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The effect of hyperbaric oxygen therapy combined with acupuncture and moxibustion in treatment of traumatic peripheral facial nerve injury and electromyography (EMG) data analysis.

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Abstract

Objective: To explore the effect of hyperbaric oxygen therapy combined with acupuncture and moxibustion in treatment of traumatic peripheral facial nerve injury and Electromyography (EMG) data analysis.

Methods: 150 patients with traumatic peripheral facial nerve injury were selected in our hospital from January 2015 to January 2016. Patients were randomly divided into drug group (n=75) and combined group (n=75) Patients in drug group were treated with conventional medicine while hyperbaric oxygen therapy combined with acupuncture and moxibustion was used in combined group. Curative effects and EMG results were compared between two groups.

Results: Compared with drug group, combined group showed an obviously higher total effective rate, M wave amplitude of facial nerve of orbicularis oculi muscle, orbicular muscle of mouth as well as frontalis muscle, and the motor unit potential voltage. The facial movement incubation period of the combined group, however, is significantly shorter than that of the drug group ($p<0.05$).

Conclusion: Hyperbaric oxygen therapy combined with acupuncture and moxibustion has satisfactory efficacy in treatment of traumatic peripheral facial nerve injury.

Keywords: Traumatic peripheral facial nerve injury, Hyperbaric oxygen therapy, Acupuncture and moxibustion, EMG.

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Introduction

Facial nerve injury, which is a common type of cranial nerve injuries, shows the symptoms like facial nerve palsy, facial spasm, seriously affecting the patient's life quality and facial aesthetics. Traditional drug or hormone therapies, such as acyclovir and corticosteroid, have been widely used in the treatment of facial nerve injury [1,2]. However, the application of those treatment are still challenged by the drug tolerance developed during the long-term use of the same chemical and the varied individual response to the same drug, which in turn lead to different treatment outcomes. Therefore, it will be with great clinical significance to develop new treatment strategies to improve the recovery of patients with facial nerve injury.

Hyperbaric oxygen therapy, which was performed by breathing pure oxygen in a pressurized tube and room, has been widely used in the treatment of patients with various critical diseases or chronic wounds. Previous studies have shown that hyperbaric oxygen therapy is able to induce facial nerve regeneration, which in turn promote the recovery of facial nerve injury [3]. Acupuncture and moxibustion, which two traditional Chinese medical treatments, have been proved to be efficient in the treatment of a variety of human diseases. A recent study has shown that, acupuncture and moxibustion can significantly reduce the degree of facial nerve paralysis [4]. In view the efficacies of those medical treatments, we speculate that the combined application of those treatments with traditional therapy may be able to speed up the recovery of facial nerve injury. In this study, 75 patients with traumatic facial nerve injury were treated with hyperbaric oxygen therapy combined with acupuncture and moxibustion on the basis of routine drug treatment. In addition, the therapeutic effect of this method was compared with routine therapy. Specific effects were retrospectively analysed as follow.

Materials and Methods

General information

150 patients with traumatic peripheral facial nerve injury were selected in our hospital from January 2015 to January 2016. Inclusion criterion: patients with traumatic facial nerve injury diagnosed by relevant inspections like facial nerve examination and head CT examination; patients with a history of head injury; patients with stable disease conditions; patients with the course of disease less than 1 months; patients voluntarily participate in this research to receive drug, acupuncture and hyperbaric oxygen therapy. Exclusion criterion: patients with other nervous diseases; patients treated with related therapy; patients with serious illness of major organs like heart, lung,

kidney, spleen and stomach; patients with hyperbaric oxygen treatment taboo or drug treatment taboo; patients with epilepsy; patients with disturbance of consciousness or difficulties in cooperating with researchers. The patients were randomly divided into drug group (n=75) and combined group (n=75). In drug group, there are 41 males and 34 females aged from 20 to 65 y with an average of 42.5 y(s=7.3). Causes of injury: 20 falling injuries, 13 tumbling injuries, 32 traffic accident injuries and 10 injuries caused by work machinery. In combined group, there are 40 males and 35 females aged from 20 to 66 y with an average of 42.6 y (s=7.4). Causes of injury: 21 falling injuries, 14 tumbling injuries, 31 traffic accident injuries and 9 injuries caused by work machinery. Independent sample comparison was performed to compare the baseline data of two groups, and no significant differences were found between those two groups ($p>0.05$).

