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Clinical trial

Acute effect of Korean hand acupuncture on neck pain: A randomized controlled preliminary study

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ABSTRACT

Introduction: Neck pain is considered a musculoskeletal disease with a prevalence of 30% to 50% in western populations. Its impact on quality of life is high and the efficacy of conventional treatments limited. Korean hand acupuncture (KHA), based on the theory that the hand is a microsystem of the human body, has the advantage to be easy to perform without side effects to the patient, having therapeutic and diagnosis value. The aim of the study was to investigate the effect of KHA on nonspecific neck pain.

Methods: A randomized controlled trial was conducted involving 31 patients with cervicalgia. The experimental (EG) (verum) and control (CG) (sham) groups were subject to KHA in the corresponding neck area of the hand (true KHA) and anterior thigh somatotopy (sham KHA), respectively. Before (T0) and after a 20 min' session of KHA (T1), intensity of pain and motion range of the most painful neck movement were measured.

Results: After treatment, statistically significant differences between the experimental and control groups were observed in both the intensity of pain (measured with a visual analogue scale); and in the percentage in the range of motion (assessed by a goniometer), ($p = 0.005$, and $p = 0.005$ respectively).

Conclusions: Our preliminary data seems to be sufficiently relevant to recommend further studies on the effects of Korean hand acupuncture on neck pain although limitations as the sample size, the methods to assess neck mobility and the assessment of the cumulative therapeutic effect have to be taken into account.

1. Introduction

Neck pain (cervicalgia) is considered a musculoskeletal disorder and one of the top five chronic pain conditions in developing countries [1]. Individual, physical, and psychosocial factors seem to be involved in its aetiology [2–6], which makes difficult to estimate its real prevalence. A prevalence of 30–50% has been reported in the adult population [7,8], being women more likely to develop neck pain than men (40% *vs* 29%) [9–11] with more than a third of affected people experiencing recurrences after their recovery [12]. In this context, neck pain has been reported as one of the major causes of medical consultations and withdrawal from work. Taking into account all the costs related to the diagnosis, treatment and the reduction in the quality of life and labour losses, neck pain constitutes a great socioeconomic burden on patients and society [2].

Cervical pain may be associated with a degenerative process or pathology identified by imaging diagnosis. However, the cause of cervical pain is often unknown [13] and therefore not easy to classify. Regarding the time factor, cervicalgia can be classified as acute or chronic. Acute cervicalgia is defined as a pain with a sudden onset lasting less than six weeks. Chronic cervicalgia is defined as the presence of progressive pain, lasting more than three months. From 6 weeks to 3 months it is considered subacute pain [14]. Nonspecific neck pain is defined as neck pain without any specific systematic disease being detected as the underlying cause of the complaint [9].

Some randomised controlled trials found no clear evidence that any type of physical therapy was more effective than any other for chronic neck pain [15]. Usually muscle relaxants and non-steroidal anti-inflammatory drugs are used for acute neck pain, but clinical practice is mostly guided by the results of studies performed for other chronic pain conditions.

Results from different studies suggest that acupuncture may be a cost-effective intervention in the management of a number of painful conditions, including neck pain [16–20]. Also, systematic reviews of

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neck pain have shown some insight into the potential benefit of acupuncture [7].

Many studies in pain research have explored the various effects of acupuncture for pain relief and it has been reported that needle stimulation applied to specific skin points activates the organism´s self-regulation and modulation activities mainly by regulating the levels of endogenous opioids, serotonin, and norepinephrine and by inhibiting nociceptors, inflammatory cytokines, and CNS activation [21]. Besides traditional acupuncture, microsystem acupuncture is now widely used. Microsystems are based on particular somatotopic fields comprising specific points of correspondence [22]. Each of the microsystem points has a correlation to a particular organ or function. Microsystem points are only detectable in a state of irritation. Stimulating microsystem points has proved to be a very effective method for treatment of different conditions, namely chronic pain. Beside physiological mechanisms proposed for traditional acupuncture, microsystems have been reported to have a greater influence on the vegetative nervous system, although the neurophysiologic mechanisms involved remain unclear [22].

