

Accepted Manuscript

Title: Clinical Effects of Acupressure on *Nakchim*: A Systematic Review

Author: Chan-Young Kwon Boram Lee

PII: S2213-4220(17)30222-6
DOI: <https://doi.org/doi:10.1016/j.imr.2018.01.002>
Reference: IMR 286



To appear in:

Received date: 26-10-2017
Revised date: 25-12-2017
Accepted date: 11-1-2018

Please cite this article as: Chan-Young KwonBoram Lee Clinical Effects of Acupressure on *Nakchim*: A Systematic Review (2018), <https://doi.org/10.1016/j.imr.2018.01.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Review Articles**Clinical Effects of Acupressure on *Nakchim*: A Systematic Review**

Chan-Young Kwon^{a*}, Boram Lee^b

^a Yanggu Public Health Center, Gangwon-do, Republic of Korea

^b Department of Clinical Korean Medicine, Graduate School, Kyung Hee University, Seoul, Republic of Korea

*Corresponding authors: Chan-Young Kwon

Address: 37, Janggeori-gil, Bangsan-myeon, Yanggu-gun, Gangwon-do, Republic of Korea

Phone: +82-10-3356-6903 Fax: +82-33-480-2546

E-mail address: beanalogue@naver.com

Abstract

We aimed to summarize and critically evaluate the evidence regarding the efficacy and safety of acupressure on *nakchim*. We searched 8 databases for studies published up to August 29, 2017. Clinical studies evaluating the efficacy of acupressure on *nakchim* were included. The acupressure methods of included studies were divided into proximal acupressure performed on acupuncture points located in neck and shoulder, and distal acupressure performed on acupuncture points located in other areas. Overall clinical effective rate (CER) and

immediately cured rate (ICR), which means rate of the symptom totally resolved after one treatment session, were calculated as mean percentage with 95% CI. All included studies were assessed for methodological quality. Two case studies and thirteen case series with 1,037 participants were included, and 17 types of proximal acupuncture points and 14 types of distal acupuncture points were used. The most commonly used proximal and distal acupuncture points were GB20 and GB39, respectively. The CER in one study using both proximal and distal acupressure was 100%. The CER and ICR in studies using only proximal acupressure was 95.65% and 71.61%. The CER and ICR in studies using only distal acupressure was 99.37% and 69.08%. Eight studies performed simple acupressure technique using one acupuncture point, of which SI11, GB39, BL57, and TE3 were used. None of the studies reported adverse events. This review suggests that acupressure may be effective on *nakchim*. However, it is not conclusive due to low methodological quality and low evidence level of included studies.

Keywords: acupressure, Oriental medicine, neck pain

1. Introduction

In East Asian traditional medicine (EATM), *nakchim* (落枕) usually refers to a kind of cervical pain accompanied by the muscles stiffness around the neck. The range of neck movement is limited, and the pain occurs after sleeping. The causes of this condition are the wrong sleeping posture, neck muscle abnormality, and wind-cold assailing.¹

This term was translated into “stiff neck” according to the World Health Organization (WHO) International Standard Terminologies on Traditional Medicine, and was defined as “*acute inflammation or sprain of the soft tissue of the neck*”.² Despite this translation, the original term, *nakchim*, contains pathological information that the condition is associated with sleeping, while the translated term does not. This is why the term “stiff neck”, which can be confused with a simple symptom of stiffness occurred in neck, cannot accurately represent the original condition. Furthermore, in East Asia, such as Korea and China, the term *nakchim* is more commonly used instead of the WHO term. Therefore, in this review, we used the original term instead of the translated term.

In 2011, a delphi consensus conducted during the development of the acupuncture clinic practice guideline for cervical pain in Korea suggested that *nakchim* can be one of the formal EATM diagnoses in cervical pain.³ Although there is no standard diagnostic criterion for *nakchim*, in a double-blind, randomized controlled trial (RCT) of *nakchim* patients, it was defined as follow: the pain and restricted motion range of neck occurred within 2 weeks; either unilateral or bilateral side can be affected; there should be no history of neck trauma; and there should be no abnormalities on radiological examinations.⁴

Although acupuncture and acupressure share same treatment points, so-called acupuncture

points, the latter is non-invasive and relatively safe because it uses human fingers or tools to press some acupuncture points without skin penetration. Acupressure has been recognized for its effectiveness on various health problems.^{5,6} Since there is no legal restriction like medical license on the treatment, it has low entry barriers. It can be performed by patients themselves or health care providers such as caregivers or nurses, although some technical knowledges are still required to perform acupressure.⁶⁻⁸ The role of caregivers and nurses is very important in patient-centered care to provide the optimal treatment environment for patients.^{9,10} In this situation, acupressure is a sharable treatment among caregivers, nurses, and doctors who manage patients on the front line, and if sufficient education is given, it is also a promising treatment that patients can do to improve their own health.⁶

In this review, we systematically reviewed to analyze acupressure method on *nakchim*, and to assess its therapeutic effect.

2. Methods

2.1. Search strategy

We conducted a systematic review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.¹¹ A systematic search was conducted on eight databases; PubMed, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL), China National Knowledge Infrastructure (CNKI), Japan Science & Technology Information Aggregator, Electronic (J-STAGE), Research Information Sharing Service (RISS), Koreanstudies Information Service System (KISS), and Oriental Medicine Advanced Searching Integrated System (OASIS). **Table 1** shows the search strategies implemented in each database. All papers published until August 29, 2017 were searched.

2.2. Study selection

In this study, the inclusion criteria was set as follows, according to an existing RCT and a textbook in China.^{4,12} (1) Patient: Patients should be suffering from pain and restricted motion range of neck which occurred within 2 weeks, and have no history of physical trauma or no abnormality in radiological examination. However, even if detailed medical histories were not reported, studies which reported that patients are suffering from *nakchim* were also included. (2) Intervention: Patients should be treated with acupressure. Acupressure was defined as a treatment to achieve therapeutic effects by pressing acupuncture points using a finger or a non-invasive tool. (3) Comparison: There was no restriction on comparison. (4) Outcome: Study should report the treatment effect using outcome measurements such as Visual Analog Scale (VAS), Numeric Rating Scale (NRS), Neck Disability Index (NDI), or

clinical effective rate (CER) based on improvement of the symptom. (5) Design: Clinical studies including case reports, case series, before-after study, and controlled study were allowed. Two authors independently selected relevant studies and any disagreement was solved through discussion.