Methods

Patients in drug group were treated with routine medicine therapy as well as related treatments, such as conventional cerebral protective agent, cranial nerve nutrition agent, vasodilator, and anti-inflammatory treatment according to patients' conditions [5].

Patients in combined group were treated with hyperbaric oxygen therapy combined with acupuncture and moxibustion. The hyperbaric oxygen treatment methods: Treatment with single hyperbaric oxygen chamber (Qingdao ze oxygen tank container equipment CO., LTD) was performed for 110 min. Patients were firstly subjected to continuous pressure treatment for 20 min. With the air pressure of 0.2 MPa, patients were allowed to breathe pure oxygen for 20 min, after 5 min rest, patients were allowed to breathe pure oxygen for another 20 min. This whole procedure was repeated. After that, decompression treatment was performed once per day for courses (12 day/course) [6].

Acupuncture treatment methods: select patients' buccal car, point te 17, point gb 14, LI4 (Hegu), point si 18 and four white points as the major acupuncture points. Targeted acupuncture was performed based on the characteristics of various acupoints. As for the treatment of acupuncture points like buccal car, point te 17, point gb 14 and LI4 (Hegu), the needles should be inserted deeply. For convalescence patients, acupuncture in Zusanli point and Qihai (CV6) point can be added. Specific acupuncture points were selected according to the clinical symptoms. Patients with chill cold were treated with acupuncture in fengchi point; quchi point was selected for patients with wind heat; yingxiang point for patients with shallow nasolabial groove; chengjiang point for patients with skew mentolabial sulcus; shuigou point for patients with wry nasolabial groove; zanzu point for patients with trouble in raising eyebrows. Routine acupuncture was performed for patients. Acupuncture in their facial acupoints through neutral supplementation and draining method was performed after the desired sensation was achieved. Excessive operations should be avoided for patients in acute phase but acupuncture can be performed. For convalescent patient, neutral supplementation and draining method in Hegu point and the acupunctures in Zusanli point and Qihai (CV6) point were performed. Moxibustion treatment can be conducted after acupuncture, after igniting. Moxibustion was places to the area near the acupuncture points of the patients [7,8]. Treatment was performed once a day for a continuous 3 courses (12 days/course).

Observation index

1. Curative effects were compared between two groups: Evaluation was performed according to the integral symptoms of patients before and after treatment and the mark sheet of peripheral facial neuritis therapy. A total of 6 evaluation items with each scored from 0 to 3 were included, and higher score indicated better recovery [9]. Cure: no less than 18 scores; effective: 12-17 scores, ineffective: less than11 scores [10].

2. EMG results were compared between the groups: A full featured myoelectricity evoked potential equipment (Dandy, Denmark) was used to perform the detection. Needle electrode was stabbed into the patients' orbicularis oculi muscle, orbicularisoris muscle and the lateral frontal muscle, the ends of the ears in the side of the wrist. M wave amplitude, facial movement incubation period and potential voltage of motor unit of different body parts were determined.

Statistical analysis

Data were processed using SPSS19.0 software, the patients' EMG results before and after treatment were expressed as "mean ± standard deviation", and tested with t test. Treatment efficacy was expressed as rate and tested with "χ^2", $p<0.05$ was considered to be statistically significant.

Results

Comparison of curative effects between two groups

Combined group showed a significant higher total effective rate compared with drug group ($p<0.05$, Table 1).

Table 1. Comparison of curative effects between two groups.

Group	Cases	Cure	Effectiveness	Ineffectiveness	Total effective rate
Drug group	75	40 (53.3)	13 (17.4)	22 (29.3)	53 (70.7)
Combined group	75	52 (69.3)	21 (28.0)	2 (2.7)	73 (97.3)*
χ^2	--	--	--	--	19.841

P	--	--	--	--	<0.05

Note: *compared with=drug group, p<0.05

Comparison of EMG results before and after the treatment

Combined group showed obviously higher M wave amplitudes of facial nerve of orbicularis oculi muscle, orbicular muscle of mouth as well as frontalis muscle and the motor unit potential voltage compared with drug group, while the facial movement incubation period of combined group is significantly shorter than that of the drug group (p<0.05, Table 2).

