MEDS Chinese Medicine (2021)
ISSN 2616-1753 Volume 3 Issue 2
DOI: 10.23977/medcm.2021.030229
Clausius Scientific Press, Canada

The Relationship between Serum Interleukin-6 and Sustained Attention in Patients with Alcohol Use Disorders

Sun Wei[1], WU Qiao[1]

[1] *Department of Psychiatry, the Third People's Hospital of Mianyang, Mianyang, Sichuan, 621000, China*

Corresponding author: WU Qiao, Email: wuqiao_self@163.com

Keywords: Alcohol use disorders il-6, Sustained attention, Iva-cpt correct number, Reaction time

Abstract: Objective To study the relationship between serum interleukin 6 (IL-6) and sustained attention in patients with alcohol use disorders(AUD)and provide evidence for improving the sustained attention of patients with AUD. Methods Forty-seven patients with AUD and 47 healthy patients from May 2020 to October 2020 in Mental Hospital of Yunan Province were selected as the study group and the control group. The IL-6 and the visual and auditory attentional performance test (IVA-CPT) were compared between the two groups, and the relationship between IL-6 and IVA-CPT in AUD patients was analyzed by Pearson's linear correlation method. Results The IL-6 of the study group was significantly higher than that of the control group, and the difference was statistically significant (P<0.05). The correct number of IVA-CPT in the study group was significantly lower than that of the control group, and the number of errors, omissions, and response time of IVA-CPT were significantly higher than those of the control group. The differences were statistically significant (P<0.05). According to the analysis of Pearson linear correlation method, there is no correlation between IL-6 and IVA-CPT correct number, error number, and missed number (P>0.05). IL-6 and IVA-CPT reaction time are negatively correlated (P<0.05). Conclusion The IL-6 of patients with AUD has a certain relationship with sustained attention. Clinically, the level of IL-6 can be reduced to improve the sustained attention of patients with AUD.

1. Introduction

Alcohol use disorders (AUD) are the most common and severe mental disorders in developed countries [1]. Alcohol use causes 5.9% of deaths (7.6% in male, 4.0% in female), among the alcohol -related deaths, the primary cause is cardiovascular disease [2]. IL-6 is a multifunctional lymphokine, which plays an important role in information transmission, activation and immune regulation, and intensification and inhibition of inflammatory response [3]. It is often at a high level in mental disorders. However, the relationship between IL-6 and sustained attention in patients with AUD has not been clearly studied. Therefore, this article conducts a detailed analysis of the relationship

between IL-6 and sustained attention in patients with AUD, and provides a theoretical basis for improving patients' sustained attention and reducing cognitive impairment in AUD.

2. Introduction

2.1 Research Object

The 47 patients with alcohol use disorder in Mental Hospital of Yunan Province from May 2020 to October 2020 were selected as the study group. The study group had 22 males and 25 females; age 22-49 years old, average (36.3±4.5) years old; disease course 3 months to 6 years, average (3.2±0.7) years; weight 47-63kg, (54.6±4.2) kg. (1) Inclusion criteria: ①After review and approval by the ethics committee of this hospital, all patients signed an informed consent, non-lactating or pregnant women; ②No antipsychotics, sedatives, hypnotics, or anti-inflammatory drugs were used in the past month; ③ No history of cerebrovascular accident, head trauma, and no family history of mental illness. (2) Exclusion criteria: ①Patients with schizophrenia, delusion, mania, epilepsy and other mental illnesses; ②Respiratory failure, disturbance of consciousness, severe liver and kidney dysfunction or suffering from heart failure, coronary heart disease, diabetes, high blood pressure, myocarditis, dementia and other cardiovascular and cerebrovascular diseases; ③Central nervous system or peripheral nervous system damage, infectious diseases, uncontrolled chronic inflammation, and recent surgical treatment; ④ Active bleeding, malignant tumor disease, gastrointestinal dysfunction and physical motor dysfunction, endocrine and metabolism disorders, etc. In addition, 47 healthy people who had physical examinations during the same period were selected as the control group, 21 males and 26 females; age 23-51 years, average (36.8±4.9) years old; weight 46-61kg, (54.2±3.7) kg.

