

## Case Report

### Effect of Percutaneous Electrical Stimulation for Occipital Nerve in Treatment Cervical Headache

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#### Abstract

**Aim:** To explore the analgesic effect of percutaneous occipital nerve electrical stimulation in the treatment of cervical headache.

**Methods:** 120 patients were randomly divided into 2 groups by digital table method, 60 cases in each group. The group 1 was treated with a percutaneous head neuroelectric stimulator once a day for 20 minutes for 15 days. Resting one week after a course of treatment, another course is to go on. The control group, routine oral anti-inflammatory analgesia and muscle relaxant drugs combined treatment for 15 days as a course of treatment, a total of two courses of treatment. After 15 days and 30 days of treatment, the pain intensity was evaluated with VAS, and the excellent and good rate of analgesia was evaluated in the two groups, and the control was carried out between the two groups.

**Results:** After 15 days and 30 days of treatment, the VAS score decreased compared with that before treatment in the 2 groups. Compared VAS of the 2 groups, the electrical stimulation group decreased significantly in comparison with the control group. After 15 days and 30 days of treatment, the excellent and good rate of analgesia was compared between the two groups, and the electric stimulation group was significantly higher than the control group, so which the number of headache attacks decreased by 1/2 and 2/3 respectively than before treatment.

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**Conclusion:** The use of percutaneous occipital nerve electrical stimulation in the treatment of cervical headache has obvious analgesic effect, which can gradually rid the patients of oral analgesic drugs or reduce the dependence on analgesic drugs. This method has the advantages of simple operation, rapid pain relief, less side effects, and can be repeated treatment, which is worthy of clinical application.

**Keywords:** Analgesic effect; Cervical headache; Control study with oral drug; Percutaneous occipital nerve electrical stimulation

#### Introduction

Cervical Headache (CEH) refers to the syndrome in which one or both side headaches are the main clinical manifestations caused by organic or functional changes in the cervical spine and soft tissues of the neck [1]. Pain often occur in the neck, shoulder and occipital region and radiate upward into the forehead, head, orbit and face. The nature of the pain is an involved pain. Along with the change of people's work and life style in contemporary society, and some people often have bad habits of improper posture, the incidence of CEH increases year by year and becomes younger and younger. The CEH pathogenesis is unclear, currently mainly focused on inflammatory theory, neural convergence theory and mechanical stimulation hypothesis. Previous use of drugs, nerve block and minimally invasive intervention to treat cervical headache has been reported [2-8]. In this paper, the treatment of cervical headache by percutaneous occipital nerve electrical stimulation was compared with conventional oral drug therapy.

#### Information and methods

##### General information

Among the 120 patients in this group, 50 were male, aged 36~69, with an average of 49.2 years. 70 women aged 37~72 years, with an average of 53.6 years. Right side headache 78 cases, left side headache 42 cases. All patients were diagnosed with cervical headache according to clinical manifestations and history, according to the international classification and diagnostic criteria of headache. Other brain diseases were excluded by CT or MR. All patients were regular treated by oral routine analgesic drug and the effect was not good.

##### Methods

The 120 patients were randomly divided into 2 groups with 60 patients in each group by digital table method. The group of test was electro-stimulated using a CEFALY head nerve stimulator produced in Belgium once a day for 20 minutes and 15 days as a course of treatment. Resting one week after a course of treatment, another course is to go on. The patients do not use any analgesic drugs during electrical stimulation therapy. Specific operation steps: put the electrode sheet in the area below the large occipital nodule after cleaning, completely fit the skin, and use cefaly head neuroelectric stimulator for treatment.

The control group was routine oral anti-inflammatory analgesic and muscle relaxant drugs combined treatment for 15 days as a course of treatment, a total of two courses of treatment. Evaluation criteria of efficacy: the VAS score was used to evaluate the pain intensity before and after treatment. The effective rate of analgesia was evaluated: The VAS after treatment lower value  $\geq 5$  was excellent, which  $\geq 3$  was good and  $< 3$  was poor than before treatment.

### Statistical management

All data are processed using SPSS 20.0 statistical software. Counting data is described by frequency or rate, and  $\chi^2$  test is used for comparison between groups; the measurement data were described by Mean  $\pm$  SD, and the comparison between groups was carried out by t test, with  $P < 0.05$  as the difference was statistically significant.

### Results

The 15 d and 30 d after treatment, the VAS of the two groups decreased than that pre-treatment, but the VAS of the test groups was significantly lower than that of the control group (Table 1).

	Pre-treatment	Treatment 15 d	Treatment 30 d
Test group	8.10 $\pm$ 0.72	3.40 $\pm$ 1.10**	2.35 $\pm$ 1.14**
Control group	7.75 $\pm$ 1.07	5.70 $\pm$ 0.72*	3.85 $\pm$ 0.68*

**Table 1:** The Comparison of VAS between 2 groups 15d and 30d after treatment (Mean  $\pm$  SD).

\* - Compared with pre-treatment  $P < 0.01$ , # - Compared with the control group  $P < 0.01$ .

