

Analysis of Related Factors of Behavioral and Psychiatric Symptoms in Vascular Dementia

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Abstract

Objective: The aims of this study were to investigate the relationship between behavioral and psychological symptoms and cognitive disturbances, ages, educations of patients and investigate the correlations among Neuropsychiatric inventory (NPI) items in patients with vascular dementia (VaD).

Methods: NPI and Mini-Mental State Examination (MMSE) were used to assess the behavioral and psychological symptoms in 120 cases with VaD and 61 cases healthy elders as control group.

Results: The score about delusion, hallucination, agitation, dysphoria, apathy, irritability, aberrant motor and appetite/eating change in the NPI list were significantly increased compared with control group ($P < 0.05$), in which the highest score in turn were dysphoria, apathy and irritability. Among the 8 items in the NPI list, delusion, apathy and aberrant motor were significantly correlated with cognitive disorder ($P < 0.05$), and abnormal behavior was correlated with ages and educations. Besides, NPI factors analysis showed there were three behavioral sub-syndromes, such as psychosis, mood disorder and behavioral disturbance.

Conclusions: Behavioral and psychological symptoms were common in VaD patients, and the frequency and severity of behavioral and psychological symptoms were correlated with cognitive disturbances, ages, and education status at different degrees.

Keywords: Vascular dementia; Behavioral and psychological symptoms; Factors analysis

Introduction

The vascular dementia (VaD) refers to the clinical syndrome that is the overall decline of intelligent and related functions induced by cerebrovascular disease and currently has become the second factors of senile dementia, and is one of the common sequelae of cerebral vascular disease [1]. Previous studies about VaD pay more attention to their intelligence and cognitive disorders of VaD patients [2]. Some non-cognitive behavioral and psychiatric symptoms may also affect the life quality of patients, and increase the risk and the burden of family and nursing in the VaD patients [3,4]. So the study of the neuropsychiatric symptoms of VaD also has positive clinical significance. Neuropsychiatric inventory (NPI) formulated by professor Cummings [5], is widely used in evaluate of spirit and behavior symptoms of dementia, and is proved to have good reliability and validity [6-8]. The aims of this study were to investigate the relationship between behavioral and psychological symptoms and cognitive disturbances, ages, educations of patients and investigate the correlations among NPI items in patients with VaD.

Materials and Methods

Study subjects

From May 2011 to June 2015, a total of 120 VaD Han nationality patients of neurology department in Jinhua downtown hospital were included, with diagnose including clinical diagnosis, internal medicine and neurological examination, and series of nervous psychology test and neuroimaging examination, in accordance with the diagnosis standard of probable vascular dementia [9]. At the same time, all VaD patients were excluded from the consciousness disturbance; other neurological diseases, systemic diseases or mental illness, and the laboratory examination were completed such as vitamin B12, thyroid function, and liver function, to exclude secondary dementia. Basic data

of study subjects were collected, including age, education level and gender et al. Mini-Mental State Examination (MMSE) was executed and MMSE score was recorded. The protocol was approved by the Research Ethics Committee of Jinhua Hospital of Zhejiang University and all the subjects (or their caregivers) gave written informed consent before participating in this study.

Examination methods

The version of MMSE formulated by Kim et al was used in this study [10]. The new version of the neuropsychiatric inventory revised by Kelly et al was used to finish NPI [11]. The assessment of MMSE and NPI were completed by specialists of our department in all VaD patients and the healthy people. The specialists in our department had been pre unified trained and examined, in order to keep homogeneity of the scale assessment, and NPI data were provided by the main caregivers of patients.

Statistical analysis

The data were expressed as mean \pm standard deviation (Mean \pm SD). Results were analysed by Student's t test. The correlation between the behavioral and psychological symptoms and MMSE, NPI age, and education status and the correlation between each item of NPI mental

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behavior symptoms were analysed by Pearson correlation analysis. All data analyses were done using SPSS 18.0 statistical software. Significance level was set at $P < 0.05$.

