## **Clinical Study**

# Observation on clinical efficacy of warm needling moxibustion plus Mulligan dynamic joint mobilization for cervical radiculopathy

温针灸加 Mulligan 动态关节松动术治疗神经根型颈椎病疗效观察

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## Abstract

**Objective:** To observe the clinical efficacy of warm needling moxibustion plus Mulligan dynamic joint mobilization for cervical radiculopathy.

**Methods:** A total of 60 cases with cervical radiculopathy were randomly divided into group A, group B and group C by random digital table, 20 cases in each group. The patients in three groups were treated with similar warm needling moxibustion. Group A only received warm needling moxibustion; group B was treated with warm needling moxibustion plus Mulligan dynamic joint mobilization; group C was treated with warm needling moxibustion plus cervical traction. Before the treatment and after 12 sessions of treatment, the patients in the three groups were assessed for score of pain and range of motion (ROM).

**Results:** By 12 sessions of the treatments, the scores of pain were obviously decreased in the three groups, with statistical significances (all P<0.05), and the pain scores of group B and group C were significantly different from the score of group A (both P<0.05). ROM of the neck was increased than before the treatment in the three groups, with statistical significances (all P<0.05), and the ROM of the neck of group B was significantly different from those of group A and group C (both P<0.05).

**Conclusion:** Warm needling moxibustion plus Mulligan dynamic joint mobilization can effectively improve the neck ROM and relieve pain in patients with cervical radiculopathy.

**Keywords:** Acupuncture Therapy; Warm Needling Therapy; Pain Measurement; Cervical Spondylosis; Radiculopathy; Neck Pain; Traction

【摘要】目的:观察温针灸加Mulligan动态关节松动术治疗神经根型颈椎病的临床疗效。方法:将60例神经根型颈椎病患者随机数字表随机分为A组、B组和C组,每组20例。三组患者均接受相同的温针灸治疗,A组仅接受温针灸治疗,B组在温针灸治疗基础上加用Mulligan动态关节松动术,C组在温针灸治疗基础上加用颈椎牵引。三组患者在治疗前及治疗12次后进行疼痛评分和颈椎活动度(ROM)评估。结果:经过12次治疗,三组疼痛评分均较治疗前明显降低,组内差异有统计学意义(均P<0.05),B组和C组疼痛评分与A组有统计学差异(均P<0.05);三组患者的颈椎ROM均较治疗前增加,组内差异均有统计学意义(均P<0.05);B组颈椎ROM与A组和C组有统计学差异(均P<0.05)。结论:温针灸加Mulligan动态关节松动术能更好地改善神经根型颈椎病患者的颈椎ROM,减轻颈部疼痛。

【关键词】针刺疗法;温针疗法;疼痛测评;颈椎病;神经根病;颈痛;牵引

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With the use of computer and change in the lifestyle, cervical spondylopathy has become a common disease and tends to affect young population<sup>[1]</sup>. Cervical spondylopathy can be divided into neck type, nerve root type, spinal cord type, vertebral artery type, sympathetic type, and mixed type. Moreover, nerve root type is the most common type of cervical

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spondylopathy, accounting for about 50%-60%<sup>[2]</sup>.

Dynamic joint mobilization is a rehabilitative and therapeutic method put forward by a physiotherapist from New Zealand in 1980s, characterized by simple operation, remarkable effect and high safety. Currently, it has been gradually approved at home. This study was designed to observe the clinical efficacy of warm needling moxibustion plus Mulligan dynamic joint mobilization for cervical radiculopathy. Now, the report is given as follows.



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## **1** Clinical Materials

## 1.1 Diagnostic criteria

In reference to the diagnostic criteria of cervical radiculopathy in *Summary on the Second National Symposium on Cervical Spondylosis*<sup>[3]</sup>: symptoms (numbness, pain) and signs in distribution of nerve root type; positive Spurling test or/and Eaton test; image findings conforming to clinical manifestations; exclusion of pain induced by lesions beyond the cervical vertebrae (thoracic outlet syndrome, tennis elbow, carpal tunnel syndrome, cubital tunnel syndrome, scapulohumeral periarthritis, tenosynovitis of longhead of biceps brachii).

## 1.2 Inclusion criteria

In conformity with the above-mentioned diagnostic criteria; age ranged 40-65 years old, both genders, occupation and nationality not limited; able to complete the treatment and experimental check based upon the requirements; without administration of any pain killers within the recent two weeks; no hypertension, diabetes, severe cardiac, pulmonary, hepatic or renal diseases; no history of mental disorder; signed the informed consent of the clinical trial.