2.2 Investigation Method

(1) IL-6: Take 5ml of fasting venous blood from the patient, centrifuge at 3000r/min for 10min, and take the supernatant to check IL-6 with double antibody sandwich enzyme-linked immunosorbent assay and Beckman Coulter LH750 automatic blood analyzer. (2) Integrated visual and auditory continuous performance test (IVA-CPT): ①Visual attention: a total of 10 numbers from 0 to 9 are randomly displayed on the computer screen, and each time when the value is numerical, trigger on the target on the computer software; 10 numbers appear on the screen at the same time and the position of the number is not fixed each time, trigger when there is a specific value;② Auditory attention: The tester randomly reads the numbers from 0 to 9 and triggers on the target on the computer software at 3 o'clock. ③Visual and auditory combination attention: 0-9 numbers are randomly displayed on the computer, and the tester reads randomly, and triggers when the displayed number matches the reading. The test results of the above three types of attention are recorded in detail and summarized to obtain the correct number, error number, missed number and reaction time of IVA-CPT. The total test time is 12 minutes.

2.3 Statistical Analysis

Use EpiData3.1 software to calibrate all data and use SPSS22.0 to process; input measurement data in the form of “±s”, and use group t-test for the results; use Pearson linear correlation method to analyze the relationship between IL-6 and IVA-CPT in patients with depression; Inspection level: $P<0.05$ indicates that the comparison result is statistically significant.

3. Results

3.1 Comparison of Two Groups of Il-6

The IL-6 (32.45±4.67) μg/L of the study group was significantly higher than the IL-6 (9.06±1.35) μg/L of the control group, and the difference was statistically significant (t=32.986, P<0.05).

3.2 Comparison of the Two Groups of Iva-Cpt

The correct number of IVA-CPT in the study group was significantly lower than that in the control group, and the number of errors, omissions, and reaction time in IVA-CPT were significantly higher than those in the control group. The differences were statistically significant (P<0.05), see Table 1.

Table 1 Comparison of Two Groups of Iva-Cpt ($\bar{x}$ ±s)

Group	Correct number	Errors	Missing number	Reaction time(ms)
Research Group(n=47)	19.20±3.57	10.15±2.13	7.32±1.48	528.90±93.25
Control Group (n=47)	16.54±2.39	6.04±1.22	4.07±0.94	357.32±64.37
t	4.245	11.479	12.708	10.381
P	<0.001	<0.001	<0.001	<0.001

3.3 Analysis of the Relationship between Il-6 and Iva-Cpt in Patients with Aud

According to the analysis of Pearson linear correlation method, there is no correlation between IL-6 and IVA-CPT correct number, error number, and missed number (P>0.05), IL-6 and IVA-CPT reaction time are negatively correlated (P<0.05), See Table 2.

Table 2 Analysis of The Relationship between Il-6 and Iva-Cpt in Patients with Aud

Variable	*r*	*P*
Correct Number	-0.029	0.786
Errors	0.057	0.321
Missing number	0.032	0.459
Response Time	-0.341	0.015

4. Discussion

IL-6 is produced by a variety of cells such as monocytes, macrophages, endothelial cells, and fibroblasts. It is first combined with low-affinity α chains to form a complex, and then combined with high-affinity β chains [4]. Thereby, various information such as pain and injury are transmitted to the cells, causing changes in neuroendocrine and related functions. For example, in the progress of AUD, IL-6-mediated T and B cell activities can promote nerve cell damage, release a large amount of free radicals, and interact with other cytokines to aggravate the functions of the amygdala, hypothalamus, and limbic system [5]. Negative regulation of the brain area makes the patient's cognitive function decline and distracted. Compared with other types of interleukins, IL-6 can better reflect the inflammatory state of the body [6]. Under the influence of other factors, the increase of IL-6 will not only limit the clinical control of AUD, but also strengthen anxiety, loss of interest, and headache [7]. Other symptoms can also promote cachexia induced by tumor necrosis

factor α (TNF-α) and interleukin-1(IL-1) and increase the damage of vascular endothelium. The results of this study showed that the IL-6 of the study group was significantly higher than that of the control group [8]. It can be seen that the inflammatory state of AUD patients is relatively active. This is because AUD can promote physiological and psychological stress responses, increase sympathetic nerve excitability, and promote IL-6 secretion and synthesis.