The Korean hand acupuncture (KHA) is based on the theory that the hand is a microsystem of the human body. Thus, the functions of human physiology can be influenced by stimulating specific corresponding points on the hand. The KHA contains 14 micro-meridians and 345 points located in the hand that match the internal organs. The correspondence points will display a hypersensitivity that will be checked by applying a slight pressure [23]. In KHA, the back of the body is represented on the back of the hand and the ventral part of the body on the palm of the hand, while the tip of the middle finger corresponds to the top center of the head, the 2nd and 4th finger correspond to the upper limbs and the thumb and 5th finger correspond to the lower limbs.

In modern acupuncture, this type of puncture is having a very fast development. It has the advantage to be easy to perform without side effects to the patient, having therapeutic and diagnosis value [24].

The main aim of the present exploratory work is to investigate the possible effects of KHA in neck pain. Specifically, we explore whether KHA treatment has an influence on the range of motion (ROM) and intensity of pain in cases of nonspecific cervicalgia and evaluate if results are sufficiently relevant to perform further studies on the effects of KHA on chronic neck pain.

2. Methods

We performed a blind, randomized controlled study. Patients were blinded to the assignments and not familiar with KHA, the specialist in TCM recruited had information about the aims of the study but was blinded to measurement outcomes and also the assessor that performed the statistical analysis was blinded to the assignment. The research protocol was approved by the Ethics Committee of the Institute of Biomedical Sciences Abel Salazar of the University of Porto (Reference number: ICBAS-UP 040/2013). Written informed consent was obtained from each participant before data collection and their rights protected. The study was conducted following the Standards for Reporting Interventions in Clinical Trials of Acupuncture (STRICTA) [25].

2.1. Sample

The participants of the study were patients recruited at a physical rehabilitation centre of Porto, Portugal, following announcement and invitation conducted across the centre. The aims, procedure and eligibility criteria of the study were provided in the announcement. After a meeting with all the potential participants to provide them with a better explanation of the study, each participant signed a written informed consent. The enrolment and assignment were conducted by the research coordinator with the support of the responsible for the centre, according to the inclusion and exclusion criteria.

Patients over 18 years old, with nonspecific cervical musculoskeletal pain, including postural neck pain and occupationally related neck pain, with mobility deficits and without previous knowledge of KHA, were included. Neurological signs, anticoagulated patients, and presence of cervical disc herniation, osteoporosis, cancer, pregnancy, primary fibromyalgia syndrome and excessive fear of needles were exclusion criteria. The final sample was constituted by 31 individuals (18 females and 13 males). The mean age for the sample was 41.03 (minimum 21 and maximum 64 years).

2.2. Study design

The participants filled in a sample selection and characterization questionnaire with demographic and medical history questions regarding. The patients were randomized into two groups, the experimental group (EG) (verum) (n = 16) and the control (sham) group (CG) (n = 15), using the toss of a coin. This was followed by a quantitative evaluation (Baseline time, Time 0 evaluation, T0) to assess the intensity of pain in the cervical region with the following movements: flexion, extension, lateral bending (right and left) and rotation (right and left). For each patient, the most painful cervical movement was assessed in terms of the range of motion (ROM) using a universal goniometer (UG). After this evaluation, the KHA treatment was applied to EG and CG groups. The KHA treatment for the EG group included hypersensitive points of the matching cervical and neck region, located in the middle phalanx of the 3rd finger. In the CG group, the needles were inserted in the points matching to the anterior leg region, located in the middle phalanx of the little finger.

After treatment, the needles were removed, followed by a rest period for 10 min. Each patient was evaluated again for intensity of pain and range of motion (Time 1 evaluation, T1). The design and flow diagram of the study is shown in Fig. 1.

