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Core Research on the Clinical Application Value of Dynamic CT Perfusion Imaging in Stroke

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Abstract: Objective: This study focused on the clinical application value of dynamic CT perfusion imaging in stroke. **Methods:** A total of 92 patients with stroke were enrolled in this study. All patients were selected from December 2017 to December 2018 according to different diagnostic methods. They were randomly divided into two groups: the observation group and control group. The number of patients in each group was 46. The observation group mainly used dynamic CT perfusion imaging for diagnosis while the control group mainly used CT plain scan. The diagnostic effects of the two groups of patients and the hemodynamic parameters of the surrounding area of sub-acute hematoma and the acute phase of stroke in the observation group were compared. **Results:** The clinical diagnosis of the observation group was 95.65% while the clinical diagnosis of the control group was 69.57%. The observation group was higher than that of the control group and the difference was significant. In addition, the hemodynamic parameters of the acute phase of the observation group and the sub-acute hematoma were also varied. **Conclusion:** Dynamic CT perfusion imaging has significant clinical value in stroke, and it is worthy of further application.

Keywords: *dynamic CT perfusion imaging; stroke; clinical value*

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1 Introduction

Stroke often occurs in the middle-aged and elderly populations with high morbidity and mortality. Therefore, it is necessary to continuously improve the clinical treatment effect[1]. The premise of treatment is to make a good and accurate diagnosis of the disease. This is also the current clinical treatment process which is conducive to further improve the prognosis of patients with stroke and further reduce the disease disability and mortality[2]. However, the clinical diagnosis results of related research have not been significantly improved. Therefore, the clinical treatment must be based on the mechanical damage caused by the hematopoietic space occupying effect and identify the secondary damage to the tissues surrounding the hematoma. This is also one of the important factors that directly lead to brain tissue damage in patients[3]. In order to further study the diagnostic effect of stroke, this study used dynamic CT perfusion imaging to diagnose stroke and combined CT scan to compare the diagnosis results of different patients in the two diagnostic methods. At the same time, the perfusion of the tissue around the acute and sub-acute cerebral hematoma was analyzed. The details are as follows.

2 Information and methods

2.1 Clinical basic data

The total number of subjects was 92 of which all patients were stroke patients who admitted to our hospital from December 2017 to December 2018. Patients were equally divided into observation and control groups according to different diagnostic

methods and the number of patients in each group was 46. The number of males in the observation group was 25 while the number of females was 21. The maximum age was 77 years old; the minimum age was 38 years old; the middle age was (55.14±2.42) years old. The number of males in the control group was 26 while the number of females was 20. The maximum age was 78 years old; the minimum age was 37 years; the middle age was (55.21±2.53) years old. There was no significant difference in age and gender between the patients, $P<0.05$ was not statistically significant.

2.2 Methods

For the control group, the GE light Speed16 CT machine was used for routine CT plain scan[4] and the bleeding site and volume of the patients were observed and monitored to further rule out the possibility of brain tumor. For the observation group, dynamic CT perfusion imaging was performed based on conventional CT plain scan. The largest area of the hematoma was scanned at the center. The scanning parameters were adjusted to 120KV 200MA and the matrix was 512x512. 50ml of iohexol (300mg/ml) was injected into the elbow via a high-pressure syringe at an injection rate of 4.5ml per second and scanned at a rate of 0.5sec per revolution for 50sec. The acquisition method was 4ix5mm. After the scan, the patients were moved to the internal medicine department for conventional treatment and the CT plain scan and CT perfusion imaging scan were performed two weeks later.

2.3 Observation indicators

The diagnostic effects of the two groups of patients and the hemodynamic parameters of the surrounding area of sub-acute hematoma and the acute phase of stroke in the observation group were observed.

2.4 Statistical analysis

SPSS 17.0 or SPSS 19.0 software has been used to test the data involved. The tool used to measure the relevant data (x±s) and the t-test was performed. The application percentage(%) indicates the count, and the line X^2 test, $P<0.05$ has statistical differences.

3 Results

3.1 Comparison of diagnostic effects

The tabular data can show that the diagnostic effect of the observation group is higher than that of the control group and it has obvious statistical significance. See Table 1 for details.