2.3. Data extraction

The study design, sample size, treatment method, duration and frequency of treatment, concurrent treatment, outcomes, results, and any adverse events reported were extracted from each study using standardized extraction form. Two authors independently extracted the data and any disagreement was solved through discussion.

2.4. Data analysis

In order to distinguish the effects of physical massage on affected muscle, the acupressure methods of included studies were divided into two categories: proximal acupressure performed on acupuncture points located in neck and shoulder, and distal acupressure performed on acupuncture points located in other areas. Overall CER of acupressure among included studies was calculated. Moreover, immediately cured rate (ICR), which means rate of the symptom totally resolved after one treatment session, was also calculated. Overall CER and ICR were presented as mean percentage with 95% confidence interval (CI). The clinical effects of simple acupressure that used only one acupuncture point were analyzed. We also analyzed the clinical effect according to whether Dong-qi therapy was performed during the

acupressure.

2.5. Methodological quality assessment

Although the methodological quality was supposed to be assessed by using different assessment tools depending on the design of the study included, the NIH's Quality Assessment of Case Series Studies was only used because all included studies were case series or case reports.¹³ Two authors independently assessed the methodological quality of included studies and any disagreement was resolved through discussion.

3. Results

3.1. Study characteristics

A total of 135 records were identified, and 15 studies were included in this review (**Figure 1**).¹⁴⁻²⁸ All studies were performed in China, and were case reports or case series with a total of 1,037 patients. One study¹⁴ performed both proximal and distal acupressure, seven studies¹⁵⁻²¹ performed only proximal acupressure, and the remaining seven studies²²⁻²⁸ only performed distal acupressure. All the practitioners were doctors (**Table 2**).

3.2. Methodological quality of clinical studies

All studies described the purpose of reporting the clinical effects of acupressure in patients with *nakchim*. There were only three studies^{17,21,27} that clearly described *nakchim* as rapid onset, neck pain with limited motion range, and no abnormalities in radiological examinations. Except for two case reports with one subject each^{22,23}, the remaining studies^{14-21,24-28} did not describe whether the cases were consecutive. Except for two case reports^{22,23}, five studies^{14,16,19,24,26} reported insufficient demographic information to analyze, and only two^{15,20} of the remaining eight studies were similar in age, and all onset were within 3 days. Except four studies^{19-21,24} in which no treatment duration was specified, all of the other studies clearly described the intervention method. The results were all raw data of CER and/or ICR, and there were nine studies^{15-18,20,21,26-28} that report clear criteria for cured, markedly improved, improved and/or not improved. Except for four studies^{19-21,24} that did not report a follow-up period, the remaining studies were evaluated as appropriate with a follow-up period of two weeks or less. There were no studies using statistical methods. Eight

studies^{15-18,20,26-28} were evaluated to describe the results well (**Table 3**).

3.3. Acupuncture points for acupressure on *nakchim*

Seventeen types of 30 proximal acupuncture points were used as basic acupuncture points. Among them, GB20 was most frequently used 4 times, GB21 3 times, and SI15, ST12, BL11, TE16, LI17, SI11, BL10 and GV16 twice, respectively. SI14, GV14, LI18, GB12, SI16, BL12, and GB6 were used once each. Nine types of 14 distal acupuncture points were used as basic acupuncture points. Among them, GB39 was most frequently used 4 times, and BL57 and TE3 were used twice, respectively. BL60, EX-UE8, LI5, TE10, LI4, and SI3 were used once each. As a whole, acupuncture points on gallbladder meridian were the most commonly used 13 times, followed by acupuncture points on bladder meridian 8 times and by acupuncture points on small intestine meridian 7 times.

Three studies^{14,15,20} used A-Shi points. The number of acupuncture points used was counted except for A-Shi points. In seven studies performing proximal acupressure¹⁵⁻²¹, an average of 2.57 acupuncture points were used, while in seven studies performing distal acupressure²²⁻²⁸, an average of 1.14 acupuncture points were used (**Table 4**).

3.4. The effects of both proximal and distal acupressure

Hu (1999)¹⁴ classified the affected muscle of *nakchim* of 9 patients into sternocleidomastoid muscle, deltoid muscle, and posterior cervical muscle, and performed both proximal and distal acupressure for 2-4 minutes per each treatment session, 1-2 sessions daily for 3-5 days.

In the case of sternocleidomastoid muscle, LI17, LI18, TE16, SI16, LI4, LI5, TE3, TE10, and A-Shi points were used; in deltoid muscle, GB20, SI15, GB21, GV14, BL11, SI14, BL10, GB39, SI3, and A-Shi points were used; and in posterior cervical muscle, GV16, BL10, SI15, GV14, SI16, BL11, BL60, SI3, and A-Shi points were used. Passive stretching of strained muscle was performed after the acupressure. As a result, the symptoms of all 9 patients were cured. The CER was 100%.

3.5. The effects of proximal acupressure

A total of 712 patients were included in the seven studies of proximal acupressure¹⁵⁻²¹. Of these, as 681 showed improvement of symptom, the overall CER was 95.65% (95% CI, 94.15 to 97.15). In four studies involving 155 patients^{15,16,19,20}, ICR was reported, ranging from 50% to 89%. As the number of patients whose symptom was cured after one treatment session was 111, the overall ICR was 71.61% (95% CI, 64.51 to 78.71).

Wei (1999)¹⁵ performed one treatment session of proximal acupressure for 6-8 minutes on 39 patients, and GB20, TE16, GB21, SI15, and A-Shi points were used. Massage on neck for 1-2 minutes was performed after the acupressure. As a result, 32 were cured and 7 were markedly improved. The CER was 100%. Wang (2001)¹⁶ performed one treatment session of proximal acupressure for 3-6 minutes on 30 patients, and SI11 was used. As a result, 15 were cured, 8 were markedly improved, 4 were improved, and 3 were not improved. The CER was 90.00%. Xiang et al (2003)¹⁷ performed 1-3 minutes of proximal acupressure per each treatment session, 1-2 sessions daily for 3-5 days on 112 patients, and GB6 and GB20 were used as basic acupuncture points. If the symptoms were severe, GB21, SI14, and GV14 were added.