The attention system is mainly divided into three types in neuroanatomy, namely, the network activation system, the post-attention system, and the pre-attention system [9]. The functional brain areas of these three are highly overlapped with the emotional center, which is the normal use of cognitive skills in daily life necessary conditions. The correct number of IVA-CPT in the study group was significantly lower than that in the control group. This analysis was related to the following factors (1) Long-term alcohol stimulation and neuronal inflammatory damage can cause striated nucleus, putamen, hippocampus and prefrontal lobe [10].The ability to control and guide the area decreases, causing inattention and shortening the duration of continuous attention; (2) Long-term drinking can cause the brain to continuously release “fatigue signals”, causing patients to appear negligent and sluggish, which will appear during the IVA-CPT test. A state of absent-mindedness and unresponsiveness; (3) The interaction of IL-6 with various cytokines will further weaken the arousal and sustained attention of the brain, and reduce the visual attention of the posterior attention system and the selective attention of the pre-attention system , Distracted attention disorder, which affects the integration of auditory and visual concentration, and visual and auditory attention, leading to increased attention errors. Therefore, the number of IVA-CPT errors, omissions, and reaction time in the study group were significantly higher than those in the control group. However, the results of IVA-CPT are closely related to the number of repetitions, stimulus intensity, test time, and the manifestation of test things. For example, when using more colorful, huge pictures or numbers to conduct attention tests, the attention of AUD patients and healthy people There is no obvious difference in force. Secondly, IVA-CPT mainly tests the visual and auditory attention, impulsivity, and response abilities of the research subjects. There are also certain differences between younger and older patients.

In summary, the IL-6 of AUD patients has a certain relationship with sustained attention. Clinically, the level of IL-6 can be reduced to improve the sustained attention of AUD patients. However, there are many factors that affect the results of IVA-CPT. In future clinical trials, it is necessary to expand the number of samples, compare the IL-6 and sustained attention levels of patients with different types of AUD, to better improve clinical research and control the occurrence and development of AUD.

References

[1] Rehm, J., Anderson, P., Barry, J., Dimitrov, P., Elekes, Z., Feijão, F., Frick, U., Gual, A., Gmel, G., Jr, Kraus, L., Marmet, S., Raninen, J., Rehm, M. X., Scafato, E., Shield, K. D., Trapencieris, M., & Gmel, G. (2015). Prevalence of and potential influencing factors for alcohol dependence in Europe. European addiction research, 21(1), 6–18.

[2] World Health Organization. Global Status Report on Alcohol and Health. Geneva, Switzerland: World Health Organization; 2014.

[3] Achur, R. N., Freeman, W. M., & Vrana, K. E. (2010). Circulating cytokines as biomarkers of alcohol abuse and alcoholism. Journal of neuroimmune pharmacology : the official journal of the Society on NeuroImmune Pharmacology, 5(1), 83–91.

[4] Inoue, K. I., Sagawa, T., & Takano, H. (2020). Role of IL-6 in Severe Inflammation. American journal of respiratory and critical care medicine, 10.1164/rccm.202007-3001LE. Advance online publication.

[5] Roberts, A. J., Khom, S., Bajo, M., Vlkolinsky, R., Polis, I., Cates-Gatto, C., Roberto, M., & Gruol, D. L. (2019). Increased IL-6 expression in astrocytes is associated with emotionality, alterations in central amygdala GABAergic transmission, and excitability during alcohol withdrawal. Brain, behavior, and immunity, 82, 188–202.

[6] Crews, F. T., D. K. Sarkar, L. Qin, J. Zou, N. Boyadjieva and R. P. Vetreno (2015). Neuroimmune Function and the Consequences of Alcohol Exposure. Alcohol Res 37(2) : 331-341, 344-351.

[7] Hämäläinen, M., Moilanen, E., Koivukangas, A., Leinonen, E., & Kampman, O. (2019). Status of inflammation and alcohol use in a 6-month follow-up study of patients with major depressive disorder. Alcohol (Fayetteville, N.Y.), 81, 21–26.

[8] Liu, W., Vetreno, R. P., & Crews, F. T. (2020). Hippocampal TNF-death receptors, caspase cell death cascades, and IL-8 in alcohol use disorder. Molecular psychiatry, 10.1038/s41380-020-0698-4. Advance online publication.

[9] Petersen, S. E., & Posner, M. I. (2012). The attention system of the human brain: 20 years after. Annual review of neuroscience, 35, 73–89.

[10] Yang, X., Tian, F., Zhang, H., Zeng, J., Chen, T., Wang, S., Jia, Z., & Gong, Q. (2016). Cortical and subcortical gray matter shrinkage in alcohol-use disorders: a voxel-based meta-analysis. Neuroscience and biobehavioral reviews, 66, 92–103.