

AN ANALYSIS OF THE POST-STROKE COGNITIVE IMPAIRMENT COMBINATION LAW OF TRADITIONAL CHINESE MEDICINE SYMPTOM BASED ON THE COMPLEX SYSTEM ENTROPY CLUSTERING METHOD

CHAOLUMEN HAN¹, SILU YANG¹, AIPING CHEN¹, ZHICHEN ZHANG², YUE LIU², YUNLING ZHANG², SHUZHEN LI^{1*}, LE WANG^{2*}

¹Beijing University of Chinese Medicine, Beisanhuan East Road, Beijing 100029, China - ²Dongfang Hospital, Beijing University of Chinese Medicine, Fengtai District, Beijing, 100078, China

ABSTRACT

Objective: To analyze the TCM symptom manifestations of patients with post-stroke cognitive impairment and explore the combination law of its core symptoms. **Method:** through the collaboration of multi centers, 1451 patients with mild cognitive impairment and mild dementia are incorporated, of which, 838 cases are with mild cognitive impairment and 613 cases mild dementia. After filtering, the occurrence rate of symptoms which is over 10% are retained and inputted to the traditional Chinese medicine inheritance auxiliary platform through standardized "four diagnostic information". And then there will be an analysis of the rules of symptoms based on complex system entropy clustering method which is software-integrated. **Result:** after the analysis based on entropy clustering method, it is found that there are 8 symptom collective groups for mild cognitive impairment and 9 symptom collective groups for mild dementia. The syndrome factor combinations that can be extracted are kidney deficiency, qi deficiency and blood stasis, spleen and kidney deficiency, phlegm stasis; kidney deficiency, phlegm stasis, qi deficiency and blood stasis, spleen and kidney deficiency, phlegm stasis and yin deficiency resulting in vigorous fire. **Conclusion:** syndrome factors of post-stroke cognitive impairment are qi deficiency, blood stasis, phlegm, yang deficiency, yin deficiency and fire. Kidney deficiency, qi deficiency and blood stasis, spleen and kidney deficiency, phlegm stasis and yin deficiency resulting in vigorous fire are typical symptoms of post-stroke cognitive impairment. Number of patients with yin deficiency resulting in vigorous fire, will increase as their disease aggravated.

Keywords: stroke, cognitive impairment, TCM symptom, complex system entropy clustering.

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Introduction

Post-stroke cognitive impairment is a common complication in stroke. It is easily ignored by patients and their families and even ignored by doctors as its early clinical performance is lighter, has longer course of disease and slow progress. Without early detection and control, it has a high risk of transforming into dementia⁽¹⁾. Traditional Chinese medicine has a unique advantage in improving early symptoms of post-stroke cognitive impairment; it can slow and stop the disease progression.

However, its corresponding dialectical criteria and prevention and control system are not available at present. The analysis of its syndromes has been the core and key of the current work⁽²⁾.

Symptom is the external performance of pathological changes; it refers to various abnormal feelings which patients themselves can perceive or it can be directly perceived by the doctors' sense organs such as eyes, ears, nose, and fingers⁽³⁾. Syndrome is a group of relative symptoms, and the two is closely connected. Symptom serves as an important basis of TCM diagnosis and differentia-

tion, it is also the foundation and requirement for TCM differentiation and treatment. Syndrome is a key link of TCM differentiation and treatment. The syndrome analysis is a hard yet hot spot of TCM research and it also constitutes an important part of standardized and normalized study of TCM^(4,5). The information obtained from four diagnostic methods by doctors of TCM, namely, observation, auscultation and olfaction, inquiry and pulse-taking is external and objective performance of overall state of the organism. The four diagnostic methods (symptoms) are the main basis of TCM differentiation, but they have such features as vagueness, overlapping, complexity and latency. Syndrome is a complex and macro-system which featured high dimension, high grade and nonlinearity⁽⁶⁾. Although some researchers have carried out a series of explosive studies in different aspects, and do have made some progress⁽⁷⁻¹⁴⁾, syndrome differentiation of post-stroke cognitive impairment has always been lack of objective and normalized standard, which brings many limits to clinical TCM differentiation treatment of post-stroke cognitive impairment and modern TCM studies.