As a result, 93 were cured, 15 were improved, and 4 were not improved. The CER was 96.40%. Huang (2003)¹⁸ performed one treatment session of proximal acupressure for 10 minutes daily for 3 days on 45 patients, and SI11 was used. Massage on neck and shoulder was performed after the acupressure. As a result, 39 were cured, and 6 were markedly improved. The CER was 100%. Lu (2004)¹⁹ performed treatment sessions of proximal acupressure for 2-3 minutes on 50 patients, and ST12 and Li17 were used. If the symptoms were severe, GB20 and EX-UE8 were added. If periarthritis of the shoulder was presented, LI15 and SI11 were added. Tuina, massage, and extension therapy were performed after the acupressure. As a result, 38 were cured, 2 were markedly improved, 1 was improved, and 9 were not improved. The CER was 82.00%. Wang (2004)²⁰ performed treatment sessions of proximal acupressure for 15-25 minutes on 36 patients, and GB20, BL10, BL11, BL12 and A-Shi points were used. As a result, all of them were cured. The CER was 100%. Li (2014)²¹ performed treatment sessions of proximal acupressure for 4 minutes on 400 patients, and GB20, GB12, ST12, and GB21 were used. Concurrent treatments including massage on neck and shoulder, herbal medicine, hot massage, physical therapy, and acupuncture were performed. As a result, 340 were cured, 24 were markedly improved, 20 were improved, and 15 were not improved. The CER was 96.25%.

3.6. The effects of distal acupressure

A total of 316 patients were included in the seven studies of distal acupressure²²⁻²⁸. Of these, as 314 showed improvements of symptom, and the overall CER was 99.37% (95% CI, 98.49 to 100.24). In six studies involving 262 patients^{22-25,27,28}, ICR was reported, ranging from

96.30% to 100%. As the number of patients whose symptom was cured after one treatment session was 181, the overall ICR was 69.08% (95% CI, 63.49 to 74.68).

Zhang (1961)²² performed one treatment session of distal acupressure for 5-7 minutes on 1 patient, and GB39 was used. Massage on neck and shoulder for 10-15 minutes was performed after the acupressure. As a result, the patient was cured. Li et al (1984)²³ performed one treatment session of distal acupressure for 2-5 minutes on 1 patient, and BL57 was used. As a result, the patient was cured. Zhang et al (1988)²⁴ performed treatment sessions of distal acupressure for 1-2 minutes on 20 patients, and TE3 was used. As a result, 19 were cured, and 1 was markedly improved. The CER was 100%. Mao (1989)²⁵ performed each treatment session of distal acupressure for 3 minutes, 1 session daily for 1-2 days on 24 patients, and GB39 and EX-UE8 were used. As a result, 17 were cured, and 7 were markedly improved. The CER was 100%. Liang (1999)²⁶ performed each treatment session of distal acupressure for 15-20 minutes, 1 session daily for 2 days on 54 patients, and BL57 was used. As a result, 41 were cured, 11 were markedly improved, and 2 were not improved. The CER was 96.30%. Li (2007)²⁷ performed each treatment session of distal acupressure for 3-5 minutes, 1 session daily for 1-2 days on 136 patients, and GB39 was used. As a result, 118 were cured, and 18 were improved. The CER was 100%. Liu (2012)²⁸ performed each treatment session of distal acupressure for 3-5 minutes, 1 session daily for 1-2 days on 80 patients, and TE3 was used. As a result, all of them were cured. The CER was 100%.

3.7. The effects of simple acupressure

Simple acupressure using one acupuncture point was performed in eight studies: two

studies^{16,18} performed proximal acupressure, and the remaining six studies^{22-24,26-28} performed distal acupressure.

Two studies involving 75 patients^{16,18} performed simple proximal acupressure on SI11. As 72 showed improvement of symptom, the overall CER was 96.00% (95% CI, 91.57 to 100.44). In the one study involving 30 patients¹⁶, the number of patients whose symptom was cured after one treatment session was reported as 15. Therefore, the ICR was 50.00% (95% CI, 32.11 to 67.89).

Six studies involving 292 patients^{22-24,26-28} performed simple distal acupressure, and each GB39^{22,27}, BL57^{23,26}, and TE3^{24,28} were used in two studies, respectively. As 290 showed improvement of symptom, the overall CER was 99.32% (95% CI, 98.37 to 100.26). In the five studies involving 238 patients^{22-24,27,28}, the number of patients whose symptom was cured after one treatment session was reported as 167. Therefore, the overall ICR was 70.17% (95% CI, 64.36 to 75.98). The numbers of patients with improvement of symptom after acupressing GB39, BL57, and TE3 were 137 out of 137, 53 out of 55, and 100 out of 100, respectively. Therefore, the overall CERs for each acupuncture point were 100%, 96.36% (95% CI, 91.42 to 101.31), and 100%, respectively. The numbers of patients whose symptom was cured after one treatment session of GB39, BL57, and TE3 were 88 out of 137, 1 out of 1, and 78 out of 100, respectively. Therefore, the overall ICRs for each acupuncture point were 64.23% (95% CI, 52.11 to 76.35), 100%, and 78.00% (95% CI, 57.45 to 98.55), respectively (**Table 5**) (**Figure 2**).

3.8. Dong-qi therapy

Twelve studies^{15-18,20,22-28} involving 578 patients performed Dong-qi therapy. The Dong-qi therapy on *nakchim* was performed by slowly moving the affected area simultaneously with acupressure. As 569 showed improvement of symptom, the overall CER was 98.44% (95% CI, 95.37 to 101.51). The number of patients whose symptom was cured after one treatment session was 260 out of 367, so the overall ICR was 70.84% (95% CI, 54.33 to 87.36).

Three studies involving 459 patients^{14,19,21} did not perform Dong-qi therapy. As 435 showed improvement of symptom, the overall CER was 94.77% (95% CI, 86.50 to 103.04). The number of patients whose symptom was cured after one treatment session was 32 out of 50, so the overall ICR was 64.00% (95% CI, 3.18 to 124.82).

3.9. Safety

None of the studies reported adverse events.