Table 2. *Facial nerve M wave amplitude in different body parts before and after the treatment ($\bar{x}$ ± s; n=75; mV).*

	Orbicularis oculi muscle		Orbicular muscle of mouth		Frontalis muscle	
Group	**Before treatment**	**After treatment**	**Before treatment**	**After treatment**	**Before treatment**	**After treatment**
Drug group	0.46 ± 0.31	1.31 ± 0.48	0.48 ± 0.21	1.61 ± 0.38	0.52 ± 0.27	1.32 ± 0.41
Combined group	0.45 ± 0.32	1.66 ± 0.54*	0.47 ± 0.22	1.89 ± 0.42*	0.51 ± 0.26	1.59 ± 0.42*
t	0.194	4.195	0.285	4.281	0.231	3.984
p	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

Discussion

Facial nerve mainly consists of muscle intermediate nerve and motor fiber which control facial expression [11]. Facial injuries may involve damages of many body regions like basis cranii, brain stem and facial canal [12]. Traumatic peripheral facial nerve injury, resulting from the trauma, shows the symptoms like facial nerve palsy, facial spasm, seriously affecting the patient's life quality and facial aesthetics [13,14]. The specific method in treatment of the traumatic peripheral facial nerve injury has not yet been reported in clinical studies. Medicine therapy is often adopted, but its treatment effect remains to be promoted. Traditional drug or hormone therapies including acyclovir and corticosteroid are the main treatments of patients with facial nerve injury [1,2]. A previous study has shown that corticosteroid treatment can significantly increase the recovery of facial motor function in patients with facial nerve injury, and the recovery rate was increased by 17% compared with the random effects model [1]. Acyclovir was also found to be able to keep satisfactory degree of facial nerve function in the treatment of facial nerve dysfunction [2]. However, the treatment efficacies of those traditional methods are not so satisfying and still need to be improved. In addition, the application of drug or hormone therapies is still challenged by drug tolerance or varied individual response.

Hyperbaric oxygen therapy has been widely used in the treatment of various human diseases. A previous study has shown that hyperbaric oxygen therapy can significantly improve the recovery of sciatic nerve crush injury in rat [15], indicating the function of this method in nerve regeneration. Acupuncture and moxibustion, which two traditional Chinese medical treatments, have also been used in various clinical practices through the ages in China. I also have been found that acupuncture and moxibustion can contribute to facial nerve regeneration after injury [4]. In this study, hyperbaric oxygen therapy combined with acupuncture and moxibustion was used to treat patients with facial nerve injury, and the efficacy was compared with the traditional method. Results showed that the combined group has an obviously higher total effective rate compared with drug group, indicating that hyperbaric oxygen therapy combined with acupuncture has better curative effects. Hyperbaric oxygen therapy can improve the state of hypoxia ischemia of facial nerve in a timely manner, so as to alleviate patients' facial spasm. It can also mitigate hypoxic damage of neuronal cells and reduce the production of inflammatory substances to achieve the function of cell edema controlling and recovery promotion. Hyperbaric oxygen can stimulate the nutrition resuming of facial nerve and promote angiogenesis as well as nerve recovery, thus raising curative effects [16-20]. Traumatic peripheral facial nerve injury, which is classified into the category of facial paralysis in traditional Chinese medicine, is mainly caused by obstructive blood gas and internal disorder [21]. Acupuncture and moxibustion treatment can increase local blood circulation to effectively improve facial blood flow status, facilitate inflammation and edema absorption, promote facial nutrition and promote healing of facial nerve In addition acupuncture and moxibustion can stimulate facial muscle, improve facial spasm conditions and facial EMG, increase M wave amplitude as well as the motor unit potential voltage and shorten the incubation period of facial movement, thus facilitating facial muscle recovery [22-25].

In conclusion, hyperbaric oxygen therapy combined with acupuncture has good curative effects in treatment of traumatic peripheral facial nerve injury and has high application value due to its functions in raising curative effectiveness and improving facial never status.