Clinical materials and methods

The study is strictly in line with the requirements of clinical epidemiology and based on multi centers and large samples to observe clinically. "Four diagnostic information" of 1451 patients with mild cognitive impairment and mild dementia is collected and with the help of "traditional Chinese medicine inheritance auxiliary platform (V2.5)", the core symptom combination rules of post-stroke cognitive impairment are tentatively explored based on complex system entropy clustering method, which can be used to analyze data. It can provide a preliminary basis and reference for further study of syndrome factors and their distribution rules, as well as the establishment of dialectical criteria.

The report is as follows:

General materials

The cases of the study derive from 14 medical institutions and with a time span of January 2011 to September 2013. The 14 medical institutions are Dongfang Hospital of Beijing University of Chinese Medicine, Wangjing Hospital of China Academy of Chinese Medical Sciences, Changchun University of Chinese Medicine affiliated hospital, Shandong University of Chinese Medicine affiliat-

ed hospital, TCM Hospital of Hebei Medical University, Peking University People's Hospital, Chongqing Hospital of Traditional Chinese Medicine, Beijing Shunyi Hospital of Traditional Chinese Medicine, Youanmen health service center in Fengtai, Beijing, Puhuangyu health service center in Fengtai, Beijing, Fangzhuang health service center in Fengtai, Beijing, Rizhao Hospital of Traditional Chinese Medicine in Shandong province, Xinglong Hospital of Traditional Chinese Medicine in Fengtai, Beijing and Xiamen Hospital of Traditional Chinese Medicine. There are altogether 1451 patients being incorporated, of which, 838 cases are with mild cognitive impairment and 613 cases mild dementia.

Diagnostic criteria

For the diagnosis of cerebral infarction, we refer to the "Guide of diagnosis and treatment of acute ischemic stroke in China 2010", which is formulated by cerebrovascular epidemiology group, branch of the Chinese Medical Association Neurology (15). The diagnosis of cognitive impairment refers to the unified standard which is set by NINDS/CSN in 2006(16).

Incorporating standard

Conforming to the diagnostic standard; 2 weeks to 6 month since cerebral infarction; clear conscious, enough visual and auditory abilities; coordinating with neuropsychology in the evaluation.

Excluding criteria

Cognitive impairment caused by non-cerebral vascular disease (like Alzheimer disease, FTD, Parkinson's disease, brain injury, cerebral hemorrhage, encephalitis, undermining of thyroid function, etc.) The scores of confirmed depression or Hamilton's Depression Scale (HAMD17) are over 17. Those who have clear focal signs and symptoms of nervous system, or other body diseases cannot complete neuropsychological tests; medium and severe dementia.

Establishment of database

Information obtained from four diagnostic methods of 1451 patients is inputted to the "platform management" and "clinical collection" module on the traditional Chinese medicine inheritance auxiliary platform to establish database for after-stroke cognitive impairment. After the entry, two

people will work as a group to verify the inputted information, so as to guarantee its accuracy. “Four diagnostic information” of traditional Chinese medicine includes 64 symptoms, 20 tongue manifestations and 10 pulse manifestations. 64 symptoms are formulated by experts based on literature and clinical experience. They include many locations of disease like heart, liver, spleen, lung and kidney; many typical symptoms and clinical information like dizziness and headache resulting from various nature of disease such as qi, blood, yin and yang. 20 tongue manifestations: based on the basic elements of tongue manifestation and make the type of basic elements a goal to collect information in a comprehensive way. The settings of tongue manifestation include four parts: tongue color, tongue shape, tongue coating and sublingual vein. There are 10 pulse manifestations and they include basic elements such as place, numbers, thickness, length, strength, hardness and fluency.

Data analysis

Yang Hongjun, a researcher of the Chinese medicine research institute from China Academy of Chinese Medical Sciences provided “traditional Chinese medicine inheritance auxiliary platform(V2.5)” and its “data analysis” module is used to analyze data, including symptom sequence and clustering. The occurrence of symptoms of each patient is ordered in descending order and the occurrence rate which is over 10% will be retained. The “symptom clustering” function of medical cases will be chosen and the analysis of clustering will be made (core calculation methods include modified mutual information method⁽¹⁷⁾ and complex system entropy clustering^(18,19). Appropriate correlation and degree of punishment should also be chosen and then “extraction combination” button can be clicked and core symptom combination will be found through network visualized display (core calculation method is unsupervised entropy clustering⁽²⁰⁾).

