

Characteristic analysis of white matter lesions in migraine patients with MRI

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Abstract. – OBJECTIVE: The aim of this study is to analyze the characteristics of white matter lesions in abnormal manifestations of magnetic resonance imaging (MRI) of patients with migraine, and its relationship with migraine.

PATIENTS AND METHODS: 38 patients, diagnosed with migraine were continuously selected as the observation group, while during the same period, 30 healthy individuals were selected as the control group. The differences of the features of MRI of two groups, the ratios of white matter lesions manifestations and the severity were compared.

RESULTS: The manifestations of MRI in patients with migraine were mainly white matter lesions. The accuracy rate was 86.7%, and the sensibility was 92.3%. According to Wahlund white matter lesions classifications, patients with migraine were mainly Level II and Level III (84.2%). It can be acquired from relevant analyses that white matter lesions classifications and the degrees of migraine were positively correlated ($p < 0.05$). White matter lesions were mainly distributed in the frontal lobe (78.9%), limbic system (60.5%) and parietal lobe (28.9%).

CONCLUSIONS: The MRI of migraine, the manifestations of white matter lesions were relatively sensitive. The higher the classification was linked with the degree of migraine. They were mainly distributed in the frontal lobe, limbic system and parietal lobe.

Key Words:

Migraine, Magnetic resonance imaging, White matter lesions.

Introduction

The migraine is a kind of headache disease that frequently appears clinically. Its occurrence rate is relatively high, which is about 34.3%-51.2%¹. Patients suffer a severe headache when the disease occurs, the disease is protracted and is difficult to be cured, and recurrent pains and sleep disorders bring severe adverse effects to work and lives of patients. WHO² has listed mental disorders, quad-

riplegia and migraine as the most severe chronic functional disorders. Clinically, the pathogenesis of migraine is not clear, and there are several theories proposed, including vascular source theory, neuron theory, nerve vascular source theory and so on³. Currently, there are rare clinical specific imaging indicators and laboratory examination methods, and magnetic resonance imaging (MRI) is the most frequently used technology in functional imaging, which has the advantages of high resolution, radiation less and no trauma. MRI is sensitive to lesions in brain tissue and soft tissue, can be quantitatively detected, and is more and more widely applied clinically⁴. With the wide development of MRI, the detection rate of white matter lesions in patients with migraine is continuously increasing, and relevant literature confirms the close relationship between migraine and white matter lesions⁵. This research is designed to analyze the characteristics of white matter lesions in abnormal manifestations of MRI in patients with migraine, and its relationship with migraine.

Patients and Methods

Patients

38 patients with migraine in our hospital were continuously collected between February 2012 and February 2014 as the observation group. All patients confirm to the diagnostic criteria of migraine in head and face pain classification proposed by International Headache Society (IHS) in 2004⁶. The patients with the histories of drug abuse and drug allergy, abnormal in growth and development, mental and communication disorders, other headaches or refuse to participate in the research were excluded. There were 15 male patients and 23 female patients, age range from 28 to 63 with the average age of (48.6 ± 7.5) . 30 individuals who were examined as healthy in our hospital during the same period were selected as

the control group. There were 10 male patients and 20 female patients, age range from 26 to 67 with the average age of (49.6 ± 7.4) . This research was approved by Ethics Committee of our hospital and obtained informed consents from patients and their families.

Research Methods

MRI was carried out by 3.0T superconductive magnetic resonance scanner provided by Siemens AG. 8 channels phased array coils was adopted to carry out MRA examinations, FLAIR examinations, T1WI examinations and T2WI examinations. The interlayer spacing was about 1.5 mm, and the thickness of the layer was about 5 mm. The examinations were carried out by professional technicians from the Department of Image, a blind method was carried out for all patients, and the examination results were judged mutually by three technicians. The numbers of white matter lesions and their locations of patients examined in two groups were completely recorded.