#### 1.3 Exclusion criteria

Those not in conformity with the above-mentioned diagnostic and inclusion criteria; those with severe traumatic injury in the head or cervical vertebrae in the recent three years; those in the acute stage of cardiac infarction; those with severe hypertension, diabetes and malignant tumors; those with mental or psychological diseases; those under administration of non-steroid anti-inflammatory drugs, anti-depressive drugs or muscle relaxants; those with age below 40 years or above 65 years; pregnant women and women within six months after delivery; and those with severe skin infection.

#### 1.4 Dropout criteria

Those with poor compliance influencing the assessment of the clinical efficacy during the trial; those unable to follow the requested treatment or unable to be assessed due to use of other therapies or medications; and those dropped out from the clinical trial.

#### 1.5 Breaking-off criteria

Those unable to continue the treatment; those had severe adverse event or reaction during the treatment; those had severe complications or aggravated situation during the treatment.

For those discontinuing the clinical trial, the reason was carefully recorded. The cases with treatment over two thirds of the course were included into the statistics of the clinical efficacy. Those with treatment less than two thirds of the course were regarded as the dropout cases, not included into the statistics of the clinical efficacy.

## **1.6 Statistical methods**

The SPSS 19.0 version statistical software package was used for statistical analysis. The measurement data in normal distribution were expressed by mean  $\pm$  standard deviation ( $\overline{x} \pm s$ ). The paired-sample *t*-test was used for intra-group comparison. One-way analysis of variance was used for inter-group comparison. Non-parametric test was used for those not in normal distribution. The enumeration data were processed by Chi-square test. *P* < 0.05 indicated a statistical significance.

#### 1.7 General data

Based upon the feature of clinical acupuncture study, single-blinded design was adopted, in order to avoid releasing the relevant information of grouping and treatment to the patients. Totally, 60 cases were enrolled, and all the patients were sick with cervical radiculopathy, accepting the rehabilitative treatment in the Department of Acupuncture, Tuina and Rehabilitation of Hangzhou Hospital of Traditional Chinese Medicine, Zhejiang Province, between July 2014 and October 2016. In accordance with the random digital table, 60 cases of the patients were randomly divided into group A, group B and group C, 20 cases in each group. One case dropped out in group A. The differences in age, gender and duration were not statistically significant (all P > 0.05) among the three groups, indicating that the three groups were comparable (Table 1).

#### Table 1. Comparison of general data among the three groups

| Course            | n  | Gender (case) |                   | Average age                         | Average duration                    |  |
|-------------------|----|---------------|-------------------|-------------------------------------|-------------------------------------|--|
| Group             |    | Male          | Female            | $(\overline{x} \pm s, \text{year})$ | $(\overline{X}\pm s, \text{month})$ |  |
| A                 | 19 | 7             | 12                | 42.4±11.3                           | 15.5±3.4                            |  |
| В                 | 20 | 7             | 13                | 42.5±11.2                           | 16.9±5.5                            |  |
| С                 | 20 | 8             | 12                | 42.2±9.3                            | 18.0±4.9                            |  |
| Statistical value |    | 0             | .46 <sup>1)</sup> | 0.01 <sup>2)</sup>                  | 0.21                                |  |
| P-value           |    | (             | ).79              | 0.99                                | 0.81                                |  |

Note: 1)  $x^2$  value; 2) *F*-value

## 2 Methods

The patients in the three groups received the same warm needling moxibustion.

Acupoints: Bilateral Tianzhu (BL 10), Fengchi (GB 20), Jingbailao (EX-HN 15) and Dazhu (BL 11).

Methods: After routine disinfection, stainless steel filiform needles of 0.30 mm in diameter and 40 mm in length were used to puncture the above acupoints perpendicularly. After the needles were inserted for 0.5-0.8 cun and the arrival of the needling sensation, the needles were manipulated with even reinforcingreducing technique. After the arrival of the needling sensation, warm needling moxibustion was applied to Tianzhu (BL 10) and Fengchi (GB 20), i.e. a piece of moxa roll of about 1 cm in length was put on the needle handle, and ignited from its bottom. After moxa roll burnt out, the needles were withdrawn. Each time, the needles were retained for 30 min.

#### 2.1 Group A

The patients in group A only received warm needling moxibustion.

## 2.2 Group B

After the warm needling moxibustion, the patients in group B were treated with Mulligan dynamic joint mobilization<sup>[4-5]</sup>.