Result

Frequency statistics of symptoms According to the peripheral symptom, tongue, pulse of the patients, ranking the 838 patients with mild cog-

nitive impairment and 613 patients with mild dementia in syndrome order. 94 kinds of arrangement are received by symptoms from high frequency to low frequency including 57 symptoms whose occurrence rates are more than10% in patients with mild cognitive impairment (Table 1), and 66 symptoms whose occurrence rate are more than 10% in patients with mild dementia (Table 2).

The combination analysis of core symptoms patients with mild cognitive disorder on complex system entropy clustering. The correlation degree is 8; the penalty degree is 2.

No	symptom	frequency	Occurrence rate	No	symptom	frequency	Occurrence rate
1	wiry pulse	567	67.66%	30	bitter taste in mouth	201	23.99%
2	pale tongue coating	515	61.46%	31	chest tightness	190	22.67%
3	dizziness	458	54.65%	32	Clumsy limbs	189	22.55%
4	thin tongue coating	429	51.19%	33	thirsty	187	22.32%
5	lack of strength	414	49.40%	34	deep pulse	182	21.72%
6	insomnia	391	46.66%	35	palpitations	180	21.48%
7	dark tongue texture	371	44.27%	36	luxated tooth	177	21.12%
8	slippery pulse	353	42.12%	37	dim complexion	173	20.64%
9	dreamfulness	328	39.14%	38	sticky and greasy sensation in mouth	170	20.29%
10	blurred vision	287	34.25%	39	heaviness of head	161	19.21%
11	mental fatigue	285	34.01%	40	Pain of limbs	151	18.02%
12	Shortness of breath	284	33.89%	41	teeth-marked tongue	148	17.66%
13	headache	279	33.29%	42	Abdominal distension	147	17.54%
14	tinnitus	271	32.34%	43	preference for sighing	147	17.54%
15	dry eyes	269	32.10%	44	Thick tongue coating	144	17.18%
16	Greasy tongue coating	266	31.74%	45	expectoration	137	16.35%
17	Irritability	260	31.03%	46	Aversion to cold and cold limbs	129	15.39%
18	numbness	259	30.91%	47	Spontaneous sweat	127	15.16%
19	soreness and weakness of waist and knees	251	29.95%	48	sluggish speech	127	15.16%
20	fatigued limbs and heavy body	247	29.47%	49	enlarged tongue	123	14.68%
21	red tongue texture	246	29.36%	50	sublingual vein tortuosity	116	13.84%
22	Light red tongue texture	242	28.88%	51	chest bloated pain	109	13.01%
23	Pale tongue texture	229	27.33%	52	facial palsy	101	12.05%
24	Yellowish tongue coating	227	27.09%	53	shallow yellow complexion	100	11.93%
25	thready pulse	226	26.97%	54	dribble of urine	98	11.69%
26	constipation	219	26.13%	55	Lack of appetite	96	11.46%
27	frequent night urination	213	25.42%	56	Red complexion	96	11.46%
28	Obesity	210	25.06%	57	fetid mouth odor	93	11.10%
29	Dark Purple mouth	206	24.58%				

Table 1: Occurrence rates are more than10% in patients with mild cognitive impairment.