Observation Indexes

The characteristics, severity and distributions of white matter lesions on MRI in two groups were compared and the relevant analyses were carried out according to the classifications of migraine. According to literature of Wahlund⁷, the degrees of white matter lesions were divided into four levels. Level 0 represents no obvious white matter lesions, Level I represents the manifestation of partial leukoaraiosis, Level 2 represents partial leukoaraiosis begin to fuse, and Level 3 represents leukoaraiosis is widely diffused and converged, and U-fiber involvement was accompanied or not accompanied. According to mi-

graine degree classification method proposed by IHS in 1998⁶ (Headache premonition, headache course of disease, headache occurrence frequency, headache duration, headache severity, quality of sleep, the degrees of anxiety and depression were references). The patients with migraine were divided into 4 levels from 0 to 3, the higher the level was more severe the headache was.

Statistical Analysis

Data are analyzed by SPSS 19.0 statistical software (SPSS Inc., Chicago, IL, USA), measurement data were represented by \bar{x} , and *t*-test was adopted for comparison among groups. Enumeration data were represented by (%), χ^2 -test was adopted for comparison among groups, χ^2 -test was adopted for the relevant analyses of migraine classifications and white matter lesions classifications. $p < 0.05$ was considered that the difference was of statistical significance.

Results

Comparisons of Imaging Features of White Matter Lesions

White matter lesions were manifested on both sides of the brain cortex around the lateral ventricle, centrum semiovale patchy or diffused mutual fusion on MRI. T2 weighted imaging and FLAIR were high signals, T1 weighted imaging shows equal or low signals, the boundaries were explicit, and no space occupying effects (Figure 1). MRI of patients with migraine was mainly manifested as white matter lesions, there were 35 cases (92.1%) detected in total, the accuracy rate was 86.7%, and the sensitivity was 92.3%. 5 patients in control group manifest white matter le-

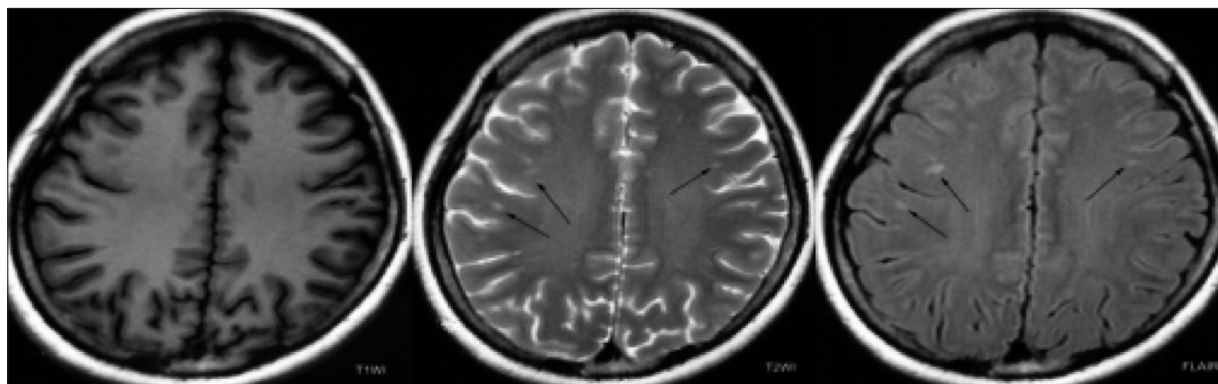


Figure 1. T1, T2 and FLAIR Scanning images of white matter lesions in the same layer of magnetic resonance imaging (T2 or FLAIR manifest high signals, while no low signal changes in T1).

sions (16.7), the comparisons among groups show that the difference was of statistical significance ($p < 0.05$). White matter lesions were mainly distributed in the frontal lobe (30 patients, 78.9%), limbic system (23 patients, 60.5%) and parietal lobe (11 patients, 28.9%) (Figures 2-3).

Analysis of Classified Correlations of Migraine and White Matter Lesions

There were 6 patients with Level I, 11 patients were with Level II and 21 patients were with Level III in migraine. 2 patients with Level 0, 4 patients with Level I, 15 patients with Level II and 17 patients with Level III in white matter lesions. According to relevant analyses, it can be acquired that the classifications of white matter lesions and the degrees of migraine were positively correlated ($r = 0.632$, $p = 0.027$).

