

Computer electroacupuncture in the treatment of bronchial asthma and syndrome irritable bowel: dependence of effects on parameters electrostimulation

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SUMMARY

Computerized electroacupuncture (CEAP) is successfully used in the treatment of a number of diseases of internal organs, including bronchial asthma (BA) and irritable bowel syndrome (IBS). As a rule, the selection of parameters for electroacupuncture stimulation of biologically active points (BAP) is empirical. The results of studies in this area do not provide convincing evidence of the benefits of certain characteristics of BAP stimulation. The study is based on the assumption that there is a dependence of the efficiency of CEAP on the parameters of BAP stimulation. Purpose of the work: to analyze the dependences of the bronchodilator effect of CEAP in the treatment of BA and the analgesic effect in the painful form of IBS on the frequency of the pulse current of positive polarity. The study included 40 BA patients and 42 IBS patients. The device "KES-01-MIDA" was used for treatment. Established

Key words: computer electroacupuncture, bronchial asthma, irritable bowel syndrome, biologically active points.

Introduction

Both bronchial asthma (BA) and irritable bowel syndrome (IBS) are quite common diseases. They significantly reduce the quality of life of patients and are associated with significant economic losses for society. Despite progress in understanding the pathogenesis of these diseases, the treatment of such patients is associated with a number of serious problems. The most significant of them are the frequent development of iatrogenic complications and the high cost of pharmacological therapy. One of the directions in solving these problems is the use of methods of treatment of traditional medicine. The results of numerous studies indicate the effectiveness of acupuncture and its modifications in the complex treatment of patients with BA and IBS [5, 10].

One of the types of acupuncture - electroacupuncture (EAP) involves stimulating BAP with a weak electric current. The most significant advantages of EAP over classical acupuncture include the ability to choose the parameters of BAP stimulation. Adjustable characteristics of electrical stimulation include stimulation time, polarity, frequency, duration and amplitude of stimulating pulses. The advent of computerized electroacupuncture (CEAP) made it possible to regulate

stimulation parameters separately for each BAP scheme without significant time expenditures and with a minimum probability of technical errors [5].

The results of studies devoted to the study of the effectiveness of CEAP in AD and IBS do not provide any justification for the choice of certain stimulation parameters [1, 6, 9].

It is known that in classical acupuncture, the choice of the method of stimulating BAP belongs to one of the leading roles in achieving a therapeutic effect [3]. It is logical to assume that the efficiency of CEAP also depends on the parameters of stimulation. Thus, the search for criteria for choosing the parameters of BAP electrostimulation is of considerable scientific and practical interest.

Back in the 1970s, F.G. Portnov found that the electrical characteristics of the BAP (action potential, electrical resistance and capacitance) change in different ways as a result of the use of currents of different frequencies [7]. However, studies confirming the clinical significance of this phenomenon have not been conducted, at least for the contingents of patients with BA and IBS. The aim of the study was to analyze the dependences of the bronchodilator effect of CEAP in the treatment of BA and the analgesic effect of CEAP in painful IBS on the frequency of the applied pulse current.

Methods

The results of treatment with the CEAP method were analyzed in 82 patients, 40 of whom suffered from moderate atopic asthma, and 42 from painful IBS. The diagnoses of bronchial asthma and irritable bowel syndrome were verified according to the National Consensus on Bronchial Asthma and Rome III Criteria, respectively [8, 11].

Treatment by the CEAP method was carried out in the absence of contraindications to reflexotherapy, set out in the Order of the Ministry of Health and Social Development of the Russian Federation No. 266 dated April 13, 2007 "On the approval of the recommended lists of medical indications and contraindications for the use of reflexology in clinical practice", as well as in the absence of electric current intolerance, the presence of an implanted pacemaker and tactile hypersensitivity.

Among the patients included in the study, there were 20 men (24.4%) and 62 women (75.6%). The average age of the patients was 45.1 ± 1.3 years (from 18 to 68 years). The age and sex characteristics of the patient population are presented in table. 1.

Table 1

Age and sex characteristics of patients

Возраст	Больные БА		Больные СРК		Всего
	Муж- чины	Жен- щины	Муж- чины	Жен- щины	
18-29 лет	1	1	1	2	5
30-39 лет	1	4	2	3	10
40-49 лет	3	15	4	13	35
50-59 лет	2	9	4	8	23
60-70 лет	1	3	1	4	9
Всего	8	32	12	30	82

At the start of the study, 28 (70%) patients with BA had an exacerbation and 12 (30%) were in remission of the disease.

All patients who took part in the study received pharmacotherapy in accordance with the treatment standards for BA and IBS [7, 10].

