CLINICAL EXPERIENCE

A Pilot Study on the Relationship between Tongue Manifestation and the Degree of Neurological Impairment in Patients with Acute Cerebral Infarction*

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ABSTRACT **Objective:** To discuss the relationship between tongue manifestation and the degree of neurological impairment in the patients with acute cerebral infarction. **Methods:** Two hundred patients with first unilateral cerebral infarction were recruited. The relationship between different tongue manifestation and National Institute of Health Stroke Scale (NIHSS) were analyzed. **Results:** NIHSS scores in the patients from different tongue color groups were analyzed and further analysis demonstrated that the NIHSS score was higher in the patients with red or bluish-purple tongue than that of those with the pink (P<0.01). On tongue fur, the NIHSS score in the patients with thick fur was higher than that of those with the thin (P=0.003). NIHSS score in patients with slippery, moist or dry fur was significant different (P=0.003), Further analysis demonstrated that the NIHSS score was higher in the patients with dry fur than that of those with moist fur, and had statistical significance (P=0.01). The NIHSS score was higher in patients from greasy fur group than that of the non-greasy (P=0.002). There was significant difference of NHISS score in the patients with different fur color (P=0.000), and further analysis demonstrated that the NHISS score in white-yellow, yellow fur group were higher than that of the white (P=0.06 or 0.000). **Conclusion:** The changes of tongue manifestation might be associated with the degree of neurological impairment in the patients with acute cerebral infarction.

KEYWORDS cerebral infarction, tongue manifestation, fur color, fur texture

Clinical reports demonstrated that the change of tongue manifestation was closely associated with diseases,[1-9] and the change of tongue fur was intimately associated with the staging, the severity of epidemic and digestive disorders.[1-3] The change of tongue proper as an assistant method can be applied to diagnose angiocardiopathy, chronic disease, and cancer etc., by which we can observe disease progression, evaluate prognosis, definite clinical stages, and guide therapy with syndrome differentiation.[4-6] The change of sublingual vessel was of higher value on diagnosing diabetes mellitus, hepatopathy, pneumocardial and cancer diseases etc.[7-9] Resent years, the studies about tongue manifestation changes of cerebral infarction are focused on the relationship between tongue manifestation and the stage of cerebral infarction,[10-14] and there is few study about the relationship between tongue manifestation and the degree of neurological impairment in the patients with acute cerebral infarction. This essay preliminarily discussed the relationship between tongue manifestation and the degree of neurological impairment in patients with acute cerebral infarction.

METHODS

Diagnostic criteria of Western Medicine on Cerebral Infarction

In the light of Diagnostic Criteria of Various Types of Cerebrovascular Disease adopted by Neurology Branch of Chinese Medical Association[15] and China Guideline for Cerebraovascular Disease Prevention and Treatment[16], the location of cerebral infarction was determined by magnetic resonance

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imaging (MRI) and diffusion weighted imaging (DWI).

Diagnostic Criteria of Chinese Medicine on Stroke

It was referred to Standard for Diagnosis and Therapeutic Effect Evaluation of Stroke drafted by a Collaborative Group of Acute Encephalopathy of State Administration of Traditional Chinese Medicine of China in 1996.[17]

Criteria of Judgment on Tongue Manifestation

At present there was no accepted criterion of quantitative analysis and classification for tongue manifestation, therefore we referred to the features of tongue manifestation described in a nationally planned textbook[18]—Diagnostics of Chinese Medicine chiefly edited by Prof. ZHU Wen-feng for higher education of "Eleventh Five-year Plan", and the pictures from tongue manifestation database available to the professionals in image-analysis system of tongue manifestation[19] developed by Shanghai University of Traditional Chinese Medicine, and clinical significance and appeared frequency of tongue manifestation observed from practical aspects, by which we determined the classification.

There were five kinds of tongue colors: pale, pink, red, dark-red, and bluish purple (including entirely bluish purple, or obvious ecchymosis, or petechia appeared on the tongue); three kinds of lingual contours: plump or teeth-printed, normal or thin, and fissured; six kinds of fur textures: thin, thick, slippery, moist, dry, and greasy; and three kinds of fur colors: white, white-yellow (yellow appeared evenly on the white fur), and yellow.

