



# Narrative Review of the Association between Cervical Region Treatment and Facial Paralysis

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Facial nerve palsy refers to sudden, unilateral lower motor neuron facial paralysis. This study aimed to determine the importance of neck treatment in the treatment of facial paralysis. A literature search was performed on six online databases and other sources until January 15, 2023. A total of 426 papers were retrieved. After excluding duplicated and inconsistent papers, papers not including cervical treatment, and experimental papers on animals, two papers were finally selected. The type of treatment method, therapeutic effects, assessment of the risk of bias in randomized controlled trials, and non-randomized controlled trials and side effects were evaluated. Chiropractic, manual therapy, facial meridian massage, and acupotomy were applied to the face and cervical spine region. The results showed that each treatment had a significant therapeutic effect through evaluation index measurement methods, such as the visual analog scale and Yanagihara's unweighted regional grading system. This study demonstrated the importance of the cervical spine area in the treatment of facial paralysis. However, this study has many limitations. Thus, high-quality randomized controlled comparative studies on the treatment of the cervical spine area only or studies that include cervical spine area treatment as an interventional treatment while performing oriental or comprehensive treatment are needed.

**Keywords:** Bell palsy; Cervical pain; Facial paralysis; Neck pain

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## INTRODUCTION

Facial nerve palsy, also called “Guanwasa” or “Bell palsy,” refers to sudden, unilateral lower motor neuron facial paralysis [1]. Facial paralysis can cause mental and physical pain. In particular, the long-lasting aftereffects of facial paralysis often cause more pain than facial paralysis itself [2]. Paralysis distorts the shapes of facial muscles and interferes with common functions such as eating and eye closure [1]. This condition affects approximately 20 or 30 per 100,000 people annually [3]. According to the 2019 health insurance statistics, 111,089 patients visited oriental medicine treatment institutions with clinical manifestations of facial nerve disorder (G51), which occupies an important part to be ranked 26th among all diseases [4].

The neck is divided into anterior and posterior cervical triangles. The anterior cervical triangle is bounded laterally by the anterior edge of the oblique muscle, superiorly by the lower edge of the mandible, and medially by the midline of the anterior neck. Many cranial and peripheral nerves pass through the anterior cervical triangle to their final destinations in other parts. Additionally, it sends nerve branches to structures located within or bordering the anterior cervical triangle and other branches to nearby structures located within the anterior cervical triangle. The cranial nerves in this category are the facial, glossopharyngeal, vagus, splenic, and sublingual nerves [5]. The facial nerve, the 7th cranial nerve, is a complex nerve with sensory, motor, and parasympathetic fibers. In addition to facial muscle movement, it controls taste in the tongue and secretion of the nasal, palate, submandibular, and sublingual glands [6]. When these facial nerves malfunction, facial nerve paralysis, a neurological disease that entails paralysis of the affected facial muscles alongside taste disorders, hearing loss, tinnitus, and reduced tear secretion, can occur [7]. Furthermore, previous studies have reported that when herpes zoster is present on the parts of the face innervated by the trigeminal nerve, facial nerve palsy occurs in these areas [8]. The facial nerves and geniculate ganglion located on the face are supplied by blood vessels divided into various arteries, including the occipital and retroauricular arteries located in the neck region. Therefore, since some of the arteries related to the facial nerve exist in the neck region, it is thought that the treatment of the neck area will be helpful in treating facial nerve paralysis [9].

A previous study showed that when the tension of the sternocleidomastoid muscle is alleviated, irritation of the

geniculate ganglion is reduced, and peripheral blood flow of the face increases [10]. Thus, treatment of the rear neck area to relieve the tension of muscles, such as the sternocleidomastoid muscle, is thought to play a significant role in the treatment of facial paralysis. Accordingly, we tried to find and review studies that treated the posterior area of the neck in facial paralysis. Although the importance of treating the neck region in managing facial nerve palsy is increasing, few studies have been conducted on this topic. Thus, this study aimed to investigate the importance of neck treatment in the treatment of facial paralysis by searching for studies that included the cervical region in the treatment of facial paralysis, and two papers were found and reported.

## MATERIALS AND METHODS

### 1. Databases and search methods

A literature search for articles on the importance of neck pain treatment in the treatment of facial paralysis was conducted using six online databases, including PubMed, Cochrane Library, EMBASE, Korean Citation Index, Korean studies Information Service System, Research Information Sharing Service, and other sources. We searched for all papers published domestically and internationally from the establishment of the databases to January 15, 2023.

Domestic and foreign databases were searched differently. For foreign search databases, such as PubMed, Cochrane Library, and EMBASE, the search terms (“bell palsy” OR “bells palsy” OR “facial nerve palsy” OR “facial palsy” OR “facial neuritis”) AND (“randomized controlled trial” OR “controlled clinical trial” OR “random” OR “placebo” OR “trial”) AND (“neck pain” OR “cervical pain” OR “neckache” OR “neck pains” OR “cervicospinal pain”) were used. For domestic databases, such as the Korean Citation Index, Korean studies Information Service System, National Science and Technology Information Center, and academic research information services, the search terms “facial neuropathy,” OR “facial paralysis,” OR “specific facial palsy,” OR “cervical pain,” OR “neck pain,” OR “neck pain” were used.