Discussion

Magnetic resonance was the most important method in researching migraine in recent years, which can be used to quantitatively analyze some specific metabolic compounds⁸. A large number of researches verified that the MRI of the white matter of patients with migraine was manifested as abnormal⁹. Comparing patients with migraine

with healthy individuals, the anterior cingulate white matter of patients with migraine reduces, signals were changed, which was linearly correlated to seizure frequency of migraine¹⁰. The reduction of white matter in the brain of patients with migraine was closely related to the conduction of pain, the changes of white matter were triggered by the frequent introduction of pain, and this kind of changes can be reversed in the intermission of migraine¹¹. The selective white matter changes occurred in the brain of patients with migraine were closely related to the degrees of disease attack and course of disease¹², which provides scientific evidence for the theory that migraine is a kind of organic disease.

The morbidity of white matter lesions in healthy persons was between 10% and 15%, and gradually increases with the increase of age¹³. A recent meta-analysis results showed that the risk of occurring white matter lesions in patients with migraine with aura was nearly twice of that of persons in the healthy control group (OR = 1.68, 95% CI: 1.07-2.65)¹¹. It was obtained from the research that MRI of patients with migraine was mainly manifested as white matter lesions, the detection rate was 92.1%, the accuracy rate was 86.7%, and the sensitivity was 92.3%. White matter lesions were mainly distributed in the frontal lobe, limbic system and parietal lobe. This kind of distribution may be of evident rela-

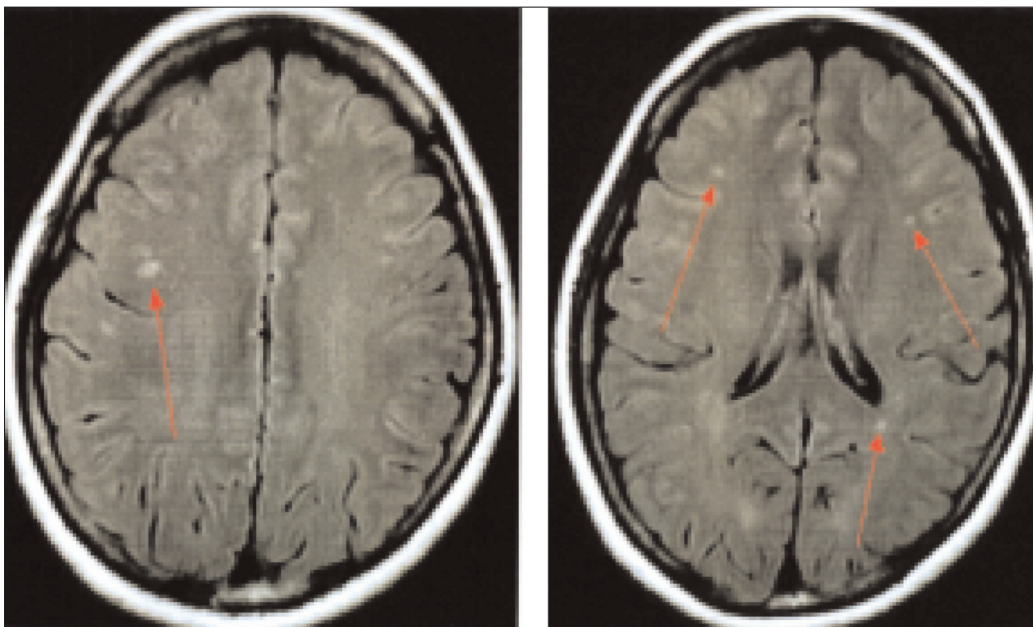


Figure 2. White matter high signals of right frontal lobe, parietal lobe, left frontal lobe, temporal lobe juncture and inferior horn of lateral ventricle on magnetic resonance imaging FLAIR.

