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DIAGNOSTIC VALUE OF MAGNETIC RESONANCE DWI AND FLAIR SEQUENCES FOR EARLY DIAGNOSIS OF ACUTE CEREBRAL INFARCTION

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ABSTRACT

Objective To analyze the value of diffusion-weighted magnetic resonance imaging (DWI) and fluid attenuated inversion recovery (FLAIR) for the early diagnosis of acute cerebral infarction. For the better diagnosis of the disease in the future, to provide guidance for treatment. Methods A retrospective analysis method was used to include 80 patients with acute cerebral infarction treated in the author's hospital from February 2016 to February 2018. All of the patients were in compliance with the relevant conditions of the study and were divided into hyperacute and acute phases. Subacute patients. Magnetic resonance DWI and FLAIR sequence scans were performed. The number and distribution of lesions were recorded; the detection of T1WI, T2WI, FLAIR, and DWI were recorded; and the imaging findings of T1WI, T2WI, FLAIR, and DWI in the superacute, acute, and subacute patients were compared; Standardized treatment was performed, and the independent living ability index (BI) score and neurological deficit score (NIHSS) score were compared before and after treatment. Results A total of 97 lesions were detected in 180 patients, including 82 new lesions, including 28 lesions in the brainstem, 20 lesions in the brain lobe, 13 lesions in the basal ganglia region, and 11 lesions in the cerebellum, 10 The lesions are in the center of the semiovale. The T1WI, T2WI, FLAIR, and DWI were detected as 70.00%, 67.50%, 81.25%, and 100.00%, respectively, $P<0.05$. 2 Subacute patients with T1WI, T2WI, FLAIR, and DWI showed similar signs of abnormal increase. In the acute phase, some patients had abnormal signals on T1WI and T2WI, and there were more abnormal signals on FLAIR. DWI had high signal and signs. Symptoms corresponded; in the super-acute phase, the signals on T1WI and T2WI were normal, and the FLAIR signal was abnormally increased. DWI was significantly increased. 3 Compared with b=1000s/mm2, the lesion image obtained by b=1200s/mm2 in DWI imaging is clearer, and the range is larger. The diffuse omnidirectional lesions are more unidirectionally cleaned and have more advantages in white matter lesions. 4 Image analysis showed that DWI showed high signal and was consistent with symptoms and signs. 5 After treatment, NIHSS scores decreased, and BI scores increased. $P<0.05$ Conclusion DWI technique is more advantageous in the early diagnosis of acute cerebral infarction, especially in hyperacute cerebral infarction with high sensitivity and can guide treatment.

KEYWORDS: Magnetic resonance; FLAIR; DWI; Acute cerebral infarction; Early diagnosis.

Acute cerebral infarction is a common clinical disease that is common in the elderly. The disease is sudden and often occurs during sleep and during quiet rest periods. The onset of symptoms may occur within hours or 1 to 2 days. Patients may have dizziness, headaches, Symptoms such as tinnitus and hemiplegia may be on one side of the limb or on a single limb, and may have symptoms such as difficulty swallowing, vomiting, nausea, and unclear speech. Brain CT examination accuracy rate in the determination of the location and size of cerebral infarction lesions 66.5% ~ 89.2%, in the diagnosis of early cerebral hemorrhage accuracy rate of 100%, it is an important clinical method to exclude cerebral hemorrhage and other diseases, but the incidence of cerebral infarction When not more than 24 hours, or when the infarction is less than 8 mm, or when the lesion is in the cerebellum or brain stem, brain CT examination often fails to provide correct judgment.[1,2] With the development of magnetic resonance imaging (MRI), it has become one of the most commonly used methods for acute cerebral infarction. Its advantages are outstanding. Some reports found that it is superior to CT in the diagnosis of cerebral infarction, but it has also been found on conventional MRI (T2WI, The sensitivity of T1WI and FLAIR) in the early stage of acute cerebral infarction is low; with diffusion-weighted magnetic resonance imaging (DWI) and fluid attenuated inversion recovery (FLAIR) Continuously improved, it is possible for early diagnosis of acute cerebral infarction. The following is a comparison of magnetic resonance DWI and FLAIR in this study.