2.3. Instruments

In the present study, the Visual Analogue Scale (VAS) was used to assess pain intensity. VAS is easy and quick to apply. This scale is easy for the patient to understand, and is also a suitable way to estimate the

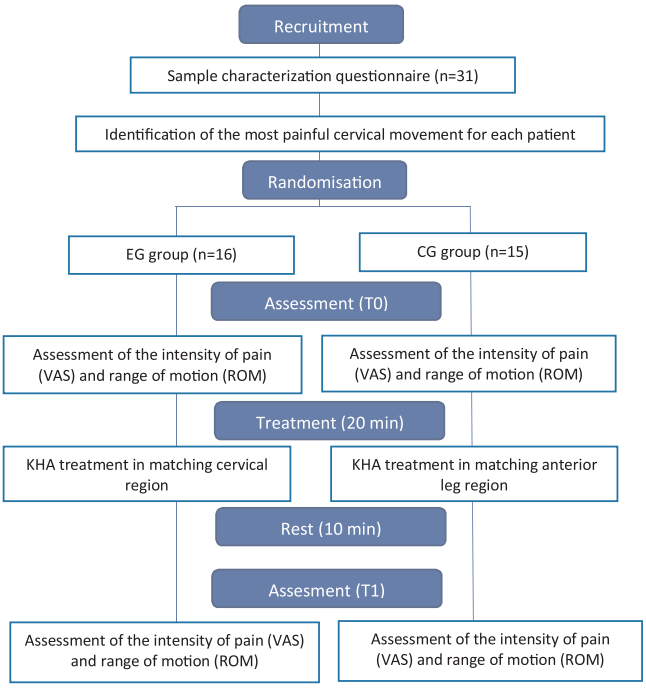

Fig. 1. Design and flow chart of the study.

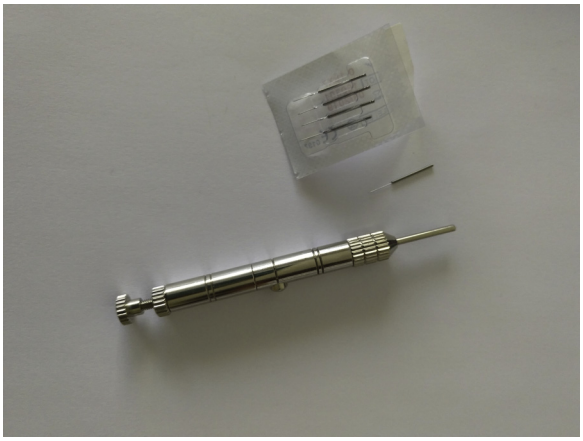

Fig. 2. Image of *Sooji Chim* needles and applicator used in the study.

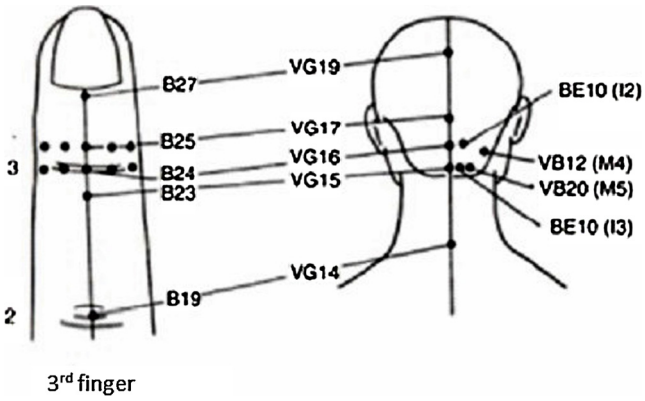

Fig. 3. Corresponding cervical area in KHA [23].

intensity of the present pain. The VAS scale consisted of a straight horizontal line of fixed length (10 cm). The ends were defined as the extreme limits of the pain, orientated from the left (worst) to the right (best). Using a ruler, the score was determined by measuring the distance (cm) on the 10-cm line between the "no pain" anchor and the patient's mark, providing a range of scores from 0 to 10.

