

SHORT COMMUNICATION

The relation between brain MRI lesions and depressive symptoms in multiple sclerosis

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Abstract

The authors investigated the relationship between depression and involvement of specific brain areas in multiple sclerosis (MS) patients. 20 MS patients (10 depressed and 10 non-depressed) were evaluated. The emotional state was assessed by several neuropsychological tests, and all of the patients underwent 1.5 Tesla magnetic resonance (MRI) including T1 and T2 weighted images. MRI data were analyzed by measuring the regional area of lesions (in mm²) in the frontal, temporal and corpus callosum locations, side and the number of lesions. The correlation of MRI findings between depressed and non-depressed groups of patients has shown that a statistically significant difference was achieved between regional frontal lesions area ($p=0.02$), as well as significant difference between regional temporal area of lesions ($p=0.13$). In the depressed group of patients a greater lesions area was achieved in the right when compared with the left frontal lobe. No differences were obtained for the temporal lobe. The highest number of lesions were observed in the right frontal lobe in the depressed group of patients. Our findings have shown that depressive symptoms are associated with the area and location of brain lesions. (*Tab. 1, Fig. 2, Ref. 8.*)

Key words: multiple sclerosis, depression, magnetic resonance, area of brain lesions.

Depression is most frequent among psychiatric disorders in multiple sclerosis. The prevalence of depression in MS is 40–50 % (Barry et al, 1995). Mechanisms underlying the depression in MS patients remain unknown (Feinstein et al, 1995; Borrás et al, 1999). Three main hypotheses are proposed:

- 1) Depression does not depend on the disease,
- 2) Mood changes are reactive, anxiety and depression appear to be related to environmental factors such as social stress,
- 3) Depression is directly related to the lesions of the disease (Zorzon et al, 2001; Bakshi et al, 2000; Schiffer et al, 1983).

This study was investigated the relationship between the involvement of three areas of the brain (frontal lobe, temporal lobe and corpus callosum) and the depression in multiple sclerosis patients.

The correlation with brain pathology detected by using MRI, disease severity and duration are discussed.

Objective

Area and location of regional brain lesions were investigated

by means of MRI, and findings between the depressed and non-depressed patients were compared.

Methods

At the Department of Neurology, Faculty Hospital, Brno-Bohunice, 20 relapsing-remitting multiple sclerosis patients (average age 37.3 ± 7.2), 6 males and 14 females treated with interferons, were analyzed. EDSS score in the whole group ranged from 1.0 to 4.0 (mean EDSS 2.5). The patients were divided into two groups according to their psychoemotional state. The group with depression included 10 patients (average age 37.3 ± 7.6 , EDSS 2.8) and the non-depressed group consisted of 10 patients (average age 37.3 ± 6.8 , EDSS 2.2) (Tab. 1).

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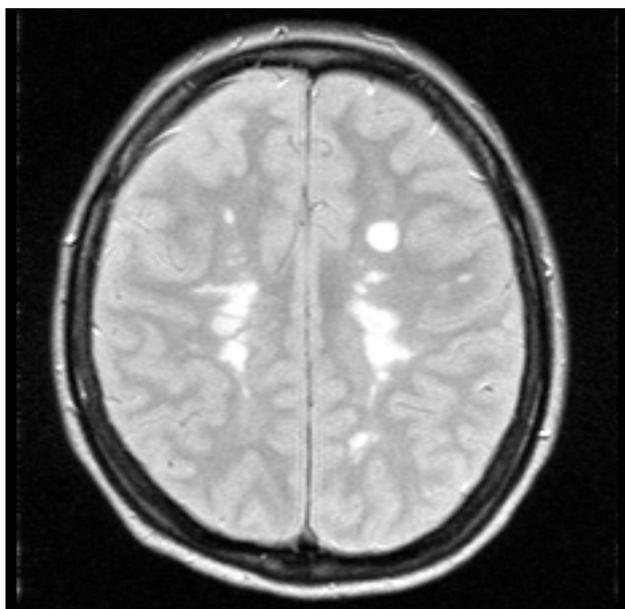


Fig. 1. Demyelinating lesions in the axial proton-density MRI scan.

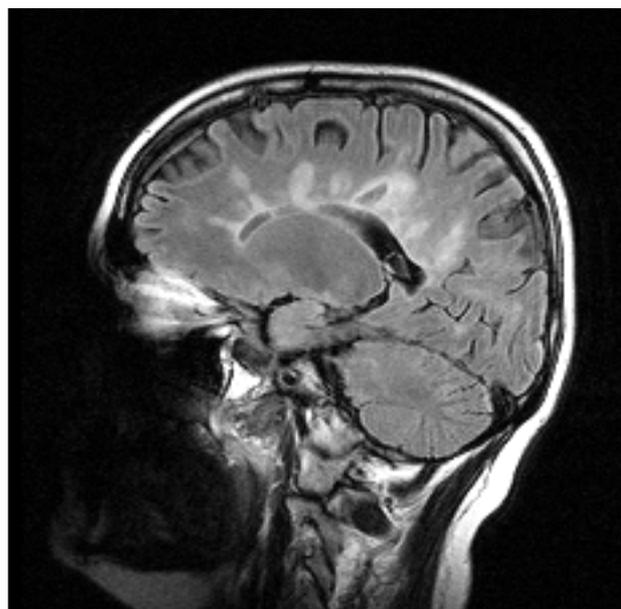


Fig. 2. Demyelinating lesions in the sagittal Flair MRI scan.