4. Discussion

This review was conducted to assess the efficacy of acupressure on *nakchim*. Fifteen case studies or case series were included, and 17 types of proximal acupuncture points and 14 types of distal acupuncture points were used. The most commonly used proximal and distal acupuncture points were GB20 and GB39, respectively. In seven studies performing proximal acupressure¹⁵⁻²¹, an average of 2.57 acupuncture points was used, while in seven studies performing distal acupressure²²⁻²⁸ an average of 1.14 acupuncture points were used. Therefore the number of acupuncture points used can be interpreted as being relatively smaller in studies performing distal acupressure. In fact, all but one studies performing distal acupressure^{22-24,26-28} used only one acupuncture point.

Acupuncture points on gallbladder meridian were most common, followed by acupuncture points on bladder meridian. In the EATM pathology, the areas where the *nakchim* occurs are mainly the posterior and lateral sides of the neck, so it can be interpreted that the acupuncture points on the meridians that pass through the affected area were used.

The CER in one study using both proximal and distal acupressure¹⁴ was 100%. The overall CER in seven studies using proximal acupressure¹⁵⁻²¹ was 95.65% (95% CI, 94.15 to 97.15), and four of these studies^{15,16,19,20} yielded the overall ICR of 71.61% (95% CI, 64.51 to 78.71). The overall CER in seven studies using distal acupressure²²⁻²⁸ was 99.37% (95% CI, 98.49 to 100.24), and six of these studies^{22-25,27,28} yielded the overall ICR of 69.08% (95% CI, 63.49 to 74.68). Although direct comparison was not possible, the proximal acupressure and distal acupressure did not overlap 95% CI in the overall CER, not like overall ICR. This suggests that there may be a possibility that the efficacy rate of distal acupressure is superior to that of

proximal acupressure.

We analyzed eight studies performing simple acupressure technique using one acupuncture point^{16,18,22-24,26-28}. In two studies performing simple proximal acupressure on SI11^{16,18}, the overall CER was 96.00% (95% CI, 91.57 to 100.44), and one study¹⁶ yielded the ICR of 50.00% (95% CI, 32.11 to 67.89). In six studies performing simple distal acupressure^{22-24,26-28}, GB39, BL57, and TE3 were used and the overall C

ER was 99.32% (95% CI, 98.37 to 100.26). Five studies^{22-24,27,28} yielded the overall ICR of 70.17% (95% CI, 64.36 to 75.98). The CERs of SI11, GB39, BL57, and TE3 were 96.00% (95% CI, 91.57 to 100.44), 100%, 96.36% (95% CI, 91.42 to 101.31), and 100%, respectively. The ICRs of the acupuncture points were 50.00% (95% CI, 32.11 to 67.89), 64.23% (95% CI, 52.11 to 76.35), 100%, and 78.00% (95% CI, 57.45 to 98.55), respectively. However, in case of the ICR of BL57, the analyzed sample size was only 1. Therefore, the effect may be exaggerated. In this view, the most efficient simple acupressure on *nackchim*, which is the most effective and works fastest according to current evidences, may be the acupressure of TE3.

Dong-qi therapy is performed simultaneously with acupuncture or acupressure, and is used to increase the therapeutic effect. Twelve studies^{15-18,20,22-28} used Dong-qi therapy and overall CER and ICR were 98.44% (95% CI, 95.37 to 101.51) and 70.84% (95% CI, 54.33 to 87.36), respectively. Three studies^{14,19,21} did not use Dong-qi therapy, and overall CER and ICR were 94.77% (95% CI, 86.50 to 103.04) and 64.00% (95% CI, 3.18 to 124.82), respectively. All the 95% CIs were overlapped, suggesting the possibility that the treatment effect may not change depending on the presence or absence of Dong-qi therapy.

Symptoms of *nakchim* include neck stiffness, but in general, the term *nakchim* refers to not only a stiff feeling but also a limited range of motion of the neck. A random population-based study of Australians reported that about 18% and 17% experienced waking cervical pain and waking cervical stiffness, respectively.²⁹ The cervical stiffness does not include limitation of the range of the joint motion, so the prevalence may be overestimated than that of *nakchim*.

Among the clinical studies included in this review, only three^{17,21,27} clearly described *nakchim* as rapid onset, neck pain with limited motion range, and no abnormalities in radiological examinations. Although *nakchim* has not been defined in modern medicine, with reference to the features of the previously described *nakchim*, the pathological condition can be defined as tissue damage and/or inflammation that are limited to the muscles, ligaments, or peripheral nerves of neck and shoulders without a history of trauma. If a patient visits with a morning stiff neck, or if an inpatient complains it one day, it is necessary to check the history of the trauma at first. Additionally, it is necessary to distinguish red flags associated with neck stiffness: *“If fatigue, diffuse joint pain, and abnormal laboratory test results are associated with the limited neck mobility, it may suggest rheumatoid arthritis; If it is accompanied by neuropathic symptoms such as sensory deficits or motor neuron signs, it may suggest spondyloarthropathy; If weight loss, anorexia, family or personal history of cancer are present, it may suggest metastasis; If fever and elevated white blood cell count are present, it may be indicative of infectious symptoms such as meningitis.”*³⁰

At this moment, clinicians will be able to use Cervicalgia (code M54.2) or Torticollis (code M43.6) as disease codes for *nakchim* patients in the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). These codes all refer to simple symptoms; however, *nakchim* needs to be considered as a syndrome with pain and

neck stiffness. These patients are common in the clinic, and often do not have clear external trauma, radiological abnormalities, or underlying diseases. In this case, a differential diagnosis could be used to make a diagnosis with *nakchim*. To do this, it is necessary to precede the creation of standards through expert consensus based on the existing inclusion criteria in clinical studies of *nakchim* patients and textbooks.^{4,12}

In the studies included in this review, it was common that acupressure effectively improved the symptoms of *nakchim*, and the therapeutic effect was immediately apparent. Acupressure applied to the distal acupuncture point was also effective. This is consistent with the results that both distal acupressure and proximal acupressure of the females with chronic neck pain showed significant pain relief.³¹ Recently, a RCT have also shown that acupressure is effective in improving acute ankle sprain injuries.³²

The underlying mechanisms of acupressure are still unclear. However, there are some hypotheses that can explain the effect of acupressure on *nakchim*. First, proximal acupressure may have relieved local muscle tensions by physically massaging the affected muscle, and may have resulted in analgesic effects through Gate Control theory.³³ Second, acupressure may have modulated sympathetic nervous system activity and hypothalamic-pituitary-adrenocortical axis to reduce the overproduction of cortisol, resulting in a systematic relaxation response which can relax stiff neck and shoulder muscles.³⁴⁻³⁶ Third, acupressure, particularly proximal acupressure, may have induced analgesic effects by physically stimulating peripheral nerves with pathological problems.³⁷ Fourth, acupressure may have induced analgesic effects through endogenous release of opioids.³⁸ Fifth, cognitive shift in perception of pain may be caused by Dong-qi therapy performed with acupressure.³⁹ Finally, acupressure may be involved in the recovery from disease by controlling the energy flow, so-

called Qi, in the meridians.