Universal goniometer was used to evaluate the range of motion. Universal goniometry is a method widely used in the clinic because of its simplicity, easy of use, and low costs associated [26]. Mobility was assessed with the patient sitting with feet firmly on the floor and hands resting on the thighs, assuming the neutral position of the cervical. After that, the patient was asked to perform the most painful cervical movement. After identification of the most painful movement, the patient returned to the initial position. At that time, the evaluation was performed asking the patient to perform the most painful cervical movement, actively, 3 times, being evaluated for mobility each time. The average value of the 3 measurements was the value recorded.

Table 2
Comparison inter-groups (EG *vs* CG) e intra-groups (T0 *vs* T1) relatively to The Visual Analogue Scale (VAS) results.

		EG group (n = 16)	CG group (n = 15)	P
Visual Analogue Scale - VAS (T0)	Mean	5.88	5.6	P = 0.68
	Median	6.5	5	
	Standard deviation	1.75	1.64	
	Maximum	8	8	
	Minimum	3	3	
	Q1/Q3	4.75/7	4.5/7	
Visual Analogue Scale - VAS (T1)	Mean	2.5	4.4	P = 0.005
	Median	2	5	
	Standard deviation	1.67	1.72	
	Maximum	5	7	
	Minimum	0	2	
	Q1/Q3	1/4	3/6	
P		*P < 0.001	*P < 0.01	
Difference in VAS results (T1-T0)	Mean	−3.38	−1.2	P = 0.001
	Median	−3	−1	
	Standard deviation	1.36	0.56	
	Maximum	−2	0	
	Minimum	−7	−2	
	Q1/Q3	−4/−2.75	−1.5/−1	

*Statistic comparison intra-groups (To *vs* T1), for EG and CG.

2.4. Acupuncture treatment

For the application of the KHA acupuncture technique, a specialist in TCM was recruited. This specialist, who performed the KHA acupuncture had information about the aims and design of the study but was blinded to measurement outcomes.

For the KHA treatment, *Sooji Chim* needles were inserted with an applicator at a depth of 1–2 mm (Fig. 2) The selection of points for the EG group included points of the matching cervical and neck region located in the middle phalanx of the 3rd finger, using the method of

Table 1
Comparison between groups with respect to age, sex and pain.

		EG group (n = 16)	CG group (n = 15)	P
Age	Mean	41.38	40.47	P = 605
	Median	36	39	
	Standard deviation	15.15	13.57	
Sex	Female	10 (62.5%)	8 (53.3%)	P = 958
	Male	6 (37.5%)	7 (46.7%)	
Time with pain	< 3 months	6 (37.5%)	6 (40%)	P = 971
	> 3 and < 12 months	4 (25%)	4 (26.7%)	
	> 12 months	6 (37%)	5 (33.3%)	
Frequency of pain	One a day	1 (6.25%)	2 (13.3%)	P = 0.928
	Two a day	5 (31.25%)	1 (6.7%)	
	More than two a day	4 (25%)	3 (20%)	
	Constantly	6 (37.5%)	9 (60%)	
More painful cervical movement	Flexion	1 (6.25%)	3 (20%)	P = 0.663
	Extension	4 (25%)	1 (6.7%)	
	Lateral bending (right)	1 (6.25%)	2 (8%)	
	Lateral bending (left)	3 (18.75%)	3 (20%)	
	Rotation (right)	6 (37.5%)	4 (26.7%)	
	Rotation (left)	3 (18.75%)	2 (8%)	