CEAP was included in the treatment regimen (Table 2) for all patients. We used the "Hardware-software complex for electropuncture stimulation KES-01-MIDA" (IES) produced by CJSC MIDAUS, Ulyanovsk. The CEAP course consisted of five sessions, carried out daily in the morning. We used biarcular BAP schemes recommended by L.S. Pesikov and S. Ya. Rybalko [4]. Patients with BA and IBS were divided into groups depending on the pulse current frequency used during treatment: 31, 53, 75, and 125 Hz (Table 3). The groups were found to be comparable in terms of gender, age, and stages of asthma (exacerbation, remission). The values of the compared frequencies were selected empirically.

table 2

The applied treatment regimens for BA and IBS by the CEAP method *

№	Аурикулярные БАТ		Частота стимуляции, Гц**	Длитель- ность стимуля- ции, сек.
	Схема лечения БА	Схема лечения СРК		
1	55*** (лев.)	51 (лев.)	31, 53, 75, 125	10
2	55 (прав.)	51 (прав.)	31, 53, 75, 125	10
3	31 (лев.)	43 (лев.)	31, 53, 75, 125	10
4	31 (прав.)	43 (прав.)	31, 53, 75, 125	10
5	13 (лев.)	55 (лев.)	31, 53, 75, 125	15
6	13 (прав.)	55 (прав.)	31, 53, 75, 125	15
7	100 (лев.)	89 (лев.)	31, 53, 75, 125	15
8	100 (прав.)	89 (прав.)	31, 53, 75, 125	15
9	22 (лев.)	83 (лев.)	31, 53, 75, 125	10
10	22 (прав.)	83 (пр.)	31, 53, 75, 125	10
11	33 (лев.)	87 (лев.)	31, 53, 75, 125	10
12	33 (прав.)	87 (прав.)	31, 53, 75, 125	10
13	29 (лев.)	97 (лев.)	31, 53, 75, 125	10
14	29 (прав.)	97 (прав.)	31, 53, 75, 125	10
15	-	34 (лев.)	31, 53, 75, 125	15
16	-	34 (пр.)	31, 53, 75, 125	15

* - in all cases, a pulsed positive bias current with pulse duration 4 ms;

** - one of the indicated frequencies was used for each of the groups of patients.

Explanation in the text.

*** - the number of auricular BAP is indicated in accordance with the classification of D.M. Tabeeva (1980).

We used individual silver-plated acupuncture needles 25 mm long, with a cross-sectional diameter of 0.25 mm (manufactured by Suzhou Medikal Appliance Factory, China). The search for BAP was carried out using a special IES mode. The needles were inserted in accordance with the rules of classical acupuncture.

Table 3

Distribution of patients included in the study by groups

Частота импульсного тока (Гц)	Больные БА	Больные СРК	Всего
31	9	10	19
53	10	10	20
75	11	11	22
125	10	11	21

Then the acupuncture needles were connected to the stimulation electrodes (Fig. 1). A control electrode covered with moisturizing cream was placed in the patient's left hand. At the beginning of treatment, patients independently chose the initial stimulation amplitude of each BAP (adaptation mode), and then changed it on-line during treatment using the control panel, focusing on the formula "stimulation should be the strongest, but not painful". BAPs were stimulated alternately during the session. The number of repetitions of the scheme per session (from the 1st to the 5th session): 3-5-7-5-3.



Rice. 1. Auricle with installed acupuncture needles, connected to the electrodes.

Before the start of the first session and after the end of the last (fifth) session in BA patients, using the Valenta + Complex (manufactured by NPP NEO, St. Petersburg), the forced expiratory volume in the first second (FEV1) was determined, which is a generally accepted indicator bronchial obstruction. In patients with IBS, the severity of pain was assessed using a visual analogue scale (VAS) [2]. We analyzed the dynamics of the values of indicators and their changes (increments, in% of the initial level) in patients of the above-described groups.

Data analysis was performed using the Statistica 6.0 system (t-test for related and unrelated cases). Data in the tables are presented as arithmetic mean \pm standard error. Differences were considered significant at $p < 0.05$.

results

Influence of the pulse current frequency on the bronchodilator effect of CEAP in the treatment of BA patients

A statistically significant increase in FEV1 was recorded when using frequencies of 75 and 125 Hz (Table 4); frequencies of 31 and 53 Hz led only to an insignificant ($P > 0.05$) growth of the indicator.

The highest increases in FEV1 in BA patients over five CEAP sessions also took place in the groups of patients with applied pulse frequencies of 75 and 125 Hz: 18.8 ± 5.4 and $13.9 \pm 2.4\%$, respectively. Moreover, the FEV1 gains in these groups were significantly higher than those in the other observation groups (Table 5). The FEV1 gains in the groups with the applied frequencies of 31 and 53 Hz were statistically insignificant: 1.3 ± 1.2 and $4.9 \pm 3.2\%$.

