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Original Article

The chiropractic techniques in the treatment of adult atlantoaxial instabilities

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Abstract: This study aims to evaluate the therapeutic effect of chiropractic techniques in the treatment of adult atlantoaxial instabilities. 128 patients with atlantoaxial instability were chosen into intervention group and control group by random digits table, with 64 patients in each group: intervention group treated with the chiropractic techniques, the control group treated with the pillow jaw belt traction. The total treatment course was 20 work-days. The therapeutic effects, the reoccurrence rate were calculated after the treatment and 1-year follow-up. The total therapeutic effective rate in the intervention group was higher than that of the control group significantly (95.3% vs. 78.1%, $P<0.05$). The improvement of vertebral basal artery flow was better than that of the control group significantly ($P<0.05$). At 1-year follow-up, the reoccurrence rate was lower than that of the control group significantly (6/64 vs. 13/64, $P<0.05$). No complications were found in intervention group. Chiropractic techniques in the treatment of atlantoaxial instability had higher therapeutic effective rate and lower reoccurrence rate.

Keywords: Atlanto-axial joint, instability, chiropractic techniques

Introduction

Diseases of the atlantoaxial joint have been a frequently discussed topic in clinical diagnosis and research because of the high risk of neurological injuries threatening. Atlantoaxial subluxation or instability is a common entity among them [1]. Conservative treatment has been the most common approach [2, 3], which consists of nonsteroidal anti-inflammatory drugs, soft collar, and gentle traction, to reduce pain to a tolerable level [4]. Massage therapies are often considered in the treatment of cervical diseases such as cervical spondylosis and atlantoaxial subluxation, and a variety of rotation practices are the mainstays of those methods [5]. Recently, literatures about its diagnosis and therapy have shown that massage therapies with different clinical outcome vary largely based on non-uniform diagnostic standard. There were many iatrogenic injuries reported with the cervical spine rotation therapy due to the wrong diagnosis or misuse of this manipulation therapy.

Chiropractic techniques using pushing while pulling technique on atlantoaxial instability, a small part of chiropractic techniques, is a newly developed therapy in our hospitals. Theoretically this chiropractic techniques which differs from the traditional way may directly reconstruct the atlantoaxial joint dynamic balance. So it is reasonable to expect a predominance clinical therapeutic effect. However it lacks the evidence of well-controlled clinical trials. Therefore, this study was designed as a randomized control study with 1-year fellow-up to evaluate the efficacy of the chiropractic techniques on adult atlantoaxial instability.

Patients and methods

Subjects

Total 128 patients with atlantoaxial instability confirmed by both clinical and cervical plain film radiograph were grouped into intervention and control by random digits table, with 64 patients in each group: intervention group treated with

Table 1. Comparison on the general data

Group	n	Male	Female	Age (year)	Course (year)	BAVS (cm/s)
Intervention	64	28	36	35.6±10.8	1.2±0.5	43.5±4.2
Control	64	31	33	34.8±11.6	1.3±0.4	44.1±5.0

Note: age, course, BAVS, *t-test, P*>0.05; sex, χ^2-*test*, *P*>0.05.

the chiropractic techniques, control group treated with pillow jaw belt traction. All patients were outpatients of the author's hospitals from March 2010 to March 2015. The clinical trial registration number was 2010BA114-MRPP-AAI-1. Individual participants in this study gave written; informed consent after the trial procedures had been fully explained. Permissions of use of the data were obtained from patients. Ethical approval to undertake this study was obtained from the Second Affiliated Hospital of Qingdao University Medical College and People's Hospital of Ningxia Hui Autonomous Region's Human Research Ethics Committee in accordance with the Declaration of Helsinki and the Medical Research Council's Good Clinical Practice Guidelines [6].

The patients in the intervention group were 28 males and 36 females, 16 to 65 years old, 35.6±10.8 years on average, with the mean illness course of 1.2±0.5 years. The patients in the control group were 31 males and 33 females, 16 to 65 years old, 34.8±11.6 years on average, with the mean illness course of 1.3±0.4 years.

The general data of the patients were comparable, basilaris arteria systolic phase maximum velocity (BAVS) between groups showed no difference significantly (*P*>0.05, **Table 1**).

Inclusion criteria

The diagnosis of atlantoaxial instability was based mainly on the nationwide criteria [7] of Beijing Medical College Affiliated People's Hospital since 1976.

