

Effects of Interventions Combined with Drugs on Serum 5-Hydroxytryptamine and Gamma-Aminobutyric Acid Levels in Neurological Tinnitus

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This study aimed to study the effects of comfort interventions combined with drugs on serum 5-hydroxytryptamine and gamma-aminobutyric acid levels and coping styles in patients with neurological tinnitus and analyses them. We selected one hundred neurological tinnitus patients admitted to the hospital from July 2021 to July 2022 for the trial. Then randomly divided them into an experimental group (n=50 cases) and a reference group (n=50 cases) according to the difference between the single and double numbers in the order of medical consultation. The reference group received conventional medication and an audio information therapy device, while the experimental group received additional comfort interventions in addition to the reference group. The disability status, serum 5-hydroxytryptamine and gamma-aminobutyric acid levels, coping style and sleep quality were compared between both groups. After the intervention, experimental group had lower all tinnitus disability scale scores than reference group (all $p < 0.05$). After the intervention, experimental group had lower serum 5-hydroxytryptamine levels but higher gamma-aminobutyric acid levels than reference group (all $p < 0.05$). After the intervention, experimental group had lower facing scores but lower avoidance and submission scores than reference group (all $p < 0.05$). After the intervention, the Athens insomnia scale scores were lower in both groups than before the intervention, and experimental group had lower scores than reference group (both $p < 0.05$). Comfort intervention combined with drugs is effective in improving disability in neurological tinnitus patients, while improving serum 5-hydroxytryptamine and gamma-aminobutyric acid levels and coping style and sleep quality, and is worth promoting.

Key words: Neurogenic tinnitus, comfort intervention, 5-hydroxytryptamine, gamma-aminobutyric acid, coping style

Neurological Tinnitus (NT) is a common clinical condition in otolaryngology and is characterized by the subjective presence of varying degrees of tinnitus in the ear in the absence of sound or electrical stimulation, often accompanied by hearing impairment and vertigo, which can have a serious impact on the physical and mental health of patients^[1,2]. At present, the treatment of NT patients is usually pharmacological, but the results are not very satisfactory and cannot be well controlled. The audiovisual information therapy device is one of the physiotherapy tools, which uses advanced electronic technology to treat the auditory system with targeted audiovisual information, but the treatment is mainly focused on physical health, neglecting the intervention of the patient's mental health^[3,4]. Comfort interventions, which focus on comprehensive

nursing interventions to make patients psychologically and physically happy or to improve their unhappiness, are now widely used in a variety of conditions. However, little research has been reported on comfort interventions and NT patients. This study aimed to study the effects of comfort interventions combined with drugs on serum 5-Hydroxytryptamine (5-HT) and Gamma-Aminobutyric Acid (GABA) levels and coping styles in patients with NT and analyses them, in order to provide an effective intervention programmer for NT patients. We selected 100 NT patients admitted to the hospital from July 2021 to July 2022 for the trial. Then randomly divided them into an experimental group (n=50 cases) and a reference group (n=50 cases) according to the difference between the single and double numbers in the order of medical consultation. Experimental

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group consisted of 27 males and 23 females; age were from 41 y to 79 y old, mean (60.39±6.72) y old; course of disease 2 mo to 16 mo, mean (7.41±1.02) mo; years of cultural education 5 y to 16 y, mean (8.52±1.44) y. Reference group consisted of 28 males and 22 females; age were from 40 y to 79 y old, mean (60.48±6.62) y old; course of disease 2 mo to 15 mo, mean (7.46±1.03) mo; years of cultural education 5 y to 16 y, mean (8.60±1.47) y. The differences in the above information between both groups were small ($p>0.05$) and could be compared at follow-up. Inclusion criteria, met the diagnostic criteria for NT^[5]; were all adults; had good compliance. Exclusion criteria associated with organic pathology; combined with severely impaired vital organ function; previous history of alcohol or (and) drug dependence; abnormal mental status. Patients all signed consent forms and the study was approved by the hospital medical ethics committee. The reference group was treated with conventional drugs and an audio information therapy device. Drugs intervention; mecobalamin neurotrophic tablets and extract of *Ginkgo biloba* leaves tablets, 2 tablets/time, 2 times/day. Audio information therapy device intervention; firstly the subject's hearing was measured in both ears with the aid of the device and the hearing curve was depicted, then the subject was instructed to wear headphones and the treatment is fully automated when the light flashes. The treatment was completed when the light went out completely. The experimental group received additional comfort interventions in addition to the reference group. In psychological interventions, the nursing staff took the initiative to greet the subjects and introduced them to the medical staff and the ward environment in a gentle and kind manner to avoid any emotional stimulation from the unfamiliar environment. The subject is encouraged to talk about his or her feelings and thoughts, and his or her doubts are answered correctly. Relaxation is provided by listening to music or watching videos according to the subject's personal interests. In environmental intervention; nursing staff create a comfortable and quiet environment for the subjects, minimize noise in the ward, and adjust the temperature and humidity of the ward to make the subjects feel comfortable. In lifestyle interventions, patients are advised to consume foods that have the ability to invigorate blood circulation, remove blood stasis and strengthen the spleen and Qi, such as yam, black fungus and cinnamon. If possible, add these herbs to the daily diet to form a medicinal dish and consume