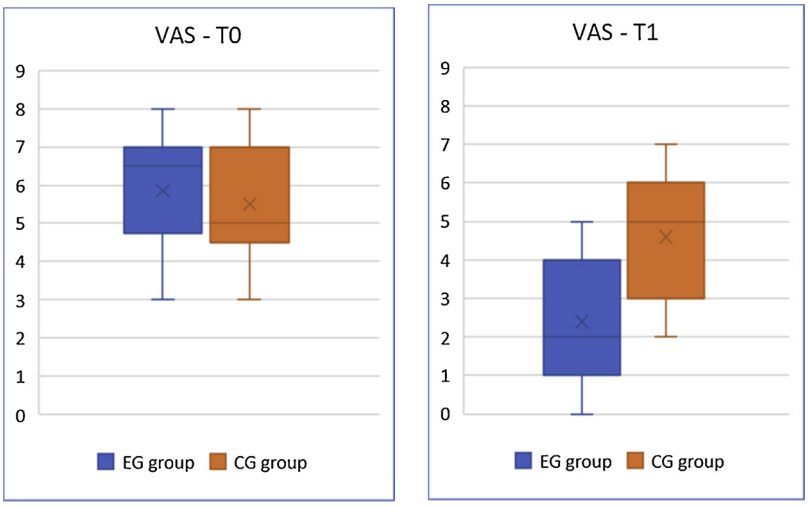

Fig. 4. Comparison between EG and CG group at T0 and T1 with respect to VAS results. The corresponding data are presented in Table 2.

Table 3
Comparison inter-groups (EG *vs* CG) e intra-groups (T0 *vs* T1) relatively to ROM results.

		EG group (n = 16)	CG group (n = 15)	P
% of range of motion (ROM) at (T0)	Mean	57.4	53.4	P = 0.446
	Median	60.4	50	
	Standard deviation	19.1	11.8	
	Maximum	88.9	73.3	
	Minimum	26.7	30.4	
	Q1–Q3	44.3–69.1	45.4–61.1	
% of range of motion (ROM) at (T1)	Mean	71.6	55.8	P = 0.005
	Median	76.05	56.2	
	Standard deviation	17	11.8	
	Maximum	92	79.6	
	Minimum	44	41.2	
	Q1–Q3	59.6–85.5	43.9–63.9	
P		*P < 0.001	*P < 0.024	
Difference in ROM results (T1 *vs* T0)	Mean	14.2	3.4	P = 0.001
	Median	11.95	2.5	
	Standard deviation	9.03	4.9	
	Maximum	35.5	11.8	
	Minimum	2.2	−5	
	Q1-Q3	10–18.4	−0.6 to 6.9	

*Statistic comparison intra-groups (To *vs* T1), for EG and CG.

hypersensitive to pressure points (Fig. 3). In the CG group, the needles were inserted in the points matching to the anterior leg region. Each patient received only one treatment. All treatments lasted 20 min.

2.5. Statistical analysis

Data were statistically analyzed with SPSS statistics 21. Non-parametric testes were used as variables did not follow a normal distribution. Mann Whitney test was used to compare continuous variables between groups and the Wilcoxon test was used for comparison of intergroup variables. P-values below 0.05 were considered statistically significant.

3. Results

A total of 31 participants comprised the final sample. From them, 18 were females (58.1%) and 13 males (41.9%). The mean age of the sample was 41.03 years; EG group: 41.38 ± 15.15 years (minimum 21 and maximum of 64 years); CG: 40.67 ± 13.57 years (minimum 23 and maximum of 64 years). There were no statistically significant differences between EG and CG groups with respect to sociodemographic variables, age and sex (Table 1). Cervical pain was characterized by time with pain, frequency of the pain and the most painful cervical movement. These variables did not reveal statistically significant differences between EG and CG groups ($p = 0.971$, $p = 0.928$ and $p = 0.663$, respectively) (Table 1).

3.1. Intensity of pain between and within groups

In the questionnaire of characterization of the sample, each patient was asked to indicate which active movement was the most painful. After that, each patient was asked to characterize the intensity of pain using the Visual Analogue Scale. Table 2 shows the results obtained with respect to the intensity of pain in the EG and CG groups, at T0 and T1 and the inter and intra-group statistical analysis.

