

# Effect of Aobo Cerebral Rehabilitation Medical Apparatus treatment on cerebral circulation and cerebral function<sup>1)</sup>

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## Abstract:

**[Objective]** To observe the clinical effect of Aobo Cerebral Rehabilitation Medical Apparatus instrument on cerebral hemodynamics and cerebral function.

**[Methods]** 180 patients with cerebrovascular disease were divided into cerebral infarction group (CAI), cerebral arteriosclerosis group (CAS), vertebral basilar artery insufficiency group (VBI), each group of 60 cases, according to the order of treatment, the patients were divided into two groups: drug treatment group and treatment group, each group of 30 cases. The drug therapy group according to the disease treatment of conventional dosage, the treatment group were treated with Aobo Cerebral Rehabilitation Medical Apparatus, continuous treatment for 30 days. Using transcranial Doppler ultrasound to reflect changes in cerebral hemodynamics (TCD) EEG and reflect the brain functional changes (BEAM) as the observation index.

**[Results]** The average blood flow velocity in cerebral infarction group, cerebral arteriosclerosis group, vertebral basilar artery insufficiency group using the instrument after treatment than before treatment, TCD increased by 23.9% ( $P<0.01$ ), 18.3% ( $P<0.05$ ), 28.3% ( $P<0.01$ ), estimation of cerebral blood flow were increased by 50.6% ( $P<0.01$ ), 25.3% ( $P<0.05$ ), 43.2% ( $P<0.01$ ), decreased by 7.9% respectively slow wave power spectrum of BEAM ( $P<0.05$ ), 4.5% ( $P<0.05$ ), 7.8% ( $P<0.01$ ), its therapeutic effect is far better than the drug treatment group superior.

**[Conclusions]** Aobo Cerebral Rehabilitation Medical Apparatus treatment for the cerebral blood flow in patients with ischemic cerebrovascular disease were significantly increased, and significantly improve brain function, activation of brain cells in the inhibitory state, to accelerate the rehabilitation of patients with brain function.

**Keywords:** Aobo Cerebral Rehabilitation Medical Apparatus; Brain function; Cerebral vascular disease; Cerebral infarction; Activated brain cells

Aobo Cerebral Rehabilitation Medical Apparatus is a instrument that was developed according to the principle and application of biomedical engineering technology, it is a comprehensive cerebral function rehabilitation instrument which integrates low frequency pulse, electric acupoint stimulation, drug penetration, drug iontophoresis and EEG biofeedback. The results of clinical observation on the effects of cerebral hemodynamics and brain function are summarized as follows:

## 1 Clinical data

In this study, 180 patients with cerebrovascular diseases were divided into cerebral infarction group (CAI), cerebral arteriosclerosis group (CAS), vertebral basilar artery insufficiency group (VBI), 60 cases in each group, according to the order of arrival, they were divided into drug treatment group and

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instrument treatment group, each with 30 cases. Among them, the CAI group male 40 cases, female 20 cases, aged 49 to 68 years old, the average age of 59.7 years; the CAS group male 29 cases, female 31 cases, aged 47 to 66 years old, the average age of 53.2 years; the VBI group male 40 cases, female 20 cases, aged 46 to 68 years old, the average age of 55.9 years.

## **2 Research method**

In this study, transcranial Doppler (TCD) which reflect cerebral hemodynamic changes and brain electrical activity mapping (BEAM) which reflect brain function changes were selected as observation indexes.

### **2.1 Instrument**

The instruments used in this project are the TC<sub>2</sub>-64B type instruments produced by Germany EME company and the DYD-500 type BEAM instruments produced by Beijing Beike Company.

### **2.2 Method**

The patients in the drug treatment group received routine medication according to the routine treatment of each disease, and were treated continuously for 30 days; The patients in the instrument treatment group were treated with Aobo Cerebral Rehabilitation Medical Apparatus for daily for 1 times, each time for 20 minutes, 30 times for 1 course of treatment. All cases underwent 1 TCD and BEAM examinations before and after treatment.

## **3 Result**

### **3.1 Cerebral infarction group**

#### **(1) Drug treatment group**

Compared with the before treatment, after treatment, the mean blood flow rate of patients increased by 9.3% ( $P>0.05$ ), cerebral blood flow was estimated to increase by 15.8% ( $P>0.05$ ), the slow wave power spectra of BEAM decreased by 2.6% ( $P>0.05$ ).

#### **(2) Instrument treatment group**

Compared with the before treatment, after treatment, the mean blood flow rate of patients increased by 23.9% ( $P<0.01$ ), cerebral blood flow was estimated to increase by 50.6% ( $P<0.01$ ), the slow wave power spectra of BEAM decreased by 7.9% ( $P<0.05$ ).

### **3.2 Cerebral arteriosclerosis group**

#### **(1) Drug treatment group**

Compared with the before treatment, after treatment, the mean blood flow rate of patients increased by 4.0% ( $P>0.05$ ), cerebral blood flow was estimated to increase by 13.4% ( $P>0.05$ ), the slow wave power spectra of BEAM decreased by 0.8% ( $P>0.05$ ).

#### **(2) Instrument treatment group**

Compared with the before treatment, after treatment, the mean blood flow rate of patients increased by 18.3% ( $P<0.05$ ), cerebral blood flow was estimated to increase by 23.5% ( $P<0.05$ ), the slow wave power spectra of BEAM decreased by 4.5% ( $P<0.05$ ).

### **3.3 Vertebral basilar artery insufficiency group**

#### **(1) Drug treatment group**

Compared with the before treatment, after treatment, the mean blood flow rate of patients increased by 5.3% ( $P>0.05$ ), cerebral blood flow was estimated to increase by 7.0% ( $P>0.05$ ), the slow wave power spectra of BEAM decreased by 1.7% ( $P>0.05$ ).