EATM treatments for *nakchim* may include acupuncture, herbal medicine, and tuina.⁴⁰⁻⁴²

However, acupressure is not only a cost-effective, safe, and non-invasive treatment, but also a treatment that can be shared among caregivers, nurses, and doctors. Moreover, acupressure is a simple treatment that can be performed by patient himself/herself. In terms of public health, this potentially reduces medical costs, and patients can improve their confidence in own health.

In our knowledge, this is the first systematic review assessing the effects of acupressure on *nakchim*. Especially, this review separately analyzed simple acupressure using one acupuncture point, and these results can be applied to clinical practice, patient education, and study design.

However, this study has the following limitations. Since all of the included studies are case report or case series, the evidence level of the results is considered to be very low. Additionally, the methodological quality of the included studies was generally poor, which can affect the reliability of the results. Moreover, among the included studies, standardized assessment tools such as VAS, NRS, and NDI were not used. The fact that specific definition and golden diagnostic criteria of *nakchim* are not established yet may be an obstacle to future research, though there is an existing RCT of *nakchim*.⁴

Therefore, in future studies, definition and diagnostic criteria of *nakchim* should be established through expert consensus, and acupressure should be considered as a main intervention considering its clinical and cost effectiveness. In order to find the optimal therapeutic effect, it is also necessary to compare the therapeutic effect by using different

acupuncture points for each affected area according to EATM theory. Additional well-designed, placebo-controlled studies using standardized acupressure methods should be performed to confirm the effects of acupressure on *nakchim*.

Funding

None

Conflicts of interest

There is no conflict of interest regarding the publication of this paper.

References

1. Korean Acupuncture & Moxibustion Medicine Society. *Acupuncture Medicine*. Seoul: Hanmi Medicinal Publishing Co; 2016, p. 485-8.
2. World Health Organization. WHO international standard terminologies on traditional medicine in the western pacific region. World Health Organization. 2007. Available at: http://www.wpro.who.int/publications/who_istrm_file.pdf?ua=1.
3. Song I, Lee GM, Hong KE. Research on oriental medicine diagnosis and classification system by using neck pain questionnaire. *The Acupuncture* 2011;28:85-100.
4. Lee KH, Youn HM, Ko WS, Song CH, Jang KJ, Ahn CB, et al. Comparison of treatment effects and allergic responses to stiff neck between sweet bee venom and bee venom pharmacopuncture. *J Pharmacopuncture* 2008;11:39-48.
5. Lee EJ, Frazier SK. The efficacy of acupressure for symptom management: a systematic review. *J Pain Symptom Manage* 2011;42:589-603.
6. Song HJ, Seo HJ, Lee H, Son H, Choi SM, Lee S. Effect of self-acupressure for symptom management: a systematic review. *Complement Ther Med* 2015;23:68-78.
7. Yue S, Jiang X, Wong T. Effects of a nurse-led acupressure programme for stroke patients in China. *J Clin Nurs* 2013;22:1182-8.
8. Tiwari A, Lao L, Wang AX, Cheung DS, So MK, Yu DS, et al. Self-administered acupressure for symptom management among Chinese family caregivers with caregiver stress: a randomized, wait-list controlled trial. *BMC Complement Altern Med* 2016;16:424.
9. Gillick MR. The critical role of caregivers in achieving patient-centered care. *JAMA*

- 2013;310:575-6.
10. Salmond SW, Echevarria M. Healthcare transformation and changing roles for nursing. *Orthop Nurs* 2017;36:12-25.
 11. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Int J Surg* 2010;8:336-41.
 12. State Administration of Traditional Chinese Medicine. Criteria of diagnosis and therapeutic effects of diseases and syndromes in traditional Chinese medicine. Nanjing: Nanjing University Press; 1994, p. 65.
 13. National Institutes of Health. Quality assessment tool for case series studies. NIH website. https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools/case_series. Published 2014. Accessed September 8, 2017.
 14. Hu LC. Clinical realization in points massage treatment of Luozhen disease. *Natural Science Journal of Hainan Teachers College* 1999;12:113-5.
 15. Wei JC. Clinical observation of 39 cases of Nakchim treated by acupuncture point massage. *Chinese Manipulation & Qi Gong Therapy* 1999;15:25.
 16. Wang L. Acupressure in Tianzong points in 30 cases of Nakchim. *Fujian Journal of TCM* 2001;32:27.
 17. Xiang YC, Liu JP, Guo JG, Zhang P. Acupressure in Xuanli points in 112 cases of Nakchim. *People's Military Surgeon* 2003;46:618.
 18. Huang JB. Acupressure in Tianzong points in 45 cases of Nakchim. *Chinese Manipulation & Qi Gong Therapy* 2003;19:25.
 19. Lu DC. Acupressure in Quepen, Tianding points in treatment of Nakchim, frozen shoulder. *Journal of Guangxi Commercial College* 2004;21:115-6.