### 2. Inclusion and exclusion criteria

The inclusion criteria included (1) randomized controlled trials (RCTs) and non-randomized controlled trials (non-RCTs) that investigated how much the neck region affects the treatment of facial paralysis and how much the treatment of this region affects the improvement of

facial paralysis treatment and (2) human clinical studies. The exclusion criteria included (1) studies on animals and (2) studies involving people with other facial diseases. Age was not considered.

The types of treatment for facial paralysis include treatments involving the use of needles, such as acupuncture, acupotomy, and thread-embedding acupuncture, and physical therapy and rehabilitation treatments, such as Chuna and meridian massage. All treatments performed either alone or in combination were selected.

### 3. Data extraction

Data were reviewed and extracted independently by two researchers. After screening all retrieved titles and abstracts, duplicate or irrelevant studies were excluded. Studies were reviewed to identify nonhuman experiments, simple review papers, and treatment areas that must be included. Any disagreements between the two researchers were resolved through discussion. In case of ambiguous data, the corresponding author was contacted via e-mail.

### 4. Analysis of the selected studies

Regarding the treatment of facial paralysis, two papers [11,12] that were finally selected approached the treatment of neck pain with different techniques. Through meridian massage and acupotomy, the neck area was treated along with the facial area.

### 5. Risk of bias assessment

The risk of bias in RCTs was evaluated by two independent researchers (YJK and YSL) using the Cochrane Risk of Bias tool (version 2) across five domains [13] to evaluate the quality of the selected RCTs. Any disagreements between the two researchers were resolved through sufficient discussion. If no consensus could be reached, the final evaluation was made through discussion with other researchers.

### 6. Safety

If the selected papers mentioned side effects that occurred during the implementation of all treatments, including each interventional treatment, the information was summarized and recorded.

conducted in the six online databases and other sources until January 15, 2023. Of the 426 studies, 37 duplicate studies were excluded, and 389 papers were reviewed, focusing on titles and abstracts. Among them, 368 papers were excluded. After reviewing the original texts of the 21 papers selected in the first round, two papers were finally selected (Fig. 1).

### 2. Characteristics of the included studies

In both papers [11,12], trials were conducted on a large number of patients as a treatment group and a control group. The age of the subjects was not mentioned in one study, whereas the average age of the subjects in the other study was 50 years. Although the treatment methods were different, the criteria for confirming the effect after treatment were similar in that the same evaluation method was used (Table 1).

#### 1) Meridian massage

In the study by Lee et al. [11], meridian massage was performed on the face and acupuncture points in the neck, such as Yifeng (TE17) and FengChi (GB20). This was a non-RCT study including 51 participants (26 in the treatment group and 25 in the control group). A total of six treatment sessions were performed for 20 minutes three times per week for two weeks. Regarding the treatment effect, the degree of facial paralysis recovery was measured by dividing the condition into five stages according to the unweighted regional grading system developed by Yanagihara and giving a total score. Back pain and neck pain were measured using the visual analog scale (VAS), and anxiety, one of the factors inducing facial paralysis, was measured using the State-Trait Anxiety Inventory, which was developed by Spielberger (1972) and adapted by Kim and Shin. Herbal medicine and acupuncture were equally administered to the treatment and control groups, and facial meridian massage was performed as an interventional treatment. The difference in the effect of meridian massage between the two groups was investigated using the t-test.

Regarding the degree of facial paralysis recovery, the difference in the increase in the score after the final treatment compared with the prescore was significantly higher in the treatment group than in the control group ( $t = 2.671, p = 0.010$ ). Statistically significant differences in wrinkles on the forehead, blinking, and lightly closing the eyes were observed. Pain analysis using the VAS revealed that the treatment and control groups had lower pain scores than the prescore. However, the pain score before and after treatment differed significantly in the