Natural apophyseal glides (NAGS): After the patient took a sitting position, the therapist stood right and anterior to the patient, the lower part of body trunk contacted with the anterior and lateral part of the patient's right shoulder, for fixing the body trunk of the patient during the treatment (right handed), and having the head of the patient to withstand the upper abdomen and chest of the therapist. Any lateral flexion or rotation must be avoided in fixing the head. The therapist put the middle phalanx of the right small finger on the spinous process of the upper part of the joint surface needed to be relaxed, with the rest four fingers to fix the occipital region. Then, the therapist put the index finger of the left hand or lateral side of the thenar on the lower part of the right small finger, to push spinous process with the left hand forward and upward toward the eyeball rhythmically, making the small joint of the selected therapeutic surface to slide effectively and rhythmically, 3 times/s, without inducing any pain to the patient, repeated for 6 times each session.

Reverse NAGS: After the patient took a sitting position, the therapist fixed the patient's body trunk like in NAGS, put the finger of the right hand on the therapeutic surface above the spinal vertebrae, flexed and held the third and fourth fingers of the left hand, with the proximal joint of the index finger flexed, the metacarpophalangeal joint straightened, and the digital joint and metacarpophalangeal joint of the thumb straightened, to withstand the transverse process of the spinal vertebra below the therapeutic surface, and push obliquely and upward along the motion of the joint, so that the small vertebral joint below the therapeutic surface slid relatively to the above vertebral body.

Sustained natural apophyseal glides (SNAGS): After the patient took a sitting position, the therapist stood behind the patient, and put the medial side of the finger tip of the right thumb on the spinous process of the cervical vertebra to-be-treated for doing SNAGS upward and obliquely toward the eyeball at 45 °. By strengthening the force of SNAGS with the thumb of the left hand, the therapist put the rest fingers on the neck and chest of the patient. While the two thumbs kept sliding forward and upward, the patient was asked to turn the head slowly sideways or bend the head toward the sick side. The movement was repeated for 6 times, maintaining the pushing force continuously till the head came back to the original position.

#### 2.3 Group C

After the warm needling moxibustion, the patients in group C received the traction treatment of the cervical vertebrae. The patient sat on the traction chair, bending the body trunk vertically and forward about 10-30 °, and the traction weight was 1/10 of the patient's body weight, for 30 min each time.

The treatment was given once every other day in the three groups, three sessions per week, totally for twelve sessions.

## **3** Observation of the Therapeutic Efficacy

## 3.1 Observed items

## 3.1.1 Pain score

Mainly, degrees of pain in the neck, shoulder and back were observed. In reference to the clinical evaluation scale and scoring criteria of the cervical spondylopathy by Zhang MS, *et al*<sup>[6]</sup>, pain degrees were divided into three grades: obvious, slight and non-obvious. Please see Table 2.

Table 2. Scoring criteria of symptoms and signs

| Symptom                             | Non-obvious (0 point) | Slight (2 points)            | Obvious (4 points)                    |
|-------------------------------------|-----------------------|------------------------------|---------------------------------------|
| Pain in the neck, shoulder and back | No obvious pain       | Frequent, slight or moderate | Severe, continuous tingling sensation |

## 3.1.2 Range of motion (ROM)

The motion of the cervical vertebrae could be limited in cervical radiculopathy. Therefore, In reference to Deng LS's method in this study<sup>[7]</sup>, the joint angle ruler was used to measure the angle of anteflexion, posterior extension, lateral flexion and rotation.

Anterior flexion and posterior extension: The normal value was 35-45 ° in anterior flexion and 35-45 ° in posterior extension. After the patient took a sitting

position, straight in the thoracic and lumber vertebrae, the therapist put the center of the joint angle ruler at the midpoint of the external auditory canal, fixed the arm vertically with the ground, moved the arm as the line between the external auditory canal and nose tip, and had the neck flexed or extended backward to its upmost for reading the relevant numeric value.

Lateral flexion: The normal value was 0-45  $^\circ$  in the left and right lateral flexion. After the patient took a

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sitting position, straight in the thoracic and lumber vertebrae and with the scapula fixed, the therapist put the joint angle ruler on the spinous process of the seventh cervical vertebra, fixed the arm vertical along the spinous process of the thoracic vertebrae and moved the arm as the line between the midpoint of vertex and spinous process of the seventh cervical vertebra, and had the neck flexed to its upmost for reading the numeric value.