20. Wang XM. Efficacy observation in 36 cases of Nakchim treated with hand acupuncture point massage therapy. *Modern Journal of Integrated Traditional Chinese and Western Medicine* 2014;13:232.
21. Li KF. Manipulation of acupuncture-based treatment in 400 cases of Nakchim. *Nei Mongol Journal of Traditional Chinese Medicine* 2014;12:91.
22. Zhang P. Massage treatment of Nakchim. *Jiangsu Journal of Traditional Chinese Medicine* 1961;1:41.
23. Li AY, Zhang SY. Acupressure in Chengshan points in treatment of Nakchim. *Journal of New Chinese Medicine* 1984;6:33.
24. Zhang JG, Wang WC. Acupressure in Zhongzhu points in treatment of Nakchim. *Journal of Sichuan of Traditional Chinese Medicine* 1988;11:59.
25. Mao WY. Acupressure in Xuanzhong and Luozhen points in treatment of Nakchim. *Military Medical Journal of South China* 1989;1:91-2.
26. Liang ZS. Acupressure in Chengshan points in treatment of Nakchim. *Journal of Agriculture* 1999;1:42.
27. Li K. Acupressure in Xuanzhong points in treatment of 136 cases of Nakchim. *Medical Journal of National Defending Forces in Southwest China* 2007;1:36.
28. Liu HF. Acupressure in Zhongzhu points in treatment of 80 cases of Nakchim. *Zhejiang Journal of Traditional Chinese Medicine* 2012;1:23.
29. Gordon SJ, Trott P, Grimmer KA. Waking cervical pain and stiffness, headache, scapular or arm pain: gender and age effects. *Aust J Physiother* 2002;48:9-15.
30. Cohen SP. Epidemiology, diagnosis, and treatment of neck pain. *Mayo Clin Proc* 2015;90:284-99.

31. Matsubara T, Arai YC, Shiro Y, Shimo K, Nishihara M, Sato J, et al. Comparative effects of acupressure at local and distal acupuncture points on pain conditions and autonomic function in females with chronic neck pain. *Evid Based Complement Alternat Med* 2011;2011. pii: 543291.
32. Zhao M, Gao W, Zhang L, Huang W, Zheng S, Wang G, et al. Acupressure therapy for acute ankle sprains: a randomized clinical trial. *PM&R* 2017;1-9.
33. Melzak R, Wall P. Pain mechanism: a new theory. *Sciences* 1965;150:971-9.
34. Arai YC, Ushida T, Osuga T, Matsubara T, Oshima K, Kawaguchi K, et al. The effect of acupressure at the extra 1 point on subjective and autonomic responses to needle insertion. *Anesth Analg* 2008;107:661-4.
35. Remington T. Calming music and hand massage with agitated elderly. *Nurs Res* 2002;51:317-23.
36. McFadden KL, Hernández TD. Cardiovascular benefits of acupressure (Jin Shin) following stroke. *Complement Ther Med* 2010;18:42-8.
37. Wang W, Tan W, Luo D, Lin J, Yu Y, Wang Q, et al. Acute pressure on the sciatic nerve results in rapid inhibition of the wide dynamic range neuronal response. *BMC Neurosci* 2012;13:147.
38. Trentini JF, Thompson B, Erlichman JS. The antinociceptive effect of acupressure in rats. *Am J Chin Med* 2005;33:143-50.
39. Shin JS, Ha IH, Lee J, Choi Y, Kim MR, Park BY, et al. Effects of motion style acupuncture treatment in acute low back pain patients with severe disability: a multicenter, randomized, controlled, comparative effectiveness trial. *Pain* 2013;154:1030-7.

40. Yu X, Li HB, Wen SY. Progress of clinical research on acupuncture treatment of stiff neck. *Journal of Liaoning University TCM* 2013;15:270-2.
41. Ou L, Zeng XH, Zhao P. Observation on the therapeutic effect of Mahuangjiazhutang combined with cupping in treatment of Nakchim. *Journal of Practical Traditional Chinese Medicine* 2009;25:790-1.
42. Chen W, Wu YC. The clinical evaluation of manipulation with fumigation on stiff neck. *Chinese J Trad Med Traum Orthop* 2009;17:16-7.

Table 1. Search Strategies

DB: PubMed, CENTRAL

("neck stiffness" OR "stiff neck" OR "acute fibrositis") AND ("acupressure"[MeSH Terms] OR acupressure)

DB: EMBASE

#1 'neck stiffness'/exp OR 'neck stiffness' OR 'stiff neck'/exp OR 'stiff neck' OR 'acute fibrositis'

#2 acupressure

#3 #1 AND #2

DB: CNKI

(落枕 OR 项强 OR 失枕 OR neck stiffness OR stiff neck) AND (指压 OR 按压 OR 穴位按摩 OR acupressure)

DB: J-STAGE

落枕 OR 项强 OR 失枕 OR neck stiffness OR stiff neck

DB: RISS, OASIS, KISS

낙침 OR 락침 OR 항강 OR 落枕

Table 2. General Characteristics of Included Studies

Study	Sample size	Treatment time per session (min)	Treatment period (day)	Treatment frequency (session per day)	Dong-qi therapy	Concurrent therapy	Results
Both proximal and distal acupressure							
Hu 1999 ¹⁴	9	2-4	3-5	1-2	NA	Passive stretching of the strained muscle	Cured: 9
Proximal acupressure							
Wei 1999 ¹⁵	39	6-8	1	1	performed	Massage on neck for 1-2min	Cured: 32, Markedly improved: 7
Wang 2001 ^{*16}	30	3-6	1	1	performed	NA	Cured: 15, Markedly improved: 8, Improved: 4, Ineffective: 3
Xiang 2003 ¹⁷	112	1-3	3	1-2	performed	NA	Cured: 93 (Cured through a single treatment: 54), Improved: 15, Ineffective: 4
Huang 2003 ^{*18}	45	10	3	1	performed	Massage on neck and shoulder	Cured: 39, Markedly improved: 6
Lu 2004 ¹⁹	50	2-3	NR	NR	NA	Tuina, massage, extension therapy, etc	Cured through a single treatment: 32, Cured through two treatments: 5, Cured through three treatments: 1, Markedly improved through multiple treatments: 2, Improved: 1, Ineffective: 9
Wang 2004 ²⁰	36	15-25	NR	NR	performed	NA	Cured through a single treatment: 32, Cured through two treatments: 3, Cured through six treatments: 1

Li 2014 ²¹	400	4	NR	NR	NA	Massage on neck and shoulder, herbal medicine, hot massage, physical therapy, acupuncture, etc.	Cured: 340, Markedly improved: 25, Improved: 20, Ineffective: 15
<hr/>							
Distal acupressure							
Zhang 1961 ^{*22}	1	5-7	1	1	performed	Massage on neck and shoulder for 10-15min	Cured: 1
Li 1984 ^{*23}	1	2-5	1	1	performed	NA	Cured: 1
Zhang 1988 ^{*24}	20	1-2	NR	NR	performed	NA	Cured through a single treatment: 17, Cured through two treatments: 2, Markedly improved: 1
Mao 1989 ²⁵	24	3	1-2	1	performed	NA	Cured through a single treatment: 14, Cured through two treatments: 3, Markedly improved through a single treatment: 6, Markedly improved through two treatments: 1
Liang 1999 ^{*26}	54	15-20	2	1	performed	NA	Cured: 41, Improved: 11, Ineffective: 2
Li 2007 ^{*27}	136	3-5	1-2	1	performed	NA	Cured through a single treatment: 87, Cured through two treatments: 31, Improved: 18
Liu 2012 ^{*28}	80	3-5	1-4	1	performed	NA	Cured through a single treatment: 61, Cured through two treatments: 13, Cured through three to four treatments: 6

Abbreviation: NA, not applicable; NR, not recorded.