The patient's chief complaint: aching and discomfort in upper cervix, vertigo, nausea, vomiting, difficult in revolving head, anxious.

Cervical palpation: The C_2 spinous process to one side, obvious tenderness, contralateral empty sag.

Transcranial Doppler (TCD) showed insufficiency of vertebra basal artery blood flow.

Exclusion criteria

Patients with severe diseases of heart, liver and kidney.

Meniere disease, cerebral arteriosclerosis, intracranial tumor.

Less than 18 years old or more than 65 years old.

Cervical tumor, vertebra cervical fracture.

Inborn cervical vertebra abnormality.

Therapeutic methods

Preparation

Relax the muscles of the cervix and shoulder by kneading and massage; the acupoints were Fengchi (G20), Tianzong (SI11), Hegu (LI4) and Jianjing (GB21).

Chiropractic techniques method

Let the patient relax and sit on a low steady stool, the physician stands on the diseased backside of the patient, for example, the C_2 processus spinosus leaning to the right, the physician would stand at the right backside of the patient. The physician's left thumb holds out against C_2 processus spinosus of the patient. At the same time, let the patient lower his/her head. Then the physician holds the patient's chin by the right elbow with the right hand supporting the patient's left occiput, keep the patient's head forward bending rightwards to a certain position. Let the patient's right side face press the operator's prothorax closely, keep the patient's head slightly upwards for 10 to 15 seconds, then gently to the right upper. Then turn the head skillfully about 5 to 10 degrees.

The physician's left thumb pushes the C_2 processus spinosus to the left side.

The patient would feel the pain alleviating, the head rotating freely. This indicates the successful chiropractic techniques.

This chiropractic techniques may be performed only once under normal circumstance, or up to 3 times weekly.

The quality control of clinical treatment

During this study, cross five years, the operator is the same one, and the techniques are

Table 2. Comparison on therapeutic effects and recurrence rate

Group	n	Cure (%)	Marked effect (%)	Effect (%)	No effect (%)	Total effect (%)	Reoccurrence rate (%)
Intervention	64	28 (43.7)	20 (31.3)	13 (20.3)	3 (4.7)	95.3	6 (9.8)
Control	64	16 (25.0)	18 (28.1)	16 (25.0)	14 (21.9)	78.1	13 (26.0)

Note: χ^2-test, χ^2=2.9041, P=0.0037<0.01; the reoccurrence rate of 1 year follow-up, χ^2=4.3250>3.841, P<0.05.

Table 3. Comparison on BAVS (cm/s)

	Before treatment	After treatment
Intervention	43.5±4.2[a]	50.2±4.5[b,d]
Control	44.1±5.0	48.3±5.4[c]

Note: between-group comparison before treatment: [a]t=0.7351, P>0.05; Inner-group comparison before and after treatment: [b]t=8.7077, P<0.01, [c]t=4.5656, P<0.01; Inter-groups comparison after treatment: [d]t=2.16, P<0.05.

unchanged in order to control the study quality.

Control group

The pillow jaw belt traction method was used, 3 to 5 kg, 20 minutes for the first time, then gradually add tractating weight and prolong traction time, up to 10 to 15 kg, 30 minutes.

The traction was performed once daily.

The therapeutic effects were assessed after 20 work day's traction.

Assessing therapeutic effect

The criteria [8] for evaluating success of therapy have been established by Chinese PLA General Logistics Department of health.

Cure: The patient's chief complaints and painful palpation are disappearing. Cervical plain film radiograph confirm normal atlanto-axial joint.

Marked effective: The patient's chief complaints are disappearing.

Effective: The patient's chief complaints are partially relieved.

No effect: The patient's chief complaints are not alleviated and the cervical plain film radiograph shows no change.

The reoccurrence rate based on both clinical and the cervical plain film radiograph was evaluated at the end of 1-year follow-up.

Statistical analysis

Numerical data were presented as mean ± SD ($\bar{x}$±s). Differences between groups were analyzed with analysis of variance (ANCOVA). χ^2-test was used for the therapeutic rate, the reoccurrence rate and the sex distribution. α level was set at 0.05 to determine the statistical significance, and all statistical testing was 2-tailed. The data were analyzed using SPSS version 13.0 (SPSS Ltd, Chicago, Ill).