Rotation: The normal value was 60-80 ° in the left and right rotation. After the patient took a sitting position, straight in the thoracic and lumber vertebrae and with the scapula fixed, the therapist put the midpoint of the joint angle ruler on the center of the vertex, fixed the arm to be parallel to the line between the two acromions, moved the arm as the line between the midpoint of the vertex and nose tip, and rotated the neck to its utmost for reading the numeric value

The measurement was conducted respectively before the treatment and after the treatment, to compare and analyze the improvement of the above items in the patients of the three groups.

## 3.2 Results

During the treatment, the treatment was interrupted in one case in group A, because of personal travel. There were no drop-out cases in the rest groups.

## 3.2.1 Comparison of pain score

After the treatment, pain score declined remarkably in the three groups, and the intra-group differences were statistically significant (all P < 0.05). Compared with group A, the scores of group B and group C were all significantly different (all P < 0.05), but the difference was not statistically significant between group B and group C (P > 0.05). The findings indicated that the three treatment protocols all can alleviate pain in the neck and shoulder for the patients with cervical radiculopathy, and the analgesic effects were better in warm needling moxibustion plus dynamic joint mobilization or traction of the cervical vertebrae than single warm needling moxibustion (Table 3).

Table 3. Comparison of pain scores before and after treatment in the three groups ( $\overline{x} \pm s$ , point)

| Group | Before treatment | After treatment           |
|-------|------------------|---------------------------|
| А     | 2.35±1.35        | $0.75{\pm}0.28^{1)}$      |
| В     | 2.23±1.59        | $0.34{\pm}0.16^{1)2)}$    |
| С     | 2.30±1.33        | 0.28±0.11 <sup>1)2)</sup> |

Note: Intra-group comparison, 1) *P*<0.05; compared with group A after treatment, 2) *P*<0.05

#### 3.2.2 Comparison of ROM of cervical vertebrae

After the treatment, the intra-group differences of ROM in anterior flexion, posterior extension, left lateral flexion, right lateral flexion, left rotation and right rotation in the three groups were statistically significant (all P < 0.05), indicating that the three treatment protocols all can improve ROM of the cervical vertebrae. After the treatment, the differences of ROM in anterior flexion, posterior extension, left rotation and right rotation between group B and group A or C were statistically significant (all P < 0.05). The differences of leftward flexion and rightward flexion in the three groups were not statistically significant (all P > 0.05). It's indicated that warm needling moxibustion plus dynamic joint mobilization was better than single warm needling moxibustion and warm needling moxibustion plus neck traction in improving anteflexion, posterior extension and rotation (Table 4 and Table 5).

Table 4. Comparison of ROM in anterior flexion, posterior extension and lateral flexion before and after treatment in the three groups ( $\overline{x} \pm s, \circ$ )

|       |    | Anterior flexion |                          | Posterior extension |                         | Left later       | Left lateral flexion  |            | Right lateral flexion |  |
|-------|----|------------------|--------------------------|---------------------|-------------------------|------------------|-----------------------|------------|-----------------------|--|
| Group | n  | Before           | After                    | Before              | After                   | Before           | After                 | Before     | After                 |  |
|       |    | treatment        | treatment                | treatment           | treatment               | treatment        | treatment             | treatment  | treatment             |  |
| A     | 19 | 29.68±9.24       | $32.82{\pm}6.51^{1)}$    | 31.06±6.96          | $32.91{\pm}5.62^{1)}$   | 35.38±5.25       | $38.41{\pm}4.13^{1)}$ | 35.65±7.30 | $38.47{\pm}6.00^{1)}$ |  |
| В     | 20 | 29.77±7.81       | $36.09 \pm 4.01^{1)2)}$  | 33.91±6.05          | $35.94{\pm}4.28^{1)2)}$ | $36.86 \pm 5.05$ | $39.60{\pm}4.11^{1)}$ | 35.83±5.49 | $39.59{\pm}5.14^{1)}$ |  |
| С     | 20 | 29.48±6.54       | 33.64±4.31 <sup>1)</sup> | 30.64±6.29          | $32.67 \pm 4.62^{1)}$   | 35.45±6.70       | $38.15{\pm}4.82^{1)}$ | 35.67±7.05 | $38.76 \pm 5.32^{1)}$ |  |