more fresh fruits and vegetables. The subject should be advised to take regular rest and to refrain from smoking, drinking, watching TV or playing electronic devices for a long time. In acupuncture, massage techniques include the tympanic membrane, occipital-knocking therapy and the Yingzhi Chengkou. The tympanic membrane technique involves using the middle finger to massage the tragus area, pay attention to the massage process and visit the area as you go, pressing all parts 25 times and paying attention to the gentle pressure. The occipital-knocking therapy technique involves applying both hands to the external auditory canal opening on both sides of the subject to close it completely, adjusting it appropriately and then folding the index finger over the middle finger, the subject is then pressed and tapped on the occipital area at the back of the head, making sure that the pressure is gentle. The Yingzhi Chengkou technique involves massaging the auricle with both hands, paying attention to the upward and downward strokes during the massage. The duration of these three massage techniques was 10 min/time. Both groups were intervened continuously for 4 w. Compared both groups on disability status, serum 5-HT and GABA levels, coping style and sleep quality. Disability was assessed using the Tinnitus Handicap Inventory (THI)^[6], which covers three dimensions; severity, emotion and function, with higher scores indicating more significant disability. Serum 5-HT and GABA levels are measured by Enzyme-Linked Immunosorbent Assay (ELISA) and all procedures are carried out according to the kit instructions, the kits were purchased from Beijing Biolab Technology Co. Ltd. Coping styles were assessed using the Medical Coping Questionnaire^[7], which covers three dimensions; facing, avoidance and submission, with scores ranging from 8-32 points, 7-28 points and 5-20 points respectively, with higher scores indicating a preference for that type of coping style. Adopted the Athens Insomnia Scale (AIS)^[8] to assess the quality of sleep, covering 8 items, all of which were scored 0-3 points, with a theoretical minimum score of 0 points and a maximum score of 24 points, with a high score indicating poor sleep quality. All of the above indicators were tested 1 d before the intervention and 4 w after the intervention. Data were analyzed using Statistical Package for the Social Sciences (SPSS) 24.0 software. The measurement data were described by ($\bar{x}\pm s$) and t-test was performed. The count data were described by [n,

(%) and the Chi-square (χ^2) test was performed. $p < 0.05$ means that the difference is statistically significant. After the intervention, experimental group had lower THI scores than reference group (all $p < 0.05$) as shown in Table 1. After the intervention, experimental group had lower serum 5-HT levels but higher GABA levels than reference group (all $p < 0.05$) as shown in Table 2. After the intervention, experimental group had higher facing scores but lower avoidance and submission scores than reference group (all $p < 0.05$) as shown in Table 3. After the intervention, AIS scores were lower in both groups than before the intervention and experimental group had lower AIS scores than reference group (all $p < 0.05$) as shown in Table 4. Patients with NT often have a reduced ability to perceive the outside world, which makes them prone to insomnia and increases negative emotions such as anxiety, depression and irritability, which in turn aggravates NT and eventually creates a vicious cycle^[9,10]. So far, the specific causes and pathogenesis of NT have not been thoroughly elucidated, and there is no specific treatment, Western medical treatment is based on medication, cognitive-behavioral interventions and hyperbaric oxygen, but the results are not very satisfactory^[11,12]. Some studies have shown that scientific and effective interventions for NT patients can improve clinical outcomes and achieve good control and improvement^[13,14]. Among them, comfort interventions can provide patients with comprehensive and personalized care services during the intervention process, through psychological, environmental, lifestyle and acupuncture measures, which can help improve their negative emotions and contribute positively to the recovery of the disease^[15]. The results of this paper demonstrate that after the intervention, experimental group had lower all THI scores than reference group. This suggests that the comfort intervention combined with medication was effective in improving the disability of NT patients. The reason for this is that the intervention programmer can effectively reduce patients' negative emotions, help them relax physically and mentally, improve their trust and treatment compliance, promote the establishment of a healthy lifestyle and facilitate their recovery. Another study reported that dietary intervention is a key element in improving the treatment effect of patients and strengthening the body's resistance and