Inclusion and Exclusion Criteria

Inclusion criteria were as follows: (1) patients were meeting the diagnostic criteria; (2) onset of the illness was within 7 days; (3) aged from 40 to 85 (gender unrestricted); (4) National Institutes of Health Stroke Scale (NIHSS) score from 7 to 20; (5) localization on internal carotid artery system or vertebral basilar system infarction; (6) informed consent was obtained before participating in this study, which was approved by the local ethics committee.

Exclusion criteria were as follows: (1) > 85- and < 40-year-old; (2) onset of the illness exceeded 7 days; (3) transient ischemic attack (TIA); (4) patients with apoplexy caused by brain tumor, cerebral trauma, hematologic disease confirmed by auxiliary examination; (5) patients who had psychosis or osteoarthrosis that influences nervous system functional assessment; (6) concurrent infection, hyperpyrexia, and serious liver and kidney dysfunction, as well as diseases of hematopoietic and endocrine system.

Evaluation of NIHSS

Two-hundred patients were enrolled in this study. The present history, past history, personal history, vital signs, general conditions of each case were collected. And patients were scored by NIHSS. It is a neurogenic examination rating scale which evaluates consciousness, ocular movement, visual fields, facial paralysis, limbs movement and sensation, limbs coordination, language, dysarthria, neglect syndrome, recognition and attention by grading. NIHSS had satisfactory reliability and validity, and it was used in evaluating neurologic impairment level in patients with acute cerebral infarction, measuring the pathogenetic condition changed sensitively, predicting short and long-term prognosis, guiding clinical care actions. All score makers were neurologic specialists who passed the normal NIHSS training and examination.

Patients Selection

Two hundred cases of middle-aged and aged hospitalized patients with first unilateral cerebral infarction examined by MRI and DWI were chosen in Neurology Department of Xuanwu Hospital from March 2008 to February 2009. And we observed the tongue manifestation of the patients whose onset of the first unilateral cerebral infarction was within 10 days.

Observation Methods of Tongue Manifestation

The tongue manifestation of all enrolled patients were observed, and tongue manifestation were checked by two independent assessors who had abundant clinical experience of Chinese medicine (CM) and one was archiater of CM. The methods were as follows: patients were prohibited dyeing-tongue food and should gargle after breakfast. At the next AM 9:00–10:00 after hospitalization, patients were advised to face to the light, sit up or lie on the back and open mouth to put out tongue naturally, and their fur color, fur texture were observed. Each observation was within 30s and the interval was about 2–3 min before

another same observation. Tongue pictures were took by Panasonic DMC-LX1 digital camera in micro-distance photography pattern as a record for three-level ward round to estimate tongue manifestation.

Statistical Analysis

All data were analyzed by SPSS 11.5 software package for windows and adopted two-sided test at a common level of significance α=0.05. Measurement data were expressed in the form of mean ± standard deviation, and Levene's test for homogeneity of variance, and groups were analyzed using Kruskal-Wallis H-test. The statistical differences were accepted as P<0.05.

RESULTS

Clinical Materials

In all 200 cases the youngest patient was aged 40, the oldest 83, and the average age 59.89 ± 10.79, of which 156 cases were males, 44 cases females. NIHSS scores: maximum 16, minimum 0, and the average score was 6.67 ± 4.25. Groups of different tongue colors: pink was 20.5% (41/200), pale 7.5% (15/200), red 25.0% (50/200), dark-red 36.0% (72/200), bluish-purple 11.0% (22/200); Group of thin fur 41.5% (83/200), group of thick fur 58.5% (117/200); Group of slippery fur 9.5% (19/200), group of moist fur 68.5% (137/200), group of dry fur 22.0% (44/200); Group of greasy fur 74.5% (149/200), group of non-greasy fur 25.5% (51/200); Group of white fur 37.5% (75/200), group of white-yellow fur 40.0% (80/200), group of yellow fur 22.5% (45/200).