Note: Intra-group comparison, 1) P<0.05; compared with group A and group C, 2) P<0.05

| Comm  |            | Left rota        | ation                    | Right rotation                 |                         |  |
|-------|------------|------------------|--------------------------|--------------------------------|-------------------------|--|
| Group | <i>n</i> — | Before treatment | After treatment          | nent Before treatment After tr |                         |  |
| A     | 19         | 67.32±8.11       | $69.68 \pm 6.29^{1)}$    | 64.44±8.64                     | $67.53 \pm 6.29^{1)}$   |  |
| В     | 20         | 66.46±8.11       | $72.09 \pm 6.02^{(1)2)}$ | 65.60±6.71                     | $70.86 \pm 5.01^{1)2)}$ |  |
| С     | 20         | 67.39±9.83       | 69.79±7.76 <sup>1)</sup> | 64.45±9.70                     | $67.12 \pm 6.89^{1)}$   |  |

Note: Intra-group comparison, 1) P<0.05; compared with group A and group C, 2) P<0.05

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## **4** Discussion

Cervical radiculopathy is clinically manifested by neck pain that radiates toward the arm or causes arm numbness, aggravated by posterior extension of the neck, decreased sensation in the dermal segmental section of the compressed nerve root, presenting with abnormal tendon reflex, decreased myodynamia, limitation of neck motion, and positive Easton and Spurling tests. The key pathological rings of cervical radiculopathy are mainly two reasons: firstly, inflammatory reaction<sup>[8-10]</sup>: tension or spasm of the soft tissues around the cervical vertebrae (muscles, fascias, ligaments), local abnormal tissue metabolism, and inflammatory factors by tissue inflammatory changes would stimulate the local nerves and blood vessels, leading to pain; secondly, joint dislocation<sup>[11-13]</sup>: osseous hyperplasia of the cervical vertebrae, disc herniation, tension and spasm of neck soft tissues would induce imbalance of the local muscles of the cervical vertebrae, pulling the joints of the cervical vertebrae away from the normal position, and hence dislocation. The two reasons are mutually influential, forming a vicious circle, becoming the main reasons causing intractable cervical radiculopathy. Therefore, the key in the treatment of this disease is to eliminate inflammatory changes and correct the dislocated joints.

Warm needling moxibustion has duel effects of both acupuncture and warming stimulation, acting to strengthen local blood circulation, decrease the excitement of the nerves, and alleviate pain<sup>[14]</sup>, and simultaneously relax the soft tissue of the neck, improve local microcirculation, decrease congestion and edema of the nerve root, and promote conversion, and discharge decomposition of inflammatory substances, beneficial to elimination of aseptic inflammation of the nerve root. Therefore, warm needling moxibustion has become a commonly-used method in the treatment of cervical radiculopathy in acupuncture clinic<sup>[15-16]</sup>, and its main goal is to eliminate the inflammatory reaction of pathological area. But, it is also found in the clinical application that pain could be alleviated quickly in some patients, but their limited motion and numb sensation in the upper limb could not be quickly cured. Moreover, the symptoms are easy to reoccur<sup>[17-18]</sup>, which might be related to no elimination of blockage and compression induced by joint dislocation.

Mulligan joint mobilization is different from the other joint mobilization in two ways<sup>[19-22]</sup>. First, Mulligan dynamic joint mobilization is conducted in the natural body position of the patient, to do rhythmic slide of the small joint for certain segment of the cervical vertebrae, to effectively relieve the tension of the ligament around the zygapophyseal joint, reduce disorders in the Luschka joint and small joints of the upper and lower zygapophyseal joints and correct dislocation, so as to improve the mechanical characteristics and biochemical circumstance of the injured intervertebral disc and alleviate the neck symptoms finally. Secondly, Mulligan joint mobilization needs the cooperation of the patient's active movement. During the active movement, the patient could move the small joints of the cervical vertebrae. At the same time, in application of Mulligan manipulations, we use the force along the motion direction of the joint surface, without causing any pain to the patient. During the treatment, we can communicate with the patient in time and observe the patient's reaction and ajust the manipulation at any time. Therefore, Mulligan dynamic joint mobilization is able to correct joint dislocation anatomically, mechanically and pathologically, characterized by quick good and painless effect.

It has been proven by the results from this study that warm needling moxibustion plus Mulligan dynamic joint mobilization can effectively relieve pain of the neck and shoulder of the patients. Most importantly, with respect to singular warm needling moxibustion and warm needling moxibustion plus traction of the cervical vertebrae, this therapy can obviously increase the range of motion in various angles, correct joint dislocation to a certain extent and restore the normal position of the joints. Whether warm needling moxibustion plus Mulligan dynamic joint mobilization can have long-term therapeutic efficacy or reduce recurrence of cervical radiculopathy needs further study.

#### **Conflict of Interest**

The authors declared that there was no potential conflict of interest in this article.

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#### **Statement of Informed Consent**

Informed consent was obtained from all individual participants or their relatives in this study.

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