Results

Basic data of study subjects

As shown in Table 1, in 120 cases of VaD patients, 67 patients were males, 53 patients were females, aged were 51~80 years, mean age was (67.98 ± 7.80) years, education years was 0~16 years, MMSE ≤ 24 , the mean score was 18.45 ± 4.54 . The normal control group were healthy elders selected at the same time with the VaD group from Wu Jiang new city community of Sanjiang streets, Jinhua City, Zhejiang province, a total of 61 cases, 30 males, 31 females, aged 54~82 year old, meaned year was 66.41 ± 7.96 years old, education years was 0~16 years, MMSE score was 26~30, mean score was 27.70 ± 2.61 . There were no statistically differences of the age and education status between the VaD group and normal control group ($P > 0.05$), the main clinical data were comparable. There were statistically significant between-group differences in the (MMSE) scores ($P < 0.05$).

The results of NPI assessment

Comparison of NPI score between the VaD patients and normal control group has been described in other studies [12]; this study focuses on the evaluation of the NPI in patients with vascular dementia. As shown in (Table 2), the NPI scores of the delusions, hallucinations, agitation, depression or dysthymia, apathy, irritability, abnormal behavior, appetite and eating disorders in the VaD group were significantly higher than those in normal control group ($P < 0.05$). The highest NPI score symptoms were in turn the depression/dysthymia, apathy and irritability. The anxiety score was higher in the VaD group than that in normal control group, but there was no significant differences ($P > 0.05$).

Correlation analysis between NPI score and MMSE score, age, and education level in VaD group

As shown in Table 3, the total NPI score had high correlation with MMSE score and had no correlation with age and education level in VaD group. The delusions, hallucinations, agitation, apathy, irritability, abnormal behavior, appetite and eating disorders were negatively related with MMSE score. The abnormal behavior, appetite and eating disorders were positively related with age and the remaining 6 items had no correlation with age. The education level was positive related with delusion and was negatively related with abnormal behavior. But the remaining 6 items had no correlation with education level.

Correlation analysis among NPI items

The correlations of frequency of emergence of NPI [12] mental behavior symptoms in VaD patients were analysed. As shown in Table 4, the results showed that there was significant correlation between delusions and hallucinations ($r = 0.753$, $P = 0.001$), depression and anxiety ($r = 0.596$, $P = 0.001$), agitation and irritability ($r = 0.591$,

S. No	Item	Control group	VaD group	F Value	P Value
		n=61	n=120		
1	Delusion	0.0 ± 0.0	0.3 ± 1.5	20.701	0.003
2	Hallucination	0.0 ± 0.0	0.3 ± 1.5	12.206	0.004
3	Agitation	0.0 ± 0.0	0.3 ± 1.6	7.482	0.021
4	Depression/Dysthymia	0.6 ± 1.6	2.3 ± 3.3	8.637	0.014
5	Dysphonia	0.6 ± 1.3	1.5 ± 2.6	2.716	0.262
6	Hyperthermia/Euphonia	0.0 ± 0.0	0.5 ± 0.3	3.194	0.193
7	Apthy	0.0 ± 0.2	1.6 ± 2.7	23.238	0.002
8	Disinhibition	0.0 ± 0.0	0.1 ± 0.7	4.342	0.114
9	Irritability/Instability	0.2 ± 0.7	0.9 ± 1.9	18.079	0.002
10	Abnormal behavior	0.0 ± 0.0	0.2 ± 0.8	6.363	0.041
11	Sleep	1.3 ± 2.2	1.4 ± 3.2	3.061	0.145
12	Appetite and eating disorder	0.1 ± 0.6	0.6 ± 2.1	6.427	0.031
	Total	2.8±4.7	9.3±10.8	26.744	0.001

Note: The above data were selected from the published article of the first half part of the study, so the VaD group had 81 cases

Table 2: Comparison of NPI score between the normal control group and VaD group, (Mean ± SD).

S. No	Items	MMSE score	Age	Education
1	Delusion	-0.164 (0.034)*	0.080(0.162)	0.152 (0.045)*
2	Hallucination	-0.199 (0.018)*	0.018(0.499)	0.032(0.325)
3	Agitation	-0.193 (0.021)*	0.003(0.607)	0.022(0.415)
4	Depression/Dysthymia	0.013(0.523)	-0.139(0.063)	-0.096(0.147)
5	Dysphonia	0.144(0.056)	-0.237 (0.004)*	-0.098(0.145)
6	Hyperthermia/Euphonia	0.039(0.313)	0.039(0.313)	0.050(0.206)
7	Apthy	-0.476 (0.001)*	0.112(0.115)	0.048(0.213)
8	Disinhibition	-0.057(0.201)	-0.058(0.201)	-0.140(0.061)
9	Irritability/Instability	-0.175 (0.030)*	-0.117(0.107)	0.074(0.179)
10	Abnormal behavior	-0.299 (0.002)*	0.269 (0.003)*	-0.184 (0.028)*
11	Sleep	-0.097(0.145)	0.174 (0.030)*	-0.046(0.218)
12	Appetite and eating disorder	-0.228 (0.005)*	0.194 (0.021)*	-0.135(0.074)
	Total	-0.289 (0.002)*	0.021(0.415)	-0.071(0.182)

Note: * $P < 0.05$.