The patients were assessed with the following psychological tests:

Hamilton Depression Rating Scale (HDRS) – this is a clinical interview based on the assessment of the presence and intensity of depressive symptoms in 23 items. Scores above 18 points were considered as indicators of depression.

W.W.K. Zung Depression and Anxiety Rating Scale is based on a self-evaluation questionnaire with a scale of 20 items. The range of scores for this scale are: light depression 40 to 48, moderate depression 48 to 55, and severe depression 56 to 80.

Montgomery and Asberg Depression Rating Scale (MADRS) (Montgomery et al 1979) is a self-evaluation questionnaire with scale of 10 items. This scale is exact for the evaluation of depression and sensitive to change.

All patients underwent 1.5 Tesla magnetic resonance (MRI) examination including T1 and T2 weighted images. MS white matter lesions were evaluated on proton density spin-echo images obtained with 5 mm slice thickness. Should the lesion be of

a circular shape, only one distance was measured. Should it be of ovoid or other shape, two distances were measured and calculated. MRI data were analyzed by measuring the regional frontal, temporal, corpus callosum and the total number and area of lesions (in mm²) and the side of lesions (Fig. 1).

Then the correlation of MRI findings between the depressed and non-depressed groups of MS patients was performed. T-test and F-test were used for statistical analysis.

Results

There were 10 patients with the diagnosis of depression (three of them with severe depression, two of them with moderate depression, and five of them with light depression). In addition to the latter groups, there were ten non-depressed patients.

The data from MRI scans showed that all patients had multiple demyelinating lesions. For the depressed group the total lesion area in the frontal lobe achieved 2158 mm², in the temporal lobe 756 mm², and in the corpus callosum 885 mm². In the non-depressed groups of patients, the total lesion area in the frontal location achieved 469 mm², that in the temporal location achieved 414 mm² and that in corpus callosum 399 mm². Statistically significant difference was detected between the regional frontal lesions area between the two groups ($p=0.02$), but not in the temporal and corpus callosum location. The difference between regional temporal lesions area was not statistically significant ($p=0.13$). A difference was obtained between the total right and left frontal lobe areas (1689 mm², 469 mm²) in the depressed group of patients. This difference implies the probable participation of the right frontal lobe damage in relation to depression. No difference was achieved in the temporal lobe (Tab. 1).

Tab. 1. The difference between the total right and left frontal lobe areas in the depressed group of patients.

Location	Depression		Control		T-test
	Area mm ²	Number of lesions	Area mm ²	Number of lesions	
Fdx	1689	35	255	19	0.02
Fsin	469	17	214	14	
F•	2158	52	469	33	0.13
Tdx	410	11	353	11	
Tsin	346	12	61	6	0.13
T•	756	33	414	17	
Corpus call.	885	32	399	36	

The data from MRI scans have shown that the diagnosis of major depression correlates with the right frontal lesion load.

Discussion

The presence of psychiatric symptoms as components of a clinical picture of multiple sclerosis has been recognized since the earliest reports of the disease. Depression is the major psychiatric symptom. The overall prevalence of depression in MS is 40–45 % (Barry et al, 1995). Psychosis is another psychiatric manifestation of MS, however occurs far less frequently than the depressive mood states. Due to significant morbidity in people with MS, there is a considerable risk of suicide in these individuals. The risk of suicide has been estimated to be 7.5-times greater in people with MS than in general population. It is very important to assess mental and psychiatric states and to treat the possible psychiatric illness in MS patients.

The major aim of affective disorders research in MS is to determine whether depression is a psychological response to the illness or a psychoneurologically based disorder resulting from demyelination.

A genetic link has been suggested between the presence of bipolar disease in patients with MS.

The most common symptoms — anxiety and depression have been found to correlate with these aspects of MS (social stress, disability, exacerbation). Depression is also suspected to be a side effect of MS treatment with interferons.

The correlation with brain pathology detected by using MRI, disease severity and duration are being discussed (Feinstein et al, 1995; Moller et al, 1994).

Our results have shown that a statistically significant difference was achieved between the frontal lesions load with the de-

pressed and non-depressed groups of patients. The presence of depression is predicted by frontal lesions. This is in correlation with the study of 95 patients set (Zorzon et al, 2001) and 48 patients set (Bakshi et al, 2000). However, no significant difference was obtained in the temporal location as described in literature (Zorzon et al, 2001; Bakshi et al, 2000).

Our findings have shown the possible association between depressive symptoms and total area of demyelinating lesions in the frontal lobe with the right superiority location in multiple sclerosis.

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