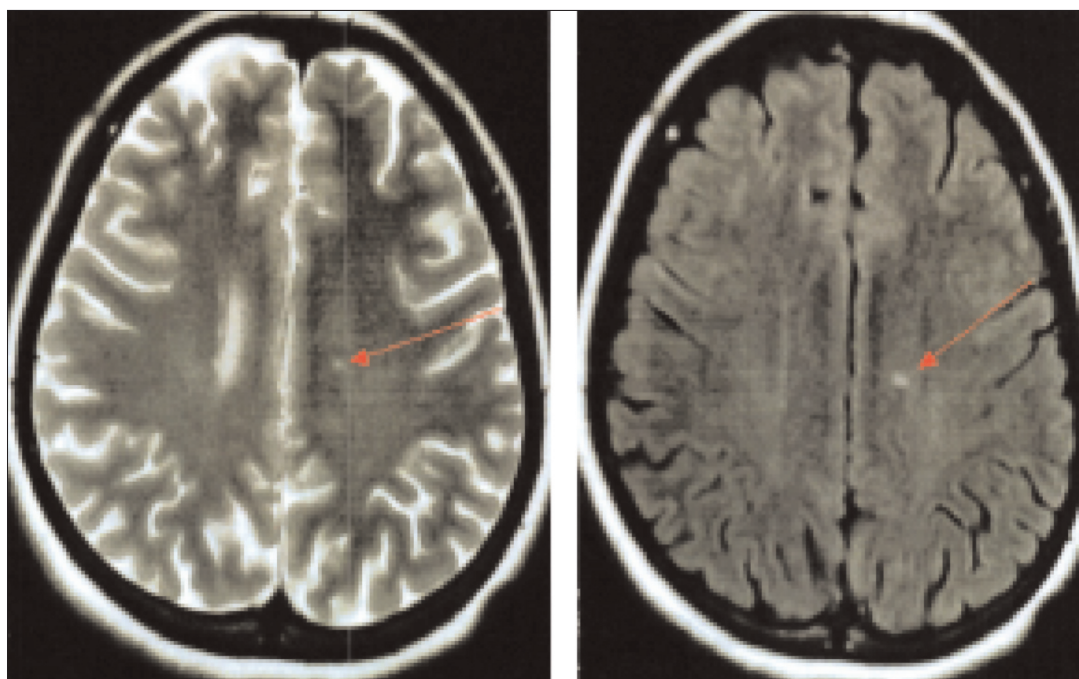


Figure 3. White matter high signals of left radial coronary area single dot on MRI T2 and FLAIR.

relationship with anatomical features of feeding vessels¹⁴. The blood supply of deep white matter of frontal lobe, limbic system and parietal lobe is mainly carried out by the perforating artery. It is terminal arteriole with small pipe diameter, has few or even no collateral circulations, uses definitive zone which is 3-10 mm from ventricle walls as the watershed, and aforementioned structures determine that white matter in this area is subject to the influence of ischemia and, therefore, lead to demyelinating disease¹⁵. Some studies¹⁶ have shown that it is correlated with specific neurological side effects of patients with migraine. MRI examinations still need to be carried out to explore its causes, and the physiological mechanism of MRI abnormalities still need to be further illustrated.

MRI technology deals with multiple statistics and parameters, reacts to changes of extension in the imaging body through directions, and can effectively display cerebral white matter fiber lesions¹⁷. Repeated migraine could lower the cognitive function of patients to the utmost extent, and through MRI, cerebral white matter lesions that were difficult to be discovered by other imaging examinations can be discovered. Some scholars adopt MRI to carry out researches about the potential cerebral white matter lesions of patients with migraine, and they discover that there

was the possibility of wallerian degeneration happens in the cerebral white matter of patients with migraine, and it was closely related to dysfunction of the cerebral cortex¹⁸.

Conclusions

MRI provides scientific statistical materials for the diagnosis and treatment of patients with migraine, in terms of the technology itself, the results may be different because of the differences of the number of samples and research objects. Therefore, MRI of patients with migraine should be further standardized to enhance the reliability of research methods and to form researches of relatively high comparability.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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