Thus, when using CEAP in the treatment of BA patients, for a more pronounced bronchodilator effect, it is preferable to use pulsed current frequencies of 75 and 125 Hz, with other identical parameters of BAP stimulation.

Table 4
Dynamics of FEV1 in BA patients at different frequencies of BAP stimulation (% of individual norm)

Частота импульсного тока (Гц)	Исходный фон	После пятого сеанса КЭАП	Достоверность различий*
31	$59,4 \pm 13,4$	$59,9 \pm 12,3$	$P = 0,5$
53	$60,7 \pm 13,7$	$63,4 \pm 13,7$	$P = 0,13$
75	$57,5 \pm 11,5$	$68,1 \pm 15,9$	$P = 0,003$
125	$56,3 \pm 12,0$	$63,4 \pm 10,4$	$P < 0,001$

* – достоверное ($p < 0,05$) различие по t-тесту для связанных случаев.

Жирным шрифтом выделены значения $p < 0,05$.

Table 5
Increases in FEV1 in BA patients after five sessions

CEAP, at different stimulation frequencies (% of the initial value)

Частота импульсного тока (Гц)	Прирост ОФВ1	Достоверность различий*
31	1,3 ± 1,2	$P_{31,53} = 0,33$ $P_{31,75} = 0,009$ $P_{31,125} < 0,001$
53	4,9 ± 3,2	$P_{53,75} = 0,04$ $P_{53,125} = 0,03$
75	18,8 ± 5,4	$P_{125,75} = 0,43$
125	13,9 ± 2,4	

* – достоверное ($p < 0,05$) различие по t-тесту для несвязанных случаев.

Жирным шрифтом выделены значения $p < 0,05$.

Influence of the pulse current frequency on the analgesic effect of CEAP in the treatment of patients with painful form of IBS

When CEAP was included in the complex therapy of IBS, we registered a similar effect to the above-described dependence of the clinical result on the pulse frequency. The severity of pain syndrome significantly decreased only in patients treated with frequencies of 75 and 125 Hz (Table 6). Accordingly, the most significant changes in the increments of the indicator, assessed by the VAS, were achieved upon stimulation of BAP with impulse current frequencies of 75 and 125 Hz: -16.1 ± 4.8 and $-22.2 \pm 6.1\%$, respectively (Table 7). Changes in the severity of pain in the groups where frequencies of 31 and 53 Hz were used during treatment were insignificant (-1.57 ± 0.8 and $-2.4 \pm 1.3\%$, respectively).

Table 6

Dynamics of pain syndrome (according to VAS) in IBS patients at different frequencies stimulation BAP (cm)

Частота импульсно-го тока (Гц)	Исходный уровень боли	Уровень боли после пятого сеанса КЭАП	Достоверность различий*
31	7,8 ± 0,4	7,7 ± 0,4	$P = 0,09$
53	6,9 ± 0,6	6,7 ± 0,6	$P = 0,09$
75	7,4 ± 0,5	6,2 ± 0,4	$P = 0,007$
125	7,8 ± 0,5	6,1 ± 0,6	$P = 0,008$

* – достоверное ($p < 0,05$) различие по t-тесту для связанных случаев.

Жирным шрифтом выделены значения $p < 0,05$.

The analysis of the obtained material showed that by the end of the fifth CEAP session, the patients of all groups showed an improvement in their clinical condition. The most pronounced positive dynamics of objective clinical indicators (in particular FEV1 in BA patients and pain intensity according to VAS in IBS patients) was observed when using stimulating impulse frequencies of 75 and 125 Hz.

Table 7

Increases in the severity of pain syndrome in IBS patients (according to VAS) after five CEAP sessions, at different stimulation frequencies (% of initial value)

Частота импульсно-го тока (Гц)	Изменение (приросты) выраженности боли	Достоверность различий*
31	-1,57 ± 0,8	$P_{21;53} = 0,6$ $P_{21;75} = 0,009$ $P_{31;125} < 0,004$
53	-2,4 ± 1,3	$P_{53;75} = 0,01$ $P_{53;125} = 0,007$
75	-16,1 ± 4,8	$P_{125;75} = 0,44$
125	-22,2 ± 6,1	

* – достоверное ($p < 0,05$) различие по t-тесту для несвязанных случаев.

Жирным шрифтом выделены значения $p < 0,05$.

conclusions

The effectiveness of CEAP in the complex treatment of BA and IBS depends on the applied frequency of stimulating impulses. The most pronounced bronchodilator effect of CEAP in the treatment of BA patients and the analgesic effect in the treatment of painful forms of IBS is observed when using pulse current frequencies of 75 and 125 Hz, with the same values of other stimulation parameters. Thus, the use of these characteristics of stimulating impulses allows achieving a more significant clinical effect of CEAP in patients with BA and painful IBS.

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