No	symptom	frequency	Occurrence rate	No	symptom	frequency	Occurrence rate
1	wiry pulse	385	62.81%	34	deep pulse	154	25.12%
2	dizziness	346	56.44%	35	light red tongue	153	24.96%
3	lack of strength	333	54.32%	36	sticky and greasy sensation in mouth	148	24.14%
4	pale tongue coating	322	52.53%	37	teeth-marked tongue	146	23.82%
5	dark tongue texture	319	52.04%	38	heaviness of head	138	22.51%
6	insomnia	296	48.29%	39	pain of limbs	134	21.86%
7	thin tongue coating	287	46.82%	40	thirsty	132	21.53%
8	mental fatigue	276	45.02%	41	abdominal distension	129	21.04%
9	clumsy limbs	258	42.09%	42	thick tongue coating	127	20.72%
10	arassy tongue coating	253	41.27%	43	bitter taste in mouth	124	20.23%
11	slippery pulse	248	40.46%	44	palpitations	123	20.07%
12	shortness of breath	247	40.29%	45	sublingual vein tortuosity	120	19.58%
13	blurred vision	238	38.83%	46	pale tongue texture	118	19.25%
14	dry eyes	234	38.17%	47	facial palsy	116	18.92%
15	reddish	233	38.01%	48	enlarged tongue	114	18.60%
16	fatigued limbs and heavy body	231	37.68%	49	spontaneous sweat	109	17.78%
17	dreamfulness	231	37.68%	50	dribble of urine	104	16.97%
18	headache	222	36.22%	51	preference for sighing	101	16.48%
19	numbness	214	34.91%	52	inability to defecate	101	16.48%
20	irritability	214	34.91%	53	shallow yellow complexion	101	16.48%
21	sluggish speech	210	34.26%	54	fetid mouth odor	95	15.50%
22	yellowish tongue coating	209	34.09%	55	aversion to cold and cold limbs	92	15.01%
23	tinnitus	209	34.09%	56	tongue with petechia or bruise	87	14.19%
24	dark purple mouth	199	32.46%	57	urgent urination	81	13.21%
25	soreness and weakness of waist and knees	197	32.14%	58	lack of appetite	80	13.05%
26	constipation	197	32.14%	59	red complexion	77	12.56%
27	frequent night urination	188	30.67%	60	chest bloated pain	76	12.40%
28	luxated tooth	176	28.71%	61	short and scanty urination	71	11.58%
29	thready pulse	166	27.08%	62	rapid pulse	68	11.09%
30	obesity	165	26.92%	63	dark green orbit	66	10.77%
31	dim complexion	163	26.59%	64	emaciation	66	10.77%
32	expectoration	159	25.94%	65	unsmooth pulse	64	10.44%
33	chest tightness	155	25.29%	66	clear and copious urination	63	10.28%

Table 2: Occurrence rates are more than10% in patients with mild dementia.

No	The combination of core symptoms	No	The combination of core symptoms
1	aphtha, chest bloated pain, face and limbs edema	27	slippery, stringer and weak pulse
2	aphtha, abdominal distension, acid reflux and noise	28	chest stuffiness, preference for sighing, thirst
3	aphtha, acid reflux and noise, dawn diarrhea	29	chest stuffiness, abdominal distension, palpitation
4	aphtha, acid reflux and noise, tidal fever and night sweating	30	chest stuffiness, blurred vision, thirst
5	aphtha, dawn diarrhea, face and limbs edema	31	tinnitus, blurred vision, soreness and weakness of waist and knees
6	greasy tongue coating, thin tongue coating, pale tongue texture	32	pale white lip color, dark purple mouth, dark tongue texture
7	greasy tongue coating, slippery pulse, dark tongue texture	33	preference for sighing, irritability, thirst
8	greasy tongue coating, slippery pulse, thick tongue coating	34	clumsy limbs, sluggish speech, facial palsy
9	greasy, dark and pale tongue coating	35	abdominal distension, acid reflux and noise, soreness and weakness of waist and knees
10	clear and copious urine, luxated tooth, frequent night urination	36	fatigued limbs and heavy body, mental fatigue, lack of strength
11	dim complexion, dark purple mouth, unsmooth pulse	37	fatigued limbs and heavy body, mental fatigue, aversion to cold and cold limbs
12	dim complexion, unsmooth pulse, sublingual vein tortuosity	38	dark purple mouth, unsmooth pulse, tongue with petechia or bruise
13	wiry pulse, thread pulse, weak pulse	39	dark purple mouth, tongue with petechia or bruise, dark tongue texture
14	rapid pulse, red tongue texture, white tongue coating	40	dribble of urine, faint defecation, frequent night urination
15	rapid pulse, white tongue coating, no or lack of tongue coating	41	dribble of urine, sticky and greasy sensation in mouth, fetid mouth odor
16	chest bloated pain, chest stuffiness, preference for sighing	42	numbness, Short and scanty urination, Tidal fever and night sweating
17	chest bloated pain, chest stuffiness, palpitation	43	Slippery tongue coating, enlarged tongue, teeth-marked tongue
18	bitter taste in mouth, preference for sighing, thirst	44	sublingual vein tortuosity, enlarged tongue, thick tongue coating
19	bitter taste in mouth, sticky and greasy sensation in mouth, fetid mouth odor	45	sublingual vein tortuosity, dark tongue texture, dark red tongue
20	thin coating, white coating, dry tongue coating	46	palpitation, shortness of breath, fatigue
21	inomnia, tinnitus, drowsiness	47	shortness of breath, mental fatigue, fatigue
22	enuresis when cough and laugh, dribble of urine, aversion to cold and cold limbs	48	enlarged tongue, teeth-marked tongue, thick tongue coating
23	lack of appetite, fatigued limbs and heavy body, mental fatigue	49	enlarged tongue, teeth-marked tongue, thin tongue
24	dry eyes, tinnitus, expectoration	50	dark tongue texture, dark red tongue texture, pale tongue texture
25	dry eyes, tinnitus, blurred vision	51	dark red tongue texture, Light red tongue texture, Yellowish tongue coating
26	dry eyes, shortness of breath, fatigue	52	dark red tongue texture, light red tongue texture, pale tongue texture