*: study performing simple acupressure which uses only one acupuncture point

Table 3. Methodological Quality Assessment of Included Studies

Study	NIH's Quality Assessment of Case Series Studies								
	1	2	3	4	5	6	7	8	9
Both proximal and distal acupressure									
Hu 1999 ¹⁴	Yes	No	NR	NR	Yes	No	Yes	NA	No
Proximal acupressure									
Wei 1999 ¹⁵	Yes	No	NR	Yes	Yes	Yes	Yes	NA	Yes
Wang 2001 ¹⁶	Yes	No	NR	NR	Yes	Yes	Yes	NA	Yes
Xiang 2003 ¹⁷	Yes	Yes	NR	No	Yes	Yes	Yes	NA	Yes
Huang 2003 ¹⁸	Yes	No	NR	No	Yes	Yes	Yes	NA	Yes
Lu 2004 ¹⁹	Yes	No	NR	NR	No	No	NR	NA	No
Wang 2004 ²⁰	Yes	No	NR	Yes	No	Yes	NR	NA	Yes
Li 2014 ²¹	Yes	Yes	NR	No	No	Yes	NR	NA	No
Distal acupressure									
Zhang 1961 ²²	Yes	No	NA	NA	Yes	No	Yes	NA	No
Li 1984 ²³	Yes	No	NA	NA	Yes	No	Yes	NA	No
Zhang 1988 ²⁴	Yes	No	NR	NR	No	No	NR	NA	No
Mao 1989 ²⁵	Yes	No	NR	No	Yes	No	Yes	NA	No
Liang 1999 ²⁶	Yes	No	NR	NR	Yes	Yes	Yes	NA	Yes
Li 2007 ²⁷	Yes	Yes	NR	No	Yes	Yes	Yes	NA	Yes
Liu 2012 ²⁸	Yes	No	NR	No	Yes	Yes	Yes	NA	Yes

Abbreviation: NA, not applicable; NR, not recorded.

NIH's Quality Assessment of Case Series Studies consists of the following questions: "1) Was the study question or objective clearly stated?; 2) Was the study population clearly and fully described, including a case definition?; 3) Were the cases consecutive?; 4) Were the subjects comparable?; 5) Was the intervention clearly described?; 6) Were the outcome measures clearly defined, valid, reliable, and implemented consistently across all study participants?; 7) Was the length of follow-up adequate?; 8) Were the statistical methods well-described?; and 9) Were the results well-described?"

Table 4. Details of Acupressure on *Nakchim*

Study	Sample size	Acupuncture points	Treatment side	Cured after one treatment session	ICR	Improved	CER
Both proximal and distal acupressure							
Hu 1999 ¹⁴	9	1) SCM: LI17, LI18, TE16, SI16, LI4, LI5, TE3, TE10, and A-Shi points 2) DM: GB20, SI15, GB21, GV14, BL11, SI14, BL10, GB39, SI3, and A-Shi points 3) PCM: GV16, BL10, SI15, GV14, SI16, BL11, BL60, SI3, and A-Shi points	NR	NA	NA	9	100%
Proximal acupressure							
Wei 1999 ¹⁵	39	GB20, TE16, GB21, SI15, and A-Shi points	NR	32	82.05%	39	100%
Wang 2001 ^{*16}	30	SI11	affected or bilateral side	15	50.00%	27	90.00%
Xiang 2003 ¹⁷	112	GB6 and GB20	affected side	NA	NA	108	96.40%
Huang 2003 ^{*18}	45	SI11	bilateral side	NA	NA	45	100%
Lu 2004 ¹⁹	50	ST12 and Li17	affected side	32	64.00%	41	82.00%
Wang 2004 ²⁰	36	GB20, BL10, BL11, BL12 and A-Shi points	affected side	32	88.89%	36	100%

Li 2014 ²¹	400	GB20, GB12, ST12, and GB21	affected side	NA	NA	385	96.25%
					71.61%		95.65%
Subtotal	712			111	(95% CI, 64.51 to 78.71)	681	(95% CI, 94.15 to 97.15)
					111/155		681/712
Distal acupuncture							
Zhang 1961 ^{*22}	1	GB39	NR	1	100%	1	100%
Li 1984 ^{*23}	1	BL57	unaffected side	1	100%	1	100%
Zhang 1988 ^{*24}	20	TE3	affected side	17	85.00%	20	100%
Mao 1989 ²⁵	24	GB39 and EX-UE8	affected side	14	58.33%	24	100%
Liang 1999 ^{*26}	54	BL57	bilateral side	NA	NA	52	96.30%
Li 2007 ^{*27}	136	GB39	bilateral side	87	63.97%	136	100%
Liu 2012 ^{*28}	80	TE3	bilateral side	61	76.25%	80	100%
					69.08%		99.37%
subtotal	316			181	(95% CI, 63.49 to 74.68)	314	(95% CI, 98.49 to 100.24)
					181/262		314/316

Abbreviation: CER, clinical effective rate; CI, confidence interval; DM, deltoid muscle; ICR, immediately cured rate; NA, not applicable; NR, not recorded; PCM, posterior cervical muscle; SCM, sternocleidomastoid muscle.