1 MATERIALS AND METHODS

1.1 General Information

Using retrospective analysis, 80 patients with acute cerebral infarction were included in the author's hospital between February 2016 and February 2018. Inclusion criteria[4,5]: 1 family of patients signed informed consent; 2 scanned by FLAIR and DWI; 3 onset time <3d; 4 with complete imaging data; 5 age ≥ 18 years, ≤ 80 years; 6 in this After the diagnosis, we received standardized treatment at our hospital and completed the follow-up. Exclusion criteria: 1 There is a pacemaker, and other reasons can not be magnetic resonance imaging; 2 claustrophobia; 3CT diagnosis of cerebral hemorrhage. Researcher data: 43 males and 37 females; aged (27-71) years; mean (55.0±8.87) years; 18 cases of paralyses, 0-III muscle tone, 8 cases of paralyses, systemic sensory impairment A total of 29 patients had mustangs and dizziness, a total of 14 cases, 13 cases with unstable walking, and 6 cases of ataxia. There were 14 cases in the hyperacute period (<6 hours), 30 cases in the acute period (6-24 hours), and 36 cases in the sub-acute period (24-72 hours).

1.2 Methods

1.2.1 The device uses a superconducting magnetic resonance system (Symphony 1.5T from Germany) head-neck combined phased-array coil, positioning scan, giving DWI horizontal plane SE plane echo scanning, parameters: ER/TE=2750/100ms, matrix= 128 × 128, visual field 23 × 23cm, layer interval 1mm, layer thickness 6mm, fat suppression, b values 0 and 1000s/mm^2, scanning 33s. MRI sequence: vector T1WI/SE, axial T2WI/TSE, FLATR, all sequence layer thickness 5mm, interval 1mm. T2WI/TSE sequence parameters: matrix 384×514, field of view FOV 25×21, TR=3647 ms, TE=98 ms. TIWI/SE sequence parameters, TR = 475ms, TE = 16ms, matrix 256x225, field of view FOV 25x21, TR = 475ms, TE = 16ms. FLAIR sequence parameters, matrix 256×225, field of view FOV 25×21, TR=8090ms, TE=95MS.

1.2.2 Research Methods 80 cases of imaging data were collected. Two radiologists diagnosed the patient's MRI images. Two experienced radiology technicians firstly identified DWI abnormally high signals, and compared the scan sequences of different infarction stages. And FLAIR, DWI sequence scan image lesion boundary, range, contrast, eliminate artifact interference; determine the location of abnormal signals on DWI according to anatomy, comprehensive patient signs, symptoms, etc. determine the location of the lesion. FLAIR distal vascular sign judgment: According to the FLAIR sequence of the posterior axial position of the coronal plane, it is judged by the stripe-like and dot-like high signal shadows that surround the infarct zone, and usually exceeds one examination level. After the inspection is completed, the system is analyzed with the supporting impact processing system. The image analysis is performed by two senior diagnostic radiographers to ensure that the analysis results of the two persons are the same. If there is any objection, the results must be agreed and the final diagnosis result should be obtained. Later, according to the results of a relatively good examination method, standardized treatment was performed. In this study, standardized treatment was performed based on the results of DWI, and follow-up was completed after in-hospital treatment was completed.

1.3 Observation Index Patients were divided into super-acute phase (onset time <6h), acute phase (6~24h), sub-acute phase (24~72h), statistics of various types of cases; statistical detection of the number of lesions and location distribution Compare the detection of acute cerebral infarction on T1WI, T2WI, FLAIR, and DWI. The ultrasonically, acute, and sub-acute phase contrast imaging findings on T1WI, T2WI, FLAIR, and DWI were compared. Observe the image quality of DWI imaging b=1000s/mm2 and b=1200s/mm2. The DWI and FLAIR sequences were analyzed for acute cerebral infarction images. According to the results of DWI diagnosis, standardized treatment; NIHSS scores[7] and BI scores[8] were compared before and after treatment.