Table 3: The combinations of three core symptoms patients with mild cognitive disorder on complex system entropy.

No	The combination of core symptoms	No	The combination of core symptoms
1	greasy tongue coating, thin tongue coating, dry tongue coating, thick tongue coating	6	red tongue texture, white tongue coating, pale red tongue texture, pale tongue texture
2	thin tongue coating, Red tongue texture, white tongue coating, pale tongue texture	7	clumsy limbs, fatigued limbs and heavy body, numbness, pain of limbs
3	enuresis when cough and laugh, urgent urination, luxated tooth, dribble of urine,	8	limbs, pain of limbs, soreness and weakness of waist and knees
4	enuresis when cough and laugh, luxated tooth, dribble of urine, much frequent urination	9	acid reflux and noise, aversion to cold and cold limbs, pain of limbs, soreness and weakness of waist and knees
5	red tongue texture, white tongue coating, pale red tongue texture, Yellowish tongue coating	10	blurred vision, aversion to cold and cold limbs, pain of limbs, soreness and weakness of waist and knees

Table 4: The combinations of four core symptoms patients with mild cognitive disorder on complex system entropy clustering.

According to cluster analysis, there are 52 kinds of combinations of the three core symptoms out of 94 symptoms of patients with mild cognitive disorder and 10 kinds of combinations of four core symptoms, which can be seen in table 3 and table 4.

With the help of “network display” function of software, visualization of a network of core combinations of symptom clustering can be seen in fig 1.

The combination analysis of core symptoms patients with mild dementia-based on complex system entropy clustering. The correlation degree is 8; the penalty degree is 2. According to cluster analysis, there are 37 kinds of combinations of the three core symptoms out of 94 symptoms of patients with mild dementia-based and 12 kinds of combinations of four core symptoms, which can be seen in table 5 and table 6.

Using the function of software’s “network display”, it shows the network visualization of the core combination of symptom clusters in Figure 2.

The first category belongs to kidney deficiency: combination 10 (blurred vision, aversion to cold and cold limbs, pain of limbs, soreness and weakness of waist and knees) + combination 5 (Red tongue texture, white tongue coating, pale red tongue texture, Yellowish tongue coating) + combination 3 (enuresis when cough and laugh, urgent urination, luxated tooth, dribble of urine) + combination 4 (enuresis when cough and laugh, luxated tooth, dribble of urine, much frequent urination) The second category belongs to Qi deficiency and blood stasis: combination 6 (Red tongue texture, white tongue coating, pale red tongue texture, pale tongue texture) + combination 2 (thin tongue coating, Red tongue texture, white tongue coating, pale tongue texture).

The third category belongs to the spleen and kidney deficiency, phlegm internal resistance: combination 7 (Physical clumsiness, fatigued limbs and heavy body, Numbness, pain of limbs) + combination 8 (fatigued limbs and heavy body, aversion to cold and cold limbs, pain of limbs, soreness and weakness of waist and knees)+ Combination of 9 (acid reflux and noise, aversion to cold and cold limbs, pain of limbs, soreness and weakness of waist and knees) + combination 1 (Greasy tongue coating, thin tongue coating, dry tongue coating, thick tongue coating).

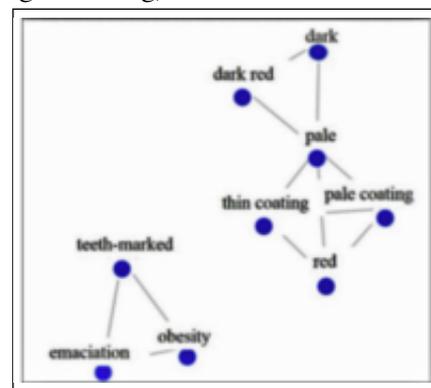


Fig. 1: Visualization of a network of core combinations of symptom clustering of mild cognitive disorder clustering.