immunity^[16]. The dietary intervention carried out in the experimental group was mainly formulated in a comprehensive manner to ensure that patients could obtain balanced nutrition and at the same time obtain the nourishing effect. In addition, 5-HT^[17] and GABA^[18] are key auditory pathway neurotransmitters, the former being a central nervous excitatory neurotransmitter and the latter a central nervous inhibitory neurotransmitter, both of which are abnormally expressed in NT patients. The results of this paper found that after the intervention, experimental group had lower serum 5-HT levels but higher GABA levels than reference group. This reflects the significant improvement of the above neurotransmitters in NT patients by the combination of comfort intervention and drugs. The reason for this may be related to the synergistic effect of the comfort intervention and the medication. After the intervention, experimental group had higher facing scores but lower avoidance and submission scores than reference group. This indicates that the intervention approach in the experimental group was effective in improving the coping style of NT patients. The reasons for this were that the intervention approach was effective in improving patients' knowledge of NT, which led to positive and objective confrontation with the disease and helped to build and enhance confidence in overcoming the disease^[19]. After the intervention, AIS scores were lower in both groups than before the intervention and experimental group had lower AIS scores than reference group. This indicates that the intervention approach in the experimental group has a certain effect on the improvement of patients' sleep quality. The reason for this is, intervention not only helps to improve sleep quality by comprehensively grasping the patients' lifestyle and treatment compliance status, but also by formulating individualized intervention plans, providing patients with physical and psychological comfort, and reducing the anxiety and tension caused by unfamiliar environments. A study by Luo *et al.*^[20] reported that comfort interventions were effective in improving sleep quality in NT patients, which provides strong evidence for this study. In summary, comfort interventions combined with drugs have been shown to be effective in NT patients, especially in terms of improving disability, serum neurotransmitter levels, coping styles and sleep quality.

TABLE 1: COMPARISON OF VARIOUS THI SCORE BETWEEN BOTH GROUPS ($\bar{x}\pm s$, POINTS)

Group	Group	Seriousness		Emotion		Function	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Experimental	50	8.58±0.86	6.94±0.42	16.09±1.33	9.40±1.06	37.52±2.10	16.47±1.52
Reference	50	8.62±0.84	7.62±0.61	16.14±1.36	11.02±1.18	37.43±2.15	18.12±1.66
t		0.235	6.492	0.186	7.222	0.212	5.184
p		0.815	<0.001	0.853	<0.001	0.833	<0.001

TABLE 2: COMPARISON OF SERUM 5-HT AND GABA LEVELS BETWEEN BOTH GROUPS ($\bar{x}\pm s$, ng/l)

Group	Cases	5-HT		GABA	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Experimental	50	47.52±4.10	20.58±3.12	22.41±3.25	31.08±4.20
Reference	50	47.39±4.18	24.58±3.58	22.48±3.29	28.54±3.79
t		0.169	5.956	0.107	3.175
p		0.866	<0.001	0.915	0.002

TABLE 3: COMPARISON OF COPING STYLES BETWEEN THE TWO GROUPS ($\bar{x}\pm s$, POINTS)

Group	Cases	Facing		Avoidance		Submission	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Experimental	50	14.58±1.30	25.42±2.01	24.58±1.09	12.45±0.46	16.12±1.08	8.58±0.78
Reference	50	14.62±1.32	21.69±1.75	24.63±1.12	14.62±0.79	16.14±1.09	10.23±0.92
t		0.153	9.897	0.226	16.785	0.092	9.673
p		0.879	<0.001	0.822	<0.001	0.927	<0.001

TABLE 4: COMPARISON OF AIS SCORES BETWEEN BOTH GROUPS ($\bar{x}\pm s$, POINTS)

Group	Cases	Pre-intervention	Post-intervention	t	p
Experimental	50	16.20±2.09	9.15±1.30	20.254	<0.001
Reference	50	16.31±2.14	10.87±1.87	13.535	<0.001
t		0.26	5.34	-	
p		0.795	<0.001	-	

Conflict of interests:

The authors declared no conflict of interests.

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