1.4 Statistical Analysis

SPSS 18.0 statistical software was used to analyze data. Count data were expressed in %. Comparisons between groups were performed using $\chi 2$ test; measurement data were used.

Table 1: Comparison of detection ratios on T1WI, T2WI, FLAIR, and DWI (n;%).

Order	n	Number of detected cases	proportion	χ^2, P
T1WI	80	56	70.00	①25.93、0.0000
T2WI	80	54	67.50	②28.70、0.0000
FLAIR	80	65	81.25	③32.56、0.0000
DWI	80	80	100.00	-

Note NO.1 is DWI to T1WI ratio NO.2, DWI to T2WI ratio to DWI to FLAIR ratio.

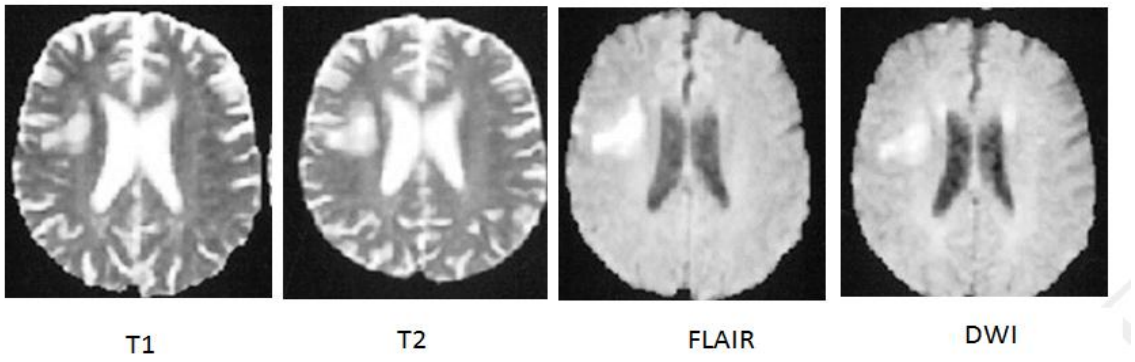

Figure 1: FIG. 1. T1WI, T2WI, FLAIR, DWI four ways schematic inspection infarction.

2.2 the effects of different detection methods on acute cerebral infarction in patients with sub-acute stage were similar on T1WIT and T2WIFLAIRI DWI, all of them were abnormal high signal intensity. Some patients with abnormal signal on T _ 1WI _ I _ T _ 2WI had more abnormal signal on flair than those with abnormal signal on T _ 1WI _ I _ T _ 2WI, and had high signal intensity on DWI, which corresponded to signs and symptoms, while in hyper-acute stage, the signal intensity of flair was abnormal in T _ 1WI _ I _ T _ 2WI and the signal intensity of flair on DWI was significantly higher than that of normal signal on T _ 1WI _ I _ T _ 2WI. See table 2.

Table 2: The effect of acute cerebral infarction on the sequence of different detection methods.

order	cases of hyper-acute stage (14 case)	cases of acute stage (30 case)	Sub-acute stage (36 cases)
T1WI	Signal normal	20 cases of abnormal signal, the other normal	Abnormal increased signal of the corresponding lesions was found
T2WI	Signal normal	In 18 cases, the signal was abnormal, the signal intensity was stronger than that of T1WI, and the boundary was blurred, of which 11 cases were smaller than DWI, and 5 cases were basically consistent with DWI.	Abnormal heighten signal of the lesion in the corresponding region
FLAIR	the signal is abnormal, the rest is normal, the signal intensity is lower than DWI, and the range is smaller than DWI.	22 cases of signal abnormalities,	It was found that there was an abnormal heighten signal in the corresponding lesion area
DWI	Significant high signal and corresponds to signs and clinical symptoms	High signal and high signal shadow and signs, symptomatic correspondence	It is found that there is abnormal signal in the corresponding lesion area, which is basically consistent with the range, intensity of T1WI, T2WI and FLAIR.