Table 1. Comparison of the diagnostic effects of the two groups

Groups	Significant effective	Effective	No effect	Total efficiency
Observation group (n=46)	28 (60.87%)	16 (34.78%)	2 (4.35%)	44 (95.65%)
Control group (n=46)	15 (32.61%)	17 (36.96%)	14 (30.43%)	32 (69.57%)
X^2				10.8974
P				0.00096

3.2 CT perfusion parameter performance

In all cases, there was a hypoperfusion gradient in the acute-hematoma area. The CBF and CBV in the hematoma area were significantly decreased and the surrounding area was also lower than the hematoma area. The MTT of the 18 hematoma areas selected from the cases was significantly prolonged. See Table 2 and Table 3 for details.

Table 2. Hemodynamic parameters of the tissue around the hematoma in acute stroke

No	CBF	CCBV	MTT	rCBF
1	11.20±2.10	1.00±0.40	7.59±1.20	0.34
2	8.95±1.20	0.89±0.10	8.00±1.25	0.77
3	15.10±5.30	0.94±0.22	5.84±0.98	0.28
4	7.51±3.20	0.72±0.13	8.88±2.23	0.28
5	10.50±2.20	0.96±0.15	8.12±1.89	0.26
6	17.00±5.08	1.08±0.40	5.98±0.58	0.75
7	14.70±4.50	0.92±0.22	9.58±2.22	0.21
8	14.80±6.30	1.10±0.30	6.63±1.11	1.53

No	CBF	CCBV	MTT	rCBF
9	16.50±5.40	1.42±0.61	3.87±0.55	0.52
10	16.50±3.20	0.88±0.12	3.30±0.98	0.75
11	20.20±6.90	1.06±0.21	7.35±1.98	0.29
12	18.10±8.40	0.84±0.33	5.16±0.99	0.58
13	23.50±11.10	0.87±0.12	5.56±1.23	0.14
14	24.30±13.20	0.99±0.25	5.40±1.47	0.07
15	10.30±4.50	1.05±0.13	3.78±0.58	0.69
16	5.20±1.20	1.00±0.41	3.93±1.0	0.17
17	5.61±2.20	1.01±0.3	7.15±1.45	0.63
18	27.70±13.50	1.85±0.12	4.45±1.40	0.60

Table 3. Hemodynamic parameters of the surrounding area of sub-acute hematoma in stroke

No	CBF	CCBV	MTT	rCBF
1	21.70±8.95	1.48±0.56	5.56±1.05	0.24
2	4.90±1.22	1.58±0.78	8.86±1.03	0.35
3	17.20±5.65	2.54±1.05	6.24±1.11	0.31
4	16.60±6.55	0.56±0.05	10.50±1.52	1.07
5	32.60±10.25	1.42±0.45	7.42±1.41	0.78
6	21.40±7.88	1.49±0.89	6.29±1.02	0.66
7	30.50±10.56	2.10±1.01	5.78±1.03	0.72
8	8.25±1.55	2.12±0.77	8.55±1.56	0.27
9	17.40±5.22	1.19±0.25	5.99±1.11	0.33
10	21.10±9.85	0.97±0.12	9.27±1.74	0.63
11	15.90±4.56	1.71±0.85	6.59±1.07	0.29
12	14.60±0.87	0.88±0.12	5.25±1.03	0.41
13	8.97±2.12	0.47±0.10	8.38±1.89	0.36
14	7.94±1.05	0.37±0.08	12.60±2.21	0.24
15	8.37±1.52	1.01±0.11	12.80±2.40	0.39
16	5.16±1.22	1.82±0.54	8.62±2.03	0.04
17	3.88±0.88	0.48±0.08	13.90±2.22	0.14
18	11.50±2.44	1.30±0.23	10.60±1.17	0.46

4 Discussion

4.1 General information

For stroke diseases, CT perfusion imaging can quickly display the hemodynamic status of the tissue surrounding the hematoma hemorrhage during the diagnosis[5]. Changes in the patient's condition can also be accurately observed to understand the dynamics of the patient's disease[6]. After conventional treatment of the surrounding tissue of the acute hematoma in patients with stroke disease, there is no significant improvement in the hypoperfusion state after the development of the sub-acute phase. Further diagnosis is needed to understand the patient's condition[7]. In this study, the clinical treatment effect of the observation group was much higher than that of the control group. Moreover, the hemodynamic parameters of the surrounding area of the hematoma in the acute phase and the hemodynamic parameters of the tissue around the sub-acute stage in the observation group have great changes. It showed that the effect of dynamic CT perfusion imaging was significant and had a high diagnostic rate, and the difference between the two groups was statistically significant[8]. In general, dynamic CT perfusion imaging is of great value in the diagnosis of stroke and deserves further research and development.

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