Table 3: Correlation analysis between NPI each item and cognitive disturbances, ages, education status (Pearson's correlation coefficient).

$P = 0.002$), which suggested that some obvious related sub-symptoms might form sub syndrome, namely the delusions and hallucinations (psychosis), depression/anxiety and dysthymia (affective disorder), agitation and irritability (loss of control behavior).

Discussion

VaD mostly occurs in 3 months after the cerebral vascular accident and shows various styles behavioral and psychological symptoms, such as a sudden or progressive cognitive impairment, emotional disorders and psychiatric abnormal. VaD may further affect the quality of life on the base of the patients with physical disability and cognitive impairment [13]. Thus in this study, Chinese version of NPI was used to perform comprehensive evaluation and understanding mental and behavioral symptoms in VaD patients. It is reported that Chinese version of NPI has favourable internal validity in Chinese and the consistency of Chinese version of NPI in Chinese is relatively high [14,15]. The correlations of mental and behavioral symptoms in VaD patients with cognitive impairment, education status, age and other factors were further analysed. Our aims were to investigate the relationship between behavioral and psychological symptoms and cognitive disturbances, ages, educations of patients and investigate

Item	Control	VaD patients	P value
	n=61	n=120	
Age	66.41 ± 7.96	67.98 ± 7.80	0.070
Education level	10.78 ± 5.32	10.10 ± 4.68	0.240
MMSE score	27.70 ± 2.61	18.45 ± 4.54	0.000
Gender (male/female)	30/31	67/53	0.406

Table 1: Basic data of between control and VaD patients (Mean ± SD).

Items	1	2	3	4	5	6	7	8	9	10	11	12
1	1											
2	.753 ^(*)	1										
3	.554 ^(*)	.586 ^(*)	1									
4	-0.068	-0.047	0.065	1								
5	-0.051	-0.083	-0.076	.596 ^(*)	1							
6	-0.021	-0.02	0.063	0.136	0.13	1						
7	0.14	0.151	.160 ^(*)	0.096	-0.15	-0.1	1					
8	-0.015	.280 ^(*)	-0.015	0.145	-0.04	-0	.364 ^(*)	1				
9	.425 ^(*)	.441 ^(*)	.591 ^(*)	-0.02	-0.03	0.15	0.14	0.06	1			
10	-0.01	.173 ^(*)	0.105	-0.03	-0.1	-0	0.029	-0	-0.024	1		
11	.326 ^(*)	.367 ^(*)	.162 ^(*)	.154 ^(*)	0.13	-0	0.063	-0	0.117	.404 ^(*)	1	
12	0.066	0.097	-0.048	0.11	0.04	-0	-0.02	-0	0.02	.676 ^(*)	.333 ^(*)	1
Total	.480 ^(*)	.538 ^(*)	.440 ^(*)	.600 ^(*)	.435 ^(*)	0.1	.370 ^(*)	.209 ^(*)	.411 ^(*)	.347 ^(*)	.627 ^(*)	.425 ^(*)

Note: 1- Delusion; 2- Hallucination; 3- Agitation; 4- Depression/Dysthymia; 5- Dysphonia; 6- Hyperthermia/Euphonia; 7- Apathy; 8- Disinhibition; 9- Irritability/Instability; 10- Abnormal behavior; 11- Sleep; 12- Appetite and eating disorder. *P<0.05.

Table 4: Correlation analysis among NPI items (Pearson's correlation coefficient).

the correlations among NPI items in patients with VaD. These might provide positive guide significance for identification and intervention on behavioral and psychological symptoms of VaD patients.