Results

Comparison of therapeutic efficacy and reoccurrence rate at the end of 1-year follow-up

The total therapeutic effective rate in intervention group was 95.3%.

28 cases (43.7%) cured, 20 cases (31.3%) marked effective, 13 cases (20.3%) effective, 3 cases (4.7%) no effect.

While that in the control group was 78.1%.

16 cases (25.0%) cured, 18 cases (28.1%) marked effective, 16 cases (25.0%) effective, 14 cases (21.9%) no effect.

There was difference significantly between two groups (P<0.01).

At 1-year follow-up, 6 cases were reoccurrence (9.8%) in intervention group, while 13 cases recurrent (26.0%) in control group. There were difference between two groups significantly (P<0.05, **Table 2**). This reoccurrence rate showed that the chiropractic techniques were better than traction in the treatment of atlantoaxial instability.

These results suggested that this chiropractic techniques were better than the control in the treatment of atlantoaxial instability with higher therapeutic effective rate and lower reoccurrence rate at the end of 1-year follow-up.

Comparison on BAVS

There were no significant differences in BAVS between *two* groups before treatment ($P>0.05$, **Table 1**).

Comparing in inner-group before and after treatment showed that two methods could improve the vertebra basal artery blood flow respectively ($P<0.01$, **Table 3**).

Comparing after treatment showed BAVS increased significantly ($P<0.05$, **Table 3**).

These results suggested that the improvement of vertebra basal artery blood flow in the intervention group was better than that of the control group significantly.

Discussion

To the best of our knowledge, this is the effective, easy and safe method of cervical manipulation in China. This randomized controlled clinical study demonstrated that this chiropractic techniques in the treatment of adult atlantoaxial instability with higher total therapeutic effective rate and lower reoccurrence rate, improved the vertebra basal artery blood flow. This method could directly rectify the joint instability; rapidly restore atlanto-axial joint dynamic balance, easy to perform, and more effective than the conventional traction. No complications were found in this study. This chiropractic techniques may be performed only once under normal circumstance, or up to 3 times weekly.

In this prospective study, this chiropractic techniques took the advantage of the Traditional Chinese Medicine (TCM) in the treatment of adult atlantoaxial instability, thoroughly relaxed to neck and shoulder muscles by kneading and massage before the cervical chiropractic techniques. The acupoints such as Fengchi (G20), Tianzong (SI11), Hegu (LI4) and Jianjing (GB21) are easy to manipulation and quick to effect in relaxing cervical muscles.

As we know although both operative and non-operative managements could relieve cervical pain in some degree, both managements might not be effective enough to achieve long-term sustained improvement and eliminate the complications. For example, cervical traction and immobilization are nonspecific treatments that may relieve pain temporally; reoccurrence of symptoms and sign were often seen after a short period. Intraarticular cortisol injection may reduce inflammation and may lead to pain relief; however, this therapy often induces more joint degenerative changes such as joint adhesion. In China, massage therapies are often considered in the treatment of cervical diseases such as cervical spondylosis and atlantoaxial subluxation, and a variety of rotation practices are the mainstays of those methods [5]. There were many iatrogenic injuries reported with the cervical spine rotation therapy due to the wrong diagnosis or misuse of this manipulation therapy [1, 9]. Safer manipulation therapy is warranted.

In this study, the chiropractic techniques are different from the other manipulation therapy. This manipulation using pushing C_2 while pulling technique preset the cervical at a special angel according to the patient's conditions, could directly rectify the joint instability, thus rapidly restore atlantoaxial dynamic balance. In the point of practice, it might be more convenience than the conventional cervical traction. Owing to the qualified physician's efforts, no complications were found in this study.

Limitations of this study

The limitation of the present study was only a small number of patients in each group; therefore, no major conclusions can necessarily be applied to other patients. In addition, the patients were selected based upon their findings; thus, there is likely some bias in patient selection for this study. Another limitation is less extensive statistical analysis about all variables such as body weight and the relation with brain lesion. It is hoped that further studies will be directed toward this end.

In conclusion, according to the findings of this study, chiropractic techniques using pushing while pulling technique in the treatment of adult atlantoaxial instability with higher total therapeutic effective rate and lower reoccurrence rate, improved the vertebra basal artery blood flow, promotes reconstruction of atlantoaxial joint dynamic balance.

Disclosure of conflict of interest

None.

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