*: study performing simple acupuncture which uses only one acupuncture point

Table 5. The Effects of Simple Acupressure in Included Studies

Acupuncture point	Cured after one treatment session	ICR	Improved	CER
SI11	15 (out of 30)	70.17% (95% CI, 64.36 to 75.98)	72 (out of 75)	50.00% (95% CI, 32.11 to 67.89)
GB39	88 (out of 137)	64.23% (95% CI, 52.11 to 76.35)	137 (out of 137)	100%
BL57	1 (out of 1)	100%	53 (out of 55)	96.36% (95% CI, 91.42 to 101.31)
TE3	78 (out of 100)	78.00% (95% CI, 57.45 to 98.55)	100 (out of 100)	100%
		69.08%		99.37%
total	181	(95% CI, 63.49 to 74.68)	314	(95% CI, 98.49 to 100.24)
		181/262		314/316

Abbreviation: CER, clinical effective rate; CI, confidence interval; ICR, immediately cured rate.

Note. “*SI11* located in the scapular region, in the depression between the upper one third and lower two thirds of the line connecting the midpoint of the spine of the scapula with the inferior angle of the scapula. *GB39* located on the fibular aspect of the leg, anterior to the fibula, 3 B-cun proximal to the prominence of the lateral malleolus. *BL57* located on the posterior aspect of the leg, at the connecting point of the calcaneal tendon with the two muscle bellies of the gastrocnemius muscle. *TE3* located on the dorsum of the hand, between the 4th and 5th metacarpal bones, in the depression proximal to the 4th metacarpophalangeal joint.” (Korean Medicine Convergence Research Information Center. KMCRIC standard acupuncture point database. KMCRIC Website. <http://www.kmcric.com/knowledge/acupoint>. Published 2008. Accessed September 19, 2017.)

Figure legend

Figure 1. The PRISMA Flow Chart of the Literature Screening and Selection Process

Figure 2. The Clinical Effect of Acupressure on *Nakchim*

Abbreviation: CER, clinical effective rate; ICR, immediately cured rate.

Accepted Manuscript

Potentially relevant articles identified through international electronic database searching MEDLINE (n=6), EMBASE (n=3), CENTRAL (n=1), CNKI (n=63), J-STAGE (n=18), RISS (n=29), KISS (n=12), OASIS (n=3)
(n = 135)

No additional records were identified through other sources

Records after duplicates removed
(n = 115)

Records screened
(n = 115)

Records excluded by titles and abstracts
(n = 86)

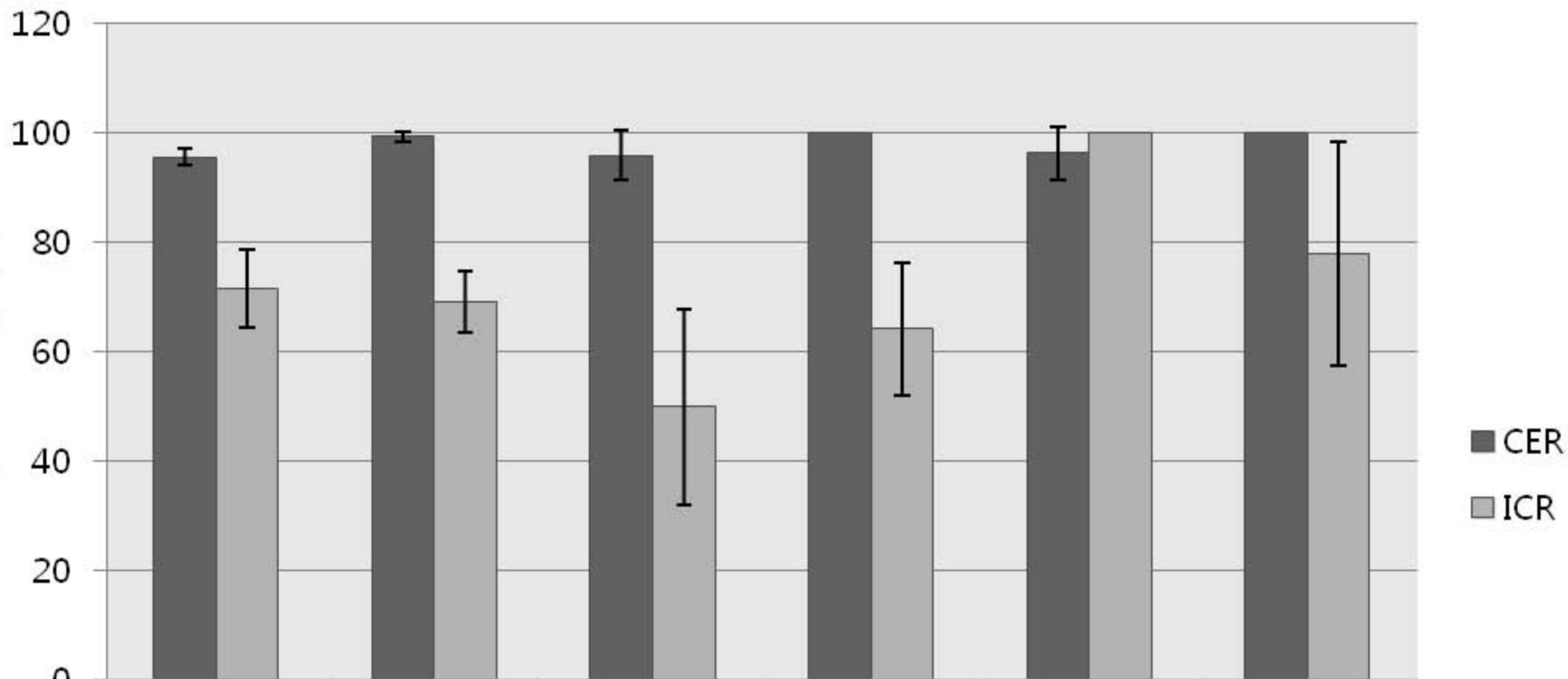
Full-text articles assessed for eligibility
(n = 29)

Full-text articles excluded, with reasons (n = 14)
(i) not a clinical study: 6
(ii) irrelevant condition: 3
(iii) not using acupressure: 2
(iv) insufficient data: 2
(v) using duplicate data: 1

Studies included in this review
(n = 15)

(i) one study: both proximal and distal acupressure
(ii) seven studies: proximal acupressure
(iii) seven studies: distal acupressure

percentage (%)



■ CER
■ ICR

	proximal acupressure	distal acupressure	SI11	GB39	BL57	TE3
CER	95.65	99.37	96	100	96.36	100
ICR	71.61	69.08	50	64.23	100	78