The number of headache attacked in 45 patients of test group was decreased by 1/2 that before treatment, so the headache intensity (VAS) was significantly decreased to 3.4, which was significantly lower than that in the control group after 15 days for continuous treatment with CEFALY instrument, and analgesic effect: excellent 36 cases, good 9 cases, effective rate reaches 75.0%. After 30 days of continuous treatment, the number of headache attacked in 52 patients of test group was decreased by 2/3 that before treatment, and the pain intensity was significantly reduced to 2.35, which was significantly lower than that in the control group. The pain effect evaluation was excellent in 39 cases, good in 13 cases, and effective rate reaches 86.7%. The 15 days and 30 days after treatment, the effective rate of analgesia was significantly higher than that of the control group (Table 2).

Days	Group	Excellence (n)	Good (n)	Effective Rate (n)
15 d	Test	60.0 <sup>#</sup> (36)	15.0 (9)	75.0 <sup>#</sup> (45)
	Control	21.7 (13)	13.3 (8)	35.0 (21)
30 d	Test	65.0 <sup>#</sup> (39)	21.7 (13)	86.7 <sup>#</sup> (52)
	Control	36.7 (22)	20.0 (12)	56.7 (34)

**Table 2:** The comparison of the excellent and good rate between the two groups.

# - Compared with the control group,  $P < 0.01$ .

### Discussion

The CEH are complicated in clinical diagnosis, pathogenesis and treatment. The prevalence of CEH is about 2.5 per cent, according

to an epidemiological survey by the International Headache Association; The 14 per cent of headache patients are CEH, their prevalence is dominated by those aged 30-50. The more studies have been done on the pathogenesis of cervical headache, but more and more studies have shown that most headaches may be associated with pathological changes in the cervical spine because the head and face structures are innervated by the trigeminal and C1-4 spinal nerves. The degenerative disc proved by experiment produced the phospholipase A2, interleukin 1 and 6, tumor necrosis factor and other inflammatory mediators. These inflammatory mediators can either directly stimulate the nerve root to produce pain, or can cause inflammation in the muscle, blood vessels and other soft tissues of the innervated region, causing spasm of the neck soft tissue, ischemia, hypoxia and the release of inflammatory mediators, which in turn stimulate nerve endings, leading to a vicious circle of pain-inflammatory mediators-pain [9-11]. In addition, the long-term malposition or improper sitting position makes the cervical spine in a state of tension for a long time, and the dynamic balance system of the cervical spine is dysregulated, which leads to abnormal physiological curvature of the cervical spine and promotes the aggravation of cervical degenerative changes. The abnormal peripheral nerve structure of C1~C3 spinal nerve is an important anatomical basis for CEH. The c1 spinal nerve (suboccipital nerve) innervates the atlantooccipital joint, involving pathological changes or injury of the joint as a possible source of pain involved in the occipital region of the head; the c2 spinal nerve innervates the atlantoaxial joint and the C2-3 articular process joint, so trauma or peripheral pathological changes in these joints can lead to headache of involvement. The third occipital nerve (posterior branch of the C3 nerve) innervates C2-3 articular process joints, from which pain can be implicated in the occipital, frontotemporal and periorbital regions of the head [12]. Thus, pain of involvement from C2-3 joint is the most common cause of CEH, accounting for up to 70% [13-14]. In recent years, there have been reported the aggregation of the descending sensory tract of the trigeminal nerve with the nerve root of the superior neck can also cause pain in the head, face and neck [15]. Judging from the CEH pathogenesis, not only the high cervical nerve C1-3 is closely related to headache, but also the lower cervical spine is involved in the conduction of headache. That headache was resulted from acute injury or chronic strain of soft tissue such as muscles, fascia, ligaments of the neck pillow, shoulder, back and the lower cervical intervertebral disc protrusion may be followed by local aseptic inflammation, which leading to hypersensitivity of the cervical spinal nerve or peripheral nerve [16]. As a result, the lower cervical disc and neck, shoulder, back muscles may also be involved in CEH formation. If CEH was not detected and treated in time, will lead to chronic headache. Not only causes insomnia, anxiety, depression, memory loss, but also can seriously affect work and social. The CEH consensus of Chinese pain experts indicated that CEH principles of treatment should be based on comprehensive treatment with emphasis on health education [15]. At present, the treatment of CEH includes oral drugs, pulsed radiofrequency, nerve block and other treatment methods. Percutaneous electrical stimulation of occipital nerve in the treatment of CEH has strong analgesic effect and few side effects. According to the patient's different illness period and the degree of adaptation to the instrument, the number of pain attacks decreased by 2/3, the pain intensity significantly lowered, the analgesic effect was obvious, and the effective rate reached 86.7% for 30d after treatment. And gradually get rid of oral analgesic drugs, so that patients reduce the dependence on analgesic drugs and achieve better headache relief effect.

In conclusion, the analgesic effect of CEH treated with percutaneous occipital nerve electrical stimulation is obvious. This method has the characteristics of simple operation, quick pain relief and repeated treatment, especially suitable for beginners to master the technique quickly. This treatment technique is a European standard method for treating migraine, clinical practice has proved that the method is a safe and effective method for treating migraine, and it is easy to operate, less side effects and patient compliance. However, there has been few reported with using the method in the treatment of CEH. The application of the method in this study has achieved satisfactory result and is generalized to importantly clinical worth.

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