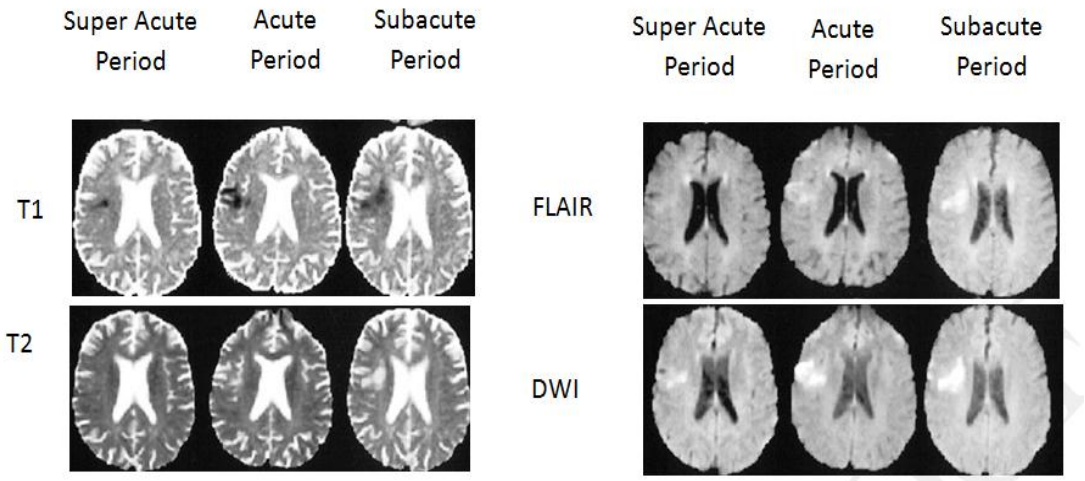

Figure 2. Effects of acute cerebral performance of different methods of sequence detection

2.3 DWI parameter selection and image quality in 80 patients with DWI imaging were performed with b=1000s/mm^2 and BX 1200s / m^2. The results showed that the focus of b=1200s/mm2 was more clearly defined, the display range was larger, and the diffusion-all direction focus was more clear than that in single direction. Especially in the white matter of the brain focus imaging is more clear.

Image Analysis of 80 patients with Acute Cerebral Infarction by DWI and FLAIR sequence Analysis MRI plain scan DWI showed high signal intensity and small signal increased in basal ganglia region. The location of high signal intensity was consistent with clinical signs and symptoms (see figure 1 below). (2) there was no abnormal T1WI signal on T _ 2WI and FLAIR, and the cerebral hemispheric vessel score was decreased in the lesion side (see figure 3 below, proximal occlusion of the middle artery) (see Fig. 4).

2.5 according to the results of DWI diagnosis, the NIHSS scores of the patients were reduced and the BI score increased, and P < 0.05. was seen in table 3.

Table 3: Comparison of NIHSS scores and BI scores before and after standardized treatment (±s; score).

time	n	NIHSS value	BI value
pretherapy	80	35.20±1.23	52.32±3.21
post-treatment	80	16.21±2.33	80.12±4.18
t	-	64.47	47.18
P	-	0.0000	0.0000