Comparing the intensity of pain between the experimental and control groups, at T0 there were no significant differences between them ($p = 0.682$). Nevertheless, after treatment, there were significant differences between the experimental and control groups ($p = 0.005$) (Table 2 and Fig. 4).

The analysis of intensity of pain within each group showed significant differences between T0 and T1 for the experimental group ($p < 0.001$) and also for the control group ($p < 0.01$).

The differences between the results of VAS at T1 *vs* T0 for each group, showed statistically significant differences ($p = 0.001$), with a significant reduction of pain in the experimental group, when compared with control group.

3.2. Range of motion (ROM) between and within groups

The range of motion of the most painful movement was measured, by means of goniometry, before and after acupuncture treatment.

The standard amplitudes for motion range are not easy to determine as the bibliography does not determine exact reference values. In the present work we used values according to guidelines [27]. These values were: 60° for the bending, 75° for extension, 45° for inclination (left and right) and 89° for rotation movements (left and right).

Table 3 shows the results obtained with respect to the range of motion of the most painful movement referred by each patient measured by goniometry in the EG and CG groups, before and after acupuncture treatment. Data correspond to the percentage of range of motion. Table 3 also shows the inter and intra-group comparisons.

When we compare the percentage of range of motion between the

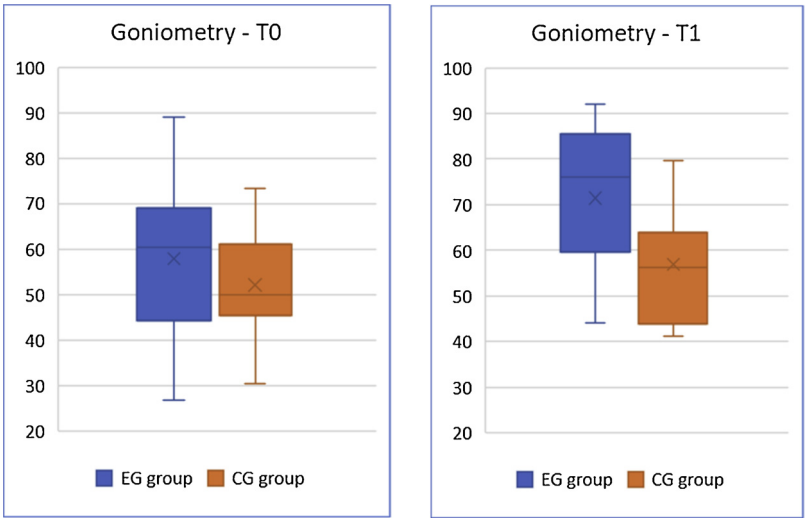

Fig. 5. Comparison between EG and CG group at T0 and T1 with respect to ROM results. The corresponding data are presented in Table 3.

experimental and control groups, we observe that at baseline there were no significant differences between both groups ($p = 0.446$). Nevertheless, after treatment, there were significant differences between the experimental and control groups ($p = 0.005$) (Table 3 and Fig. 5).

The analysis of ROM within each group showed significant differences between T0 *vs* T1 for experimental group ($p < 0.001$) and also for the control group ($p < 0.024$).

When we considered the differences between the results of ROM at T1 *vs* T0 for each group, we observed that the comparison between groups also shown statistically significant differences ($p = 0.001$) with a significant improvement of movement in the experimental group.

4. Discussion

Different studies suggest that acupuncture may be a cost-effective intervention in the management of a number of painful conditions, including headache, neck pain, and back pain [7,28,29]. In contemporary acupuncture practice, many alternative models are available to treat any particular presentation. KHA is considered a hand microsystem acupuncture in which pain shown in the hands corresponds to the painful part of the body. Therefore, the functions of human physiology can be influenced by stimulating specific corresponding points on the hand. In this sense, stimulation of the tender points in the hand can affect positively pain relief [30]. There are very few published studies on KHA but some have showed that KHA can be an effective therapy for pain, namely low back and knee joint pain [31] and oromyofacial pain [30]. Nevertheless, there is a lack of published reports about its possible effect in chronic neck pain.