NIHSS Scores in Acute Cerebral Infarction Patients with Different Tongue Colors

The NIHSS score was different in the patients with different tongue colors (P<0.05), further analysis showed that the NIHSS score in the patients with red, bluish-purple tongue were higher than that of those with pink (P<0.01 and P<0.05, respectively, Table1).

Table 1. NIHSS Scores in Acute Cerebral Infarction Patients with Different Tongue Color ($\bar{x} \pm s$)

Group	Case	NIHSS
Pink	41	5.00 ± 4.32
Pale	15	7.00 ± 3.96
Red	50	7.92 ± 4.13**
Dark red	72	6.43 ± 4.00
Bluish-purple	22	7.50 ± 4.59*

Notes: *P<0.05, **P<0.01, compared with pink group

NIHSS Scores in Acute Cerebral Infarction Patients with Thin or Thick Fur

The NIHSS score in thick fur group (7.42 ± 4.20, 117 cases) was higher than that of those with thin (5.61 ± 4.11, 83 cases, P<0.01).

NIHSS Scores in Acute Cerebral Infarction Patients with Slippery, Moist or Dry Fur

The NIHSS score was different in the patients of slippery, moist and dry fur groups (P<0.01), and by further analysis found that the NIHSS scores in dry fur group were higher than that of those with slippery or moist fur group, which was statistically significant (Table 2).

Table 2. NIHSS Scores in Patients with Dry, Slippery, and Moist Fur ($\bar{x} \pm s$)

Group	Case	NIHSS	r	P
Slippery	19	6.16 ± 3.70*	0.180	0.002
Moist	137	6.11 ± 4.15**		
Dry	44	8.64 ± 4.28		

Notes: *P<0.05, **P<0.01, compared with dry tongue

NIHSS Scores in Acute Cerebral Infarction Patients with Greasy or Non-greasy Fur

The NIHSS scores in greasy group (7.21 ± 4.13, 149 cases) were higher than that of those with non-greasy (5.08 ± 4.24, 51 cases, P<0.01).

NIHSS Scores in Acute Cerebral Infarction Patients with Different Fur Color

The NIHSS score of patients were different among different fur color groups (P<0.01), further analysis demonstrated that the NIHSS scores in white-yellow and yellow fur group were higher than that of those of white, both had statistical significance (Table 3).

Table 3. NIHSS Scores in Patients with Different Fur Color ($\bar{x} \pm s$)

Group	Case	NIHSS
White	75	5.16 ± 3.80
White-yellow	80	7.04 ± 4.36*
Yellow	45	8.53 ± 3.95*

Notes: *P<0.01, compare with white fur

DISCUSSION

Tongue inspection is a kind of diagnostic method achieved by observing tongue fur, texture, and sublingual vein in patients, and as an important evidence for CM diagnosis which is not subjective feelings from

patient, but objective indices observed by doctor. With a long history, tongue inspection was recorded in *Huangdi's Internal Classic* (Huang Di Nei Jing) at the early age of 2,000 years ago, "patients with pyretic pulmonary disease appears...yellow fur". And *Synopsis of the Golden Chamber* (Jin Gui Yao Lue) described, "if patient appears fullness in chest, withered lips, bluish purple tongue etc., diagnosis of blood stasis can be made with high certainty". Clinical practice has proved, it is like a mirror that changes of tongue manifestation can quickly, vividly, and objectively reflect the changes of internal organs such as asthenia or sthenia in Zang-Fu organs, rising or falling in qi and blood, waxing or waning in body fluids, serious or mild in pathogenetic condition, and good or poor in prognosis etc.

This study demonstrated that the NIHSS score was higher in the patients with red or bluish-purple tongue than that of those with pink, higher in the thick than that of those with thin, higher in the greasy than that of those with non-greasy. In conclusion, appearing red or bluish-purple tongue, thick, dry, greasy, yellow fur in the patients with acute cerebral infarction suggest that the degree of neurological impairment was severe.

This clinic study provided a reference to evaluate the severity and prognosis in patients with acute cerebral infarction. However, more cases are needed in further research to enhance the validity and credibility of our study.

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