -64, 2, t-value = 3.11]



Naming

FIGURE 3

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fMRI scan: November 11, 2008

Writing names of pictured objects – Copying English words

Left ventral temporal lobe [MNI coordinates (x, y, z) -36, -70, -16, t-value = 7.98]