#### **(2) Instrument treatment group**

Compared with the before treatment, after treatment, the mean blood flow rate of patients increased by 28.3% ( $P<0.01$ ), cerebral blood flow was estimated to increase by 43.2% ( $P<0.01$ ), the slow wave power spectra of BEAM decreased by 7.8% ( $P<0.01$ ).

Brain function is thought to be highly positively correlated with cerebral blood flow, and the relationship between brain function and cerebral blood flow can be reflected by changes in brain electrical activity. The study results show that: Aobo Celebral Rehabilitation Medical Apparatus can significantly increase the cerebral blood flow in patients with ischemic cerebrovascular disease, and significantly improve brain function, the curative effect is superior to the drug treatment group, and it is beneficial to accelerate the rehabilitation of brain function.

## **4 Discuss**

Basic treatment of Aobo Celebral Rehabilitation Medical Apparatus

### **4.1 Increase cerebral blood flow**

Remove the edema and swelling of brain tissue around the lesion; Stimulate vagus nerve, relieve cerebral vasospasm; Reduce cerebral vascular resistance, accelerate blood flow; Promote the formation of collateral circulation, increase the supply of oxygen and glucose.

### **4.2 Increase brain metabolic rate**

Alter the secretion of nerve mediators in vivo and the activity of the enzyme system, promote metabolism, accelerating the synthesis of ATP, enhanced brain sodium pump power, eliminate the anaerobic glycolysis state of brain tissue, restore aerobic metabolism.

### **4.3 Improve brain microcirculation**

Speed up the exchange of material and energy between the inner and outer of the cerebral vessels, increase the amount of exchange: enhanced anticoagulation, keep the blood vessels unobstructed.

### **4.4 Strengthen brain electrical activity**

Increase the physiological wave in brain electrical act, reduce the pathological wave, and promote the recovery of brain function.

### **4.5 Rehabilitation brain function**

Promote the compensation of brain function and the re formation of low-grade functions; Activate the inhibitory brain cells; Mobilize the potential energy of the brain, enhance comprehensive analysis ability and improve memory, language, mental and psychological barriers; Regulate the balance of excitation and inhibition of the cerebral cortex; Improve the function of autonomic nervous system.

## **Author contribution:**

**Mingde Jiao:** Brain Rehabilitation Instrument clinical trial program principal designer, Clinical report "The effect of Brain Rehabilitation Instrument (BRI) in the treatment of cerebral circulation and the function" writer.

**Zuodong Sun:** Brain Rehabilitation Instrument clinical trial program design participants, Inventor of Brain Rehabilitation Instrument .

1) This is a paper published by Professor Mingde Jiao was in "medical care appliances" in March 1998, he was responsible for the clinical trial of Brain Rehabilitation Instrument in Second Affiliated Hospital of Harbin Medical University, Zuodong Sun (inventor of Brain Rehabilitation Instrument) was listed as co-author, the data root in the clinical report: "The effect of Brain Rehabilitation Instrument

(BRI) in the treatment of cerebral circulation and the function "issued by The Second Affiliated Hospital of Harbin Medical University in November 10, 1995 (the original copy can be found in Aobo medical website), in addition, the main participants and contributors to the clinical trial of Brain Rehabilitation Instrument in Second Affiliated Hospital of Harbin Medical University were three experts, including Danfeng Xu, Lanying Li, and Bo Yu, I apologize and thank you for being here. Brain Rehabilitation Instrument commissioned a total of two clinical company for clinical trials, the other is First Hospital of Harbin, in the clinical report" The effect of Brain Rehabilitation Instrument (BRI) in the treatment of cerebral circulation and the function " (the original copy can be found in Aobo medical website) issued by the hospital, a total of 120 patients were divided into two groups: vascular dementia group and vertebrobasilar insufficiency group, Professor Congmin Yu is the author, in addition, the main participants and contributors to the clinical trial of Brain Rehabilitation Instrument in First Hospital of Harbin Medical University were five experts, including Ying Zhao, Caiwa Zhang, Guilan Wang, Xiuhua Zhang, Shufang Mou.

Brain Rehabilitation Instrument is the author Sun Zuodong's first invention, he declared two utility models in May 4, 1995 and November 26, 1996 respectively: Brain tonic (ZL95210432.6) and (Brain tonic instrument) ZL96246672.7, he is also the first to use transcranial electrical stimulation (low-frequency pulse electricity) in stroke sequelae, vascular dementia and other difficult encephalopathy rehabilitation treatment project, the application of the technique has passed clinical trials in November 10, 1995 and November 15th in the Second Affiliated Hospital of Harbin Medical University and the First Hospital of Harbin, in December 4, 1995, it passed the expert appraisal organized by Heilongjiang medical administration bureau, identification certificate number of scientific and technological achievements: (95)HeiKeYaoJianZi016, At the same time, Brain Rehabilitation Instrument has been approved for registration, its product registration number: HeiYiXieZhunZi(95)No.227014.

In addition to transcranial electrical stimulation, Brain Rehabilitation Instrument has drug penetration and drug iontophoresis, later, a large number of clinical trials found that the real treatment was "electrical stimulation.", therefore, in the product upgrading, only the transcranial electrical stimulation was reserved. The name of the Brain Rehabilitation Instrument has undergone many changes, respectively named Aobo Brain Rehabilitation Instrument, Aobo Cerebral Rehabilitation Medical Apparatus, until now the tDCS Brain Function Rehabilitation Instrument.