3 DISCUSSION

The sensitivity of routine MRI in the diagnosis of early cerebral infarction was low. In this study, the ratio of T _ 1WI ~ I ~ T _ 2WI _ (flair) detection was 70.000 and 67.50%, respectively. The FLAIR was relatively high, but it was still not ideal. This is because T2WII-flair detects that there must be autogenic edema in all the lesions, but the patients with cerebral infarction have early ischaemia, which leads to the decrease of sodium and other functions, the occurrence of water and sodium retention, and the dispersion and weakening of water molecules in the local cells, but the total amount of water will not change. Therefore, FLAIR and T2WI showed no significant abnormal signal in the lesion region.[9,10] DWI is a non-invasive method to detect the diffusion of water molecules in living tissues. It can detect the direction of diffusion of water molecules in tissues by comparing the light changes of tissue signals before and after measuring the sensitive gradient field of pressure diffusion. The indirect reflection of micro-tubule structure and characteristics on DWI is considered to be of great value in the diagnosis of ultra early cerebral chemist. In this study, DWI and FLAIR sequences were compared in the early diagnosis of acute cerebral infarction and DWI was found to be superior.

The early stage of acute cerebral infarction can be divided into hyper acute phase and sub-acute phase. Routine MRI has good diagnostic ability in sub-acute phase. In this study, abnormal elevated signals were observed in T1WI and T _ 2WI _ flair in patients with sub-acute stage of cerebral infarction. However, in the acute phase, only 22 of the 30 patients with FLAIR were diagnosed as signal abnormalities, and as many as 8 patients were diagnosed, and even 7 of the patients in the hyper-acute phase had abnormal signal. Both T1WI and T2WI showed abnormal signals. It shows that the diagnostic value of routine MRI in acute stage is not satisfied with clinical. Demand, and in the super-acute phase is almost impossible to diagnose. In this study, DWI increased all the signals in sub acute, acute and hyper-acute phases, which were consistent with signs and symptoms. DWI was more accurate, considering that acute cerebral alchemist and hypoxia mainly led to cytosine edema. Among them, neuronal / Anglia cells were the dominant, with acute cerebral infarction, chemise hypoxia encephalopathy and early necrosis. The abnormal signal of infarct Foch.[12,13] DWI can be found more than conventional sequence, which can reflect the changes and characteristics of gastric tube structure, which is helpful to detect abnormal signal earlier. DSI can effectively exclude stroke, highlight the target site through various techniques, and reflect cardiovascular abnormalities and aberrations through clear development of blood vessels, so the specificity is high.[14] In this study, by comparing the quality of b=1000s/mm^2 and b=1200s/mm^2 in DWI imaging, we found that b=1200s/mm^2 can make the image clearer and expand the display range, especially in the white matter, which is beneficial to the future brain research and provide important information for clinical treatment. For example, the effect of tumor on white matter bundles provides a reference for reducing the damage of white matter bundles. In this study, DWI The standardized treatment with the diagnostic results was effective, the NIHSS score decreased and the BI score increased (P < 0.05). Consideration of this may be associated with DWI as a reference for the latter treatment to reduce white matter injury, which is an important three component element of the central nervous system and related to nerve injury and the recovery of patients' ability to live.[15,16]

FLAIR uses different T1 values between different tissues to reflect the lesion under the condition of non-signal producing precursor. Compared with DWI, flair has smaller display range and lower signal intensity in the early stage of acute cerebral infarction. The old infarct T1 is similar to cerebration fluid (CSF). The new focus T1 was shorter than cerebration fluid (CSF) and showed

high signal intensity.[17,18] In this paper, FLAIR sequence is hyper-intense in sub-acute and acute groups, and less. DWI is high signal in acute cerebral infarction in hyper-acute phase, corresponding to signs and symptoms, it can effectively distinguish focus from normal brain. Tissue, which can be compared from different lesions, according to the signal changes in the nature of the lesions, in the initial diagnosis of lesions has an important value.[19,20] Therefore, the combination of FLAIR and DWI will be more conducive to the diagnosis of acute and hyper-acute cerebral infarction.

In conclusion, compared with conventional MRI sequence, Mr DWI technique has more advantages in acute phase, especially in hyper-acute phase, which provides important basis for clinical diagnosis and treatment.

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