No	The combination of core symptoms	No	The combination of core symptoms
1	aphtha mouth, short and scanty urine, face and limbs edema	20	abdominal distension, preference for sighing, chest bloated pain
2	wiry pulse, slippery pulse, sunken pulse	21	abdominal distension, aversion to cold, cold limbs, spontaneous
3	wiry pulse, reddish tongue, yellowish coat	22	abdominal distension, lack of appetite, muscular twitching
4	wiry pulse, fine pulse, yellowish coat	23	abdominal distension, muscular twitching, chest bloated pain
5	thin coat, fine pulse, thick coat	24	clumsy limbs, sluggish speech, expectoration
6	yellowish face, emaciation, thin tongue	25	clumsy limbs, sluggish speech, facial palsy
7	frequent night urination, tinnitus, inability to defecate	26	clumsy limbs, fatigue limbs, heavy body, limbs soreness
8	frequent night urination, tinnitus, soreness and weakness of waist and knees	27	clumsy limbs, numbness, facial palsy
9	frequent night urination, clumsy limbs, fatigue limbs, heavy body	28	luxated tooth, blurred vision, soreness and weakness of waist and knees
10	frequent night urination, clumsy limbs, dribble of urine	29	dark purple mouth, dim complexion, dark tongue
11	frequent night urination, clumsy limbs, numbness	30	dark purple mouth, dark tongue, pale tongue
12	frequent night urination, fatigue limbs, heavy body, soreness and weakness of waist and knees	31	fissured tongue, slippery tongue, thick tongue
13	enuresis when cough and laugh, urgent urination, dribble of urine	32	dribble of urine, short and scanty urine, face and limbs edema
14	slippery pulse, no tongue or lack of tongue, fine pulse	33	short and scanty urine, vexing heat in chest, palms and soles, constipation
15	chest tightness, palpitations, shortness of breath	34	short and scanty urine, constipation, face and limbs edema
16	tinnitus, blurred vision, inability to defecate	35	palpitations, shortness of breath, lack of strength
17	tinnitus, shortness of breath, soreness and weakness of waist and knees	36	palpitations, thirst, spontaneous
18	pale lips, red tongue, light red tongue	37	tongue with petechia or bruise, dim complexion, dark tongue
19	reddish tongue, light pink tongue, pale tongue		

Table 5: The combinations of three core symptoms patients with mild dementia-based on complex system entropy clustering.

No	The combination of core symptoms	No	The combination of core symptoms
1	aphtha mouth, bitter taste in mouth, sticky and greasy sensation in mouth, fetid mouth odor	7	chest tightness, preference for sighing, palpitations, chest bloated pain
2	wiry pulse, slippery pulse, fine pulse, weak pulse	8	reddish tongue, pale tongue, light red tongue, yellowish coat
3	wiry pulse, lack of fluid in tongue, fine pulse, weak pulse	9	fatigue limbs, heavy body, lack of strength, lack of strength
4	rapid pulse, red tongue, white coat, no coat or lack of coat	10	fatigue limbs, heavy body, mental fatigue, lack of strength
5	dry eyes, tinnitus, blurred vision, soreness and weakness of waist and knees	11	fatigue limbs, heavy body, short of breath, pain of limbs, soreness and weakness of waist and knees
6	dry eyes, tinnitus, blurred vision, thirst	12	choppy pulse, tongue with petechia or bruise, sublingual vein tortuosity dark tongue

Table 6: The combinations of four core symptoms patients with mild dementia-based on complex system entropy clustering.

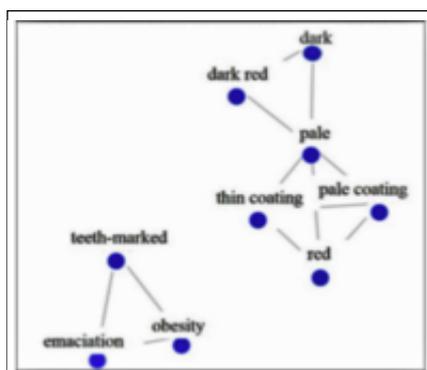


Fig. 2: Combination of core symptoms of mild dementia.