With the present study we intended to get some evidence of the possible effect of KHA correspondence points therapy in cervicalgia, namely in reducing neck pain and increasing the range of motion. For that, we analyzed two variables: the intensity of pain and the range of motion before and after the acupuncture intervention in two randomized groups of patients with nonspecific neck pain. With respect to the analysis of the range of cervical motion, goniometry had been validated in different works [32]. According to different studies, the Visual Analogue Scale is considered a good parameter for intensity of pain evaluation [33]. This is an important aspect as appropriate measurable parameters need to be carefully considered to contribute to the credibility of the effectiveness of acupuncture treatments.

The results obtained by VAS and UG show no significant differences between both groups before the intervention. Nevertheless, after the acupuncture treatment, both groups reduced pain and improved the range of motion, although the effect was more evident in the experimental group when compared with the control group. In our opinion, the improvement of pain obtained in the control group can be attributed to a physiological unspecific effect associated with punction rather than a placebo effect, as we also observed in this group an effective improvement in cervical range. In this sense, one of the main limitations of trial studies is to know how much of the total effect may be attributable to the therapy. In our study we also analysed the differences between the results of VAS and ROM at T1 *vs* T0 for each group, having observed a significant reduction of pain and improvement of the range of motion only in the experimental group.

These results suggest that in this sample the verum therapy of corresponding points of KHA has a specific effect in terms of reduction of pain and improvement of cervical motion. Nevertheless, being a preliminary study, findings should be interpreted in light of its limitations.

- The small sample size was a limitation of the study, preventing the results from being conclusive. For future studies should be larger and based on calculation of a sample size.

- More restrictive inclusion criteria could be used to ensure more uniform characterization of clinical variables. For future studies the research inclusion criteria proposed will be: Patients with non-specific neck pain for more than 3 months (chronic pain), aged 18 years old and older and with moderate pain (VAS of pain > 4).

Specific pathology such as cervicogenic headache, cervicogenic dizziness, whiplash associated disorders, cervical radiculopathy, fractures, spondylosis-thesis, inflammatory diseases, fibromyalgia, cancer, neck pain resulting from surgery, post-traumatic stress disorder or cervicobrachial syndrome will be excluded.

- Another limitation was the use of universal goniometer for assessing neck mobility. In terms of angular measurements, the universal goniometer is widely used to evaluate the movement of joints due to its easy use and reduced cost. It has been considered the gold standard for clinical assessment of ROM. However, it holds two limitations: first, the alignment of the axis of the UG with the axis of the movement of the head [27]; second, the positioning of the arms relatively to the head and the reference frame the trunk [34]. So, in further analysis, additional tools like inclinometers, digital goniometers, smartphone application-based tools, and laser-guided devices could also be used [35].

- The choice of mobility assessment using the active movement represents another limitation. According to the International Classification of Functioning, Disability and Health (ICF), to obtain values of greater amplitude and greater viability, passive motion can be used for the evaluation of cervical mobility [36], although both types of movement are referred in literature as being used in clinical situations

[37].

- This study evaluated just the effect of one acupuncture treatment. Follow up sessions should be conducted to assess whether the effect continues, and whether further treatment would provide a better therapeutic effect.

5. Conclusions

Despite these limitations, our preliminary data, resulting from only one treatment, are sufficiently relevant to recommend further studies on the effects of Korean hand acupuncture on chronic neck pain. In future research, better characterization of patients and improved methodologies can contribute to establish the potential effects of Korean hand acupuncture in reduction of pain and improvement of mobility in patients with chronic cervicalgia.

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Declaration of Competing Interest

The authors declare that they have no conflict of interests.

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