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References

1. Ramsey MJ, Der Simonian R, Holtel MR. Corticosteroid treatment for idiopathic facial nerve paralysis: a metaanalysis. Laryngoscope 2000; 110: 335-341.
2. Kinishi M, Amatsu M, Mohri M. Acyclovir improves recovery rate of facial nerve palsy in Ramsay Hunt syndrome. Auris Nasus Larynx 2001; 28: 223-226.
3. Salgado Alves Vilela D, Roberto Lazarini P, Ferreira Da Silva C. Effects of hyperbaric oxygen therapy on facial nerve regeneration. Acta Oto-Laryngologica 2008; 128: 1048-1052.
4. Li Y, Liu L A, Zhao L. Acupuncture and moxibustion for peripheral facial palsy at different stages: multi-central large-sample randomized controlled trial. Zhongguo Zhen Jiu Chinese Acup Moxib 2011; 31: 289-293.
5. Chen W, Jiang G, Fu J. Emg analysis of hyperbaric oxygen therapy combined with acupuncture and moxibustion in treatment of traumatic peripheral facial nerve injury. Chinjrehabil Theory Pract 2016; 22: 696-700.
6. Chen W, Lou X, Yu Z. Effects observation of hyperbaric oxygen therapy combined with acupuncture and moxibustion in treatment of traumatic oculomotor nerve injury. Chinas Rural Med 2014; 21: 33-34.
7. Tan R. Early curative effect observation of hyperbaric oxygen combined with medication therapy in treatment of brain injury. Guide of China Med 2014; 11: 121-122.
8. Zhang Y, Yang C, Zhu L. Curative effect analysis of hyperbaric oxygen in treatment of peripheral nerve injury. Disab Chinese Med 2014; 22: 18-20.
9. Zhang T. The curative effect of hyperbaric oxygen combined with medication in treatment of neural damage. Chinese J Pract Nerv Dis 2016; 19: 128.
10. We C, Li Y. 48 cases of hyperbaric oxygen in comprehensive treatment of oculomotor nerve injury. Shaanxi Med J 2015; 44: 199-200.
11. Zhang H, Li Z. Curative effect observation of hyperbaric oxygen in treatment of zygomatic orbital floor fractures and supraorbital nerve damage caused by the surgery. Chinese Med Sailing High Press Med J 2013; 20: 236-239.
12. Pu W. Curative effect observation of hyperbaric oxygen combined with drug therapy in treatment of brain damage. Chinese Foreign Med Res 2014; 11: 36-37.
13. Duan H, Li H, He X. The clinical research of hyperbaric oxygen combined with mcgf in treatment of cranial nerve damage in craniocerebral trauma. Zhejiang J Traum Surg 2013; 18: 502-503.
14. Hubing. Curative effect observation of hyperbaric oxygen combined with medication in treatment of early brain injury. Guide China Med 2014; 11: 54-55.
15. Haapaniemi T, Nishiura Y, Dahlin LB. Functional evaluation after rat sciatic nerve injury followed by hyperbaric oxygen treatment. J Perip Nerv Sys 2002; 7: 149-154.
16. Zha X. Clinical observation on hyperbaric oxygen combined with drugs in early treatment of cranial nerve injury. Chinese Rural Health 2013; 5: 64-65.
17. Mengjun. Related discussion about hyperbaric oxygen in auxiliary treatment of radioactive nerve injury. Int J Rad Nucl Med 2013; 37: 381-384.
18. Xu C, Luo S, Gu Q. The influence of hyperbaric oxygen therapy on cognitive impairment with brain injury. Neur Inj Funct Reconstr 2013; 7: 231-232.
19. Mateng. The curative effect of hyperbaric oxygen therapy in treatment of incomplete spinal cord injury and and its impact on patients daily life function. Chinese J Pract Nerv Dis 2015; 17: 73-75.
20. Feng L, Ma JY. The influence of early hyperbaric oxygen combined with edaravone in treatment of IL-6 and TNF-α of patients with severe craniocerebral injury. Neur Inj Funct Reconstr 2014; 8: 70-71.
21. Lou YL, Shan H. The mechanism of acupuncture and its influence on cerebral palsy of young rats model behavior. CRTER 2016; 20: 7314-7319.
22. Li S, Lu P, Lao J. Different clinical observation on acupuncture in treatment of traumatic nerve damage. Chinese Acup Moxib 2013; 33: 993-995.
23. Zhanghui. Effect analysis of acupuncture in treatment of facial paralysis with different damage degrees. China Pract Med 2013; 8: 230-231.
24. Hulian. The clinical effect of acupuncture and moxibustion in treatment of facial paralysis analysis of different severity. Chinese J Pract Nerv Dis 2016; 19: 95-96.
25. Gao F, Cong X. The influence of acupuncture in treatment of facial paralysis of different damage degree. Massage Rehab Med 2013; 28: 60-61.

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