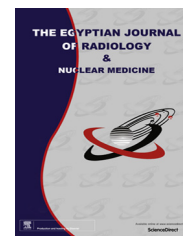




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ORIGINAL ARTICLE

Role of magnetic resonance spectroscopy (MRS) in nonlesional temporal lobe epilepsy



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KEYWORDS

MRS;
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Abstract *Objective:* The purpose of this study was to evaluate the role of magnetic resonance spectroscopy (MRS) in nonlesional temporal lobe epilepsy.

Subjective and methods: Between April 2011 and December 2013, a total of 30 patients having partial seizures with or without secondary generalization were selected from the Neurology Department, Sayed Galal Hospital, Al Azhar University and were studied in this work. All patients included in the study had clinical history, seizure symptoms, inter-ictal electroencephalography and neuroimaging findings that were consistent with “non-lesional epilepsy of temporal lobe origin”. We mean by non-lesional epilepsy that those cases are not secondary to other pathological lesions e.g. tumor, vascular insult or post inflammatory. Mesial temporal sclerosis was considered as nonlesional temporal lobe epilepsy. Each patient was thoroughly asked about the detailed clinical history after reviewing the referring imaging request and laboratory findings. The MRI and MRS examinations were performed in all the patients in one session. They were performed at 1.5 T super conducting system.

Results: MRS was performed in a total of 30 patients. Sixteen patients were males and 14 were females. The average age of the patients was 32 years (range: 17–47 years). Seventeen patients (56.7% of total patient number) were found to have clinical and EEG criteria of epileptic activity related to temporal lobe origin on the right side, while 11 patients (36.7% of total patient number) were found to have these findings on the left side. Two patients (6.6% of total patients' number) were having bilateral temporal lobe epileptic activity. Twenty six patients (about 87% of total patient

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number) were able to be lateralized with MRS using asymmetry index, 16 cases lateralized to the right side (about 53% of total patient number) and 10 cases lateralized to the left side (about 34% of total patient number). The remaining 4 patients (about 13% of total patient number) failed to be lateralized in our study. The sensitivity and specificity of the Conventional MRI and MR spectroscopy for detection of mesial temporal lobe epilepsy were 60% & 65% and 86% & 83% respectively.

Conclusion: MR spectroscopy is a very sensitive guiding tool in predicting the temporal lobe epilepsy (TLE) and the side of involvement in patients with TLE even in patients with MR negative studies. It helps in detecting abnormal spectra of various brain metabolites. MR spectroscopy has demonstrated consistent metabolic abnormalities in partial seizures. MRS can also detect bilateral affection with the ipsilateral side more affected.

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1. Introduction

Epilepsy is a common chronic neurological disorder that is characterized by recurrent unprovoked seizures. These seizures are transient signs and/or symptoms due to abnormal, excessive or synchronous neuronal activity in the brain. About 50 million people worldwide have epilepsy at any one time. Epilepsy is usually controlled, but not cured with medication, although surgery may be considered in difficult cases. However, over 30% of people with epilepsy do not have seizure control even with the best available medications. Not all epilepsy syndromes are lifelong – some forms are confined to particular stages of childhood. Epilepsy should not be understood as a single disorder, but rather as a group of syndromes with vastly divergent symptoms but all involving episodic abnormal electrical activity in the brain (1).

Temporal lobe epilepsy (TLE) is the most common form of partial epilepsy. Two types of non-lesional medial TLE are distinguished based on imaging and histopathological findings (1): TLE with mesial temporal lobe sclerosis (TLE-MTS, about 60–70%), which is characterized by an atrophied hippocampus with MR signal abnormalities and severe neuronal loss in the histological examination, and (2) TLE with a normal appearing hippocampus on the MRI (TLE-no, about 30–40%) and no or mild neuronal loss in the histological examination (2).

The temporal lobe is the most epileptogenic region of the brain. In fact, 90% of patients with temporal interictal epileptiform abnormalities on their electroencephalograms (EEGs) have a history of seizures. Temporal lobe epilepsy (TLE) is the most frequent cause of focal and refractory seizures. Mesial temporal sclerosis is the pathologic finding in 65% of temporal lobectomy specimens from adults with TLE. Mesial temporal sclerosis displays neuronal loss in the hippocampal formation, with accompanying astrogliosis. The majority of temporal lobe seizures originate in the mesial temporal structures, primarily in the hippocampus, parahippocampal gyrus and amygdala (3).

MRS is a noninvasive technique capable of providing metabolic information about different tissues; also it enables tissue characterization on a biochemical level surpassing that of conventional magnetic resonance imaging (cMRI). It detects abnormalities that are invisible to cMRI because metabolic abnormalities often precede structural changes (4).

Proton MRS has the potential to identify metabolic abnormalities before structural changes exist, as shown in

many studies that MRS detects abnormalities in patients who had normal MRI examination, i.e. patients with negative MRI. Metabolic abnormality may precede the development of structural lesion, but the connection between the severity of metabolic disturbance and structural lesion is not straightforward (5).

The purpose of this study was to evaluate the role of magnetic resonance spectroscopy (MRS) in non-lesional temporal lobe epilepsy.

2. Subjects and methods

2.1. Patient population

Between April 2011 and December 2013, a total of 30 patients having partial seizures with or without secondary generalization were selected from the Neurology Department, Sayed Galal Hospital, Al Azhar University and were studied in this work. All patients included in the study had clinical history, seizure symptoms, inter-ictal electroencephalography and neuroimaging findings that were consistent with “non-lesional epilepsy of temporal lobe origin”. We mean by non-lesional epilepsy that those cases are not secondary to other pathological lesions e.g. tumor, vascular insult or post inflammatory. Mesial temporal sclerosis was considered as nonlesional temporal lobe epilepsy. In this study the diagnosis of non-lesional temporal lobe epilepsy (TLE) was based on the following criteria: (1) No lesion detected by conventional MR imaging other than mesial temporal sclerosis, (2) Focal ictal temporal lobe patterns recorded with EEG, and (3) Clinical features consistent with seizures of temporal lobe origin. The attack usually begins with an aura of a rising epigastric sensation and progress to altered consciousness with variable orolimentary manifestations such as lip smacking, chewing and manual automatisms. This may be accompanied by fear, or fear may exist alone as the second most common aura. Head deviation early in the seizure is usually ipsilateral to the seizure focus, but head deviation may occur late in the seizure which is contralateral and often a prelude to generalization. Patients are partially responsive during a seizure and often had post-ictal confusion or aphasia and the aura is usually remembered after recovery. Each patient was thoroughly asked about the detailed clinical history after reviewing the referring imaging request and laboratory findings.

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