120 cases of VaD patients meeting the inclusion criteria were selected in this study. Through the neuropsychiatric questionnaire analysis and evaluation in VaD patients and normal control subjects, it was found that mental behavior symptoms were common in VaD patients. In VaD patients, the NPI scores of delusions, hallucinations, agitation, depression or dysthymia, apathy, irritability, abnormal behavior, appetite and eating disorders and other 8 sub symptoms were significantly higher than those in normal control group. The NPI scores in turn were depression/dysthymia, apathy, irritability, agitation, hallucinations, delusions the abnormal behavior, and appetite and eating disorders, suggesting that depression, apathy and other "negative" symptoms were obvious in VaD patients. The NPI scores of depression/dysthymia and apathy were high in the VaD patients, which might be related with different degree of physical disability in VaD patients. It was reported that VaD was related with the damage of the front of the brain, especially the connection between the frontal lobe and subcortex [16], suggesting that these differences might be related to different clinical types of VaD. But the subtype of VaD patients did not be explored in this study, there was no relevant conclusion. In clinical practice, the clinicians and caregivers do not pay attention on the "negative" symptoms, but these symptoms can significantly affect the life quality of patients. At the same time, NPI score of anxiety in VaD patients was higher than that in normal control group, although there was no significant difference about NPI score of anxiety between VaD patients and control group, the clinicians and caregivers should also pay more attention on it.

As the behavioral and psychological symptoms were general in VaD patients [17], in order to provide help for the early intervention of the behavioral and psychological symptoms, we further explored the relationship between occurrence of the VaD and influence factors such as cognitive impairment, age and education level. In this study, we found that, there was a significant difference in the 8 sub items of NPI score of mental and behavioral symptoms between VaD patients and control group, in addition to depression. The remaining 7 items were positively related with the degree of cognitive decline. With the progress of VaD, the cognitive impairment was aggravated, the spirit symptoms, such as hallucinations, agitation, indifference, abnormal behavior were also aggravated in different degree. While it was reported that hallucinations and agitation in VaD patients were negatively related with the degree of

cognitive impairment, namely, the hallucinations, agitation and other symptoms in the VaD patients were obvious in early period [18]. The researchers suggested that although the behavioral and psychological symptoms were general in AD and VaD patients, its appearance time and development might be certain differences. The distinguishing of two types of dementia patients remains to be confirmed by further studies. For the age factor, our results showed that the abnormal behavior was highly related with the age. With the increase of the age, the probability of occurrence abnormal behavior in VaD patients was increased. The anxiety was negatively related with the age, namely the younger VaD patients was prone to anxiety, which might be related to that cognitive impairment and physical disability might have more effect and impact on the social role of younger patients. But in this study, the age was actual age when the patients were included in the group, and was not the age of onset of the disease, so the effect of the factors was remained to be explored. At the same time, we also found that the delusion was positively related with education status. The patients with the higher the education status was prone to the delusion. Abnormal behavior was negatively related with the education status, namely, the patients with the higher the education status was prone to the abnormal behavior.

When the NPI score was designed by Cummings et al [5], they did not scale the structure. But with the extensive use of NPI in the psychiatry symptoms research of dementia, based on the study of AD patients, the researchers groups found that NPI could be divided into 3 syndrome [19-21], namely, affective disorder (including depression and anxiety), psychotic (delusions and hallucinations) and loss of control behavior (including irritable, emotional instability, indifference and abnormal behavior). NPI could also be divided into 4 syndrome, namely, affective disorder, psychotic, abnormal behavior and loss of self-control [8,22,23]. At present, the related research based on VaD patients is rare. Therefore, in this study we analyzed the correlation among NPI each factor in VaD patients. Three syndromes were obtained in VaD patients, namely the delusions and hallucinations (psychosis), depression/anxiety and dysthymia (affective disorder), agitation and irritability (loss of control behavior), which was similar to the previous study based on AD. We found a significant association between psychotic symptoms and loss of control behavior. This result suggested that the psychoneurologic symptoms of VaD patients might exists some sub syndromes that had some general characters. So certain single symptoms in VaD patients should not be payed too much attention. Our study also suggested that each item of the sub syndrome not only might exist close relation, but some sub syndromes might

also exist the common pathophysiologic mechanisms or downstream effects, and its specific pathophysiological basis still need further study.

Conclusion

Altogether, our present study showed that behavioral and psychological symptoms are common in VaD patients, and the frequency and severity of behavioral and psychological symptoms are correlated with cognitive disturbances, ages, and education status at different degrees, and sub syndromes of VaD may exist the common pathophysiological basis. The results of our study provide a new clue for pathophysiologic mechanisms and therapeutics of VaD.

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