The first category belongs to the kidney deficiency: combination 4 (rapid pulse, red tongue, white coat, no coat or lack of coat) + combination 5 (dry eyes, tinnitus, blurred vision, soreness and weakness of waist and knees) + combination 8 (red-

dish tongue, pale tongue, light red tongue, yellowish coat) + combination 11 (fatigue limbs, heavy body, short of breath, pain of limbs, soreness and weakness of waist and knees).

The second category is turbid phlegm obstructing internal: combination 7 (chest tightness, preference for sighing, palpitations, chest bloated pain).

The third category belongs to Qi deficiency and blood stasis: combination 2 (wiry pulse, slippery pulse, fine pulse, weak pulse).

The fourth category belongs to spleen and kidney deficiency, phlegm resistance turbid phlegm obstructing internal: combination 9 (fatigue limbs, heavy body, lack of strength, lack of strength) + combination 10 (fatigue limbs, heavy body, mental fatigue, lack of strength).

The fifth category belongs to yin deficiency with effulgent fire: Combination 1 (aphtha mouth, bitter taste in mouth, sticky and greasy sensation in mouth, fetid mouth odor) + combination 3 (wiry pulse, lack of fluid in tongue, fine pulse, weak pulse) + combination 6 (dry eyes, tinnitus, blurred vision, thirst) + combination 12 (choppy pulse, tongue with petechia or bruise, sublingual vein tortuosity dark tongue)

Discussions

The relationships of disease, syndrome differentiation and syndromes are inseparable. Diseases are the largest category, which can be expressed as various stages of syndrome and its corresponding symptoms with a dynamic evolution. The syndrome differentiation is the summarization and generalization of the nature of the disease. And syndrome elements constitute the smallest unit of syndromes⁽²¹⁾, which are mainly divided into two major categories as disease location and disease characteristics. Generally speaking, the dynamic combination of the disease location and the disease characteristics forms syndromes, which helps to flexibly guide clinical syndrome differentiation. Therefore, the syndrome and syndrome elements are the key links of the connection of the disease and syndrome, syndrome and symptoms⁽²²⁾.

Academician Wang Yongyan⁽²¹⁾ has proposed that the syndrome is a non-linear complex giant system, with “internal deficiency and external excess, dynamic space-time, multi-dimensional interface” features. One basic way of researches is to determine the diagnosis of syndromes according to the combination of different syndromes elements, with the basic syndrome elements as a point cut, and through the “dimension reduction and degree elevation”. Complex system based on entropy clustering is one of the most commonly used methods of non-linear data mining, and it is widely used in the extraction of syndrome elements of multiple diseases^(23,24). The superiority of the method is based on the internal correlation between data variables in order to find and summarize characteristics and rules of them.

Although the basic pathogenesis of stroke is quit clear in Traditional Chinese Medicine, the etiology and pathogenesis theory of post-stroke cognitive disorder is still in the exploratory stage. In this study, with a large-sample, multi-center, multi-regional and multi-level collaborative network system, the four diagnostic methods of patient cases were reduced dimension. And after the syndrome elements were extracted, Qi deficiency, blood stasis, sputum, Yang deficiency, Yin deficiency and fire were found the basic pathological elements of the disease. The disease located in the brain, mainly involved kidney, liver and spleen, and is categorized in mixed excessiveness and deficiency, which once again confirmed the exploration of the prede-

cessors on the syndrome elements⁽¹⁴⁾.

Kidney deficiency, qi deficiency and blood stasis, spleen and kidney deficiency, phlegm obstruction, are the typical syndromes for the post-stroke cognitive disorder patients. Patients with fire excess from yin deficiency will aggravate with the worsen disease condition.

This conclusion can help to clarify the nature of the nature and pathogenic development of the disease, and provide strong support for the TCM early prevention and treatment of post-stroke cognitive disorder, which is also helpful to the chronic disease prevention and treatment. However, the study of post-stroke cognitive disorder syndrome is still at the initial stage, and need to do more work in further expanding the sample size, using data mining tools, deeply exploring common syndromes distribution and syndromes development rules.

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Corresponding author

LE WANG, E-mail: 13661172704@139.com;
SHUZHEN LI, E-mail: shuzhenli2011@163.com
(China)