## RESULTS

### 1. Study search results

A total of 426 studies were retrieved through searches

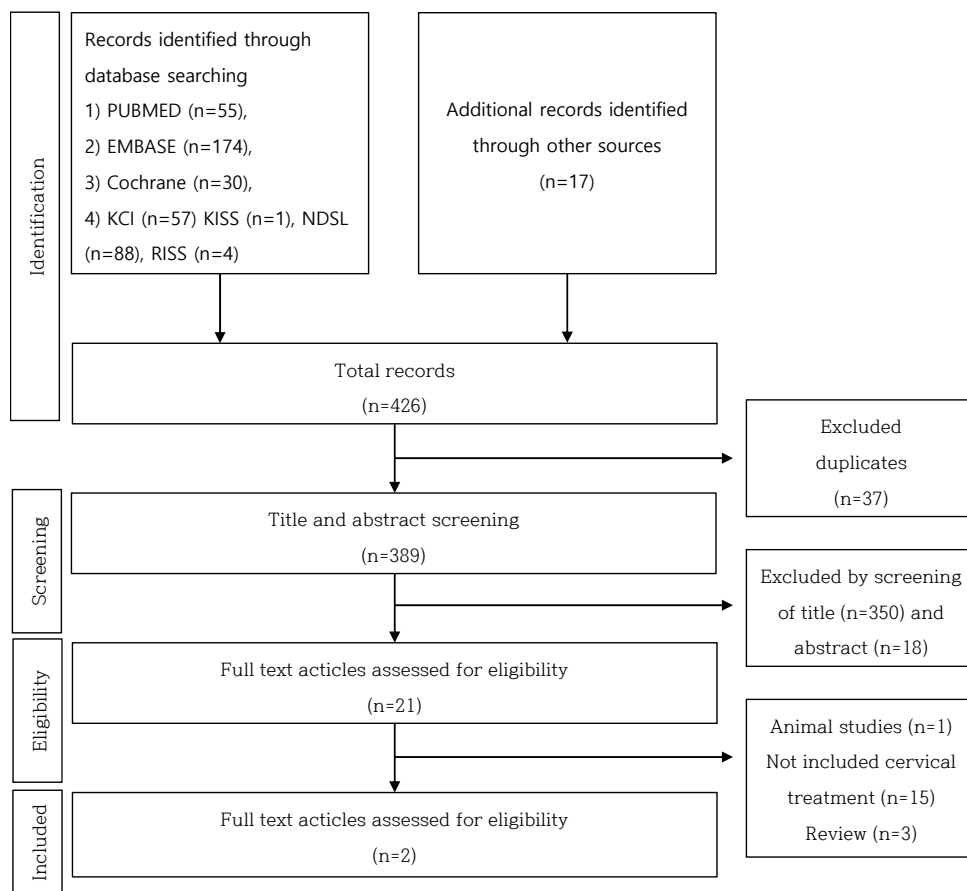


Fig. 1. Flowchart of the selection process.

treatment group. Unlike other areas, the postmortem score increased in the control group but decreased in the treatment group, indicating that the anxiety score was effective in that respect.

## 2) Acupotomy

The study by Lee et al. [12] showed that acupuncture treatment, herbal acupuncture, oriental medicine, Western treatment, and examination were common to the treatment and control groups. Only acupotomy was performed in the treatment group, and the affected area extended to the mastoid, C7 spinous process, antiligament, C2 spinous process, tender points around the facet joint, C1 transverse process, and C1 and C3 facet joints. Acupuncture was performed twice daily in hospitalized patients and 2-3 times a week in outpatients. Electroneurography was performed 7 days after the onset to measure the degree of disability. Antiviral agents, blood circulation agents, and vitamins were administered, and artificial tears and eye ointments were used. As a non-drug treatment, physical therapy, including facial massage and electrical therapy, was performed once a day.

Acupuncture was performed three times, once every 4-5 days during hospitalization and outpatient periods. However, it is difficult to confirm the final number of treatment sessions for each treatment because the total hospitalization period or outpatient period was not mentioned.

Treatment efficacy was evaluated using the Yanagihara unweighted grading system (hereinafter referred to as the Y-system) and VAS. Measurements were made during the patient's first visit and at one, two, and three weeks after the first visit. The comparison of the Y-score improvement by treatment period between the two groups showed significant differences in both groups except for the period between the first visit and the first week after the first visit and 2-3 weeks after the first visit. Furthermore, significant differences in the improvement of the VAS score after each treatment period were observed between the two groups, and a significant difference in improvement was observed when the replicated analysis of covariance (ANVOCA) test was performed by correcting the VAS score before treatment, which could affect the comparison of the VAS results.

**Table 1.** Characteristics of cervical region treatment for facial paralysis

No.	Author (y)	Study type	Sample age	Sample M:F (I/C)	Course of condition	Treatment point	Outcome assessment	Duration (frequency/total period)	Adverse events
1	Lee (2014) [12]	RCT	Group A: average age 50.8 years Group B: mean age 54.07 years	6:9/7:8	3 wk	Acupuncture - Mastoid and C7 spinous processes - Cervical ligament - Tenderness around the C2 spinous process, facet joint, and C1 transverse process - C1 and C3 facet joints Treatment group acupuncture points - Sishukong (TE23), Taiyang (EX-HN5), Tongziliao (GB1), Yingxiang (LI20), Juliao (GB29), Quanliao (SI18), Xiaguan (ST7), Jiace (ST6), Daying (ST5), zygoma, mandibular branch of the trigeminal nerve, and maxillary branch of the trigeminal nerve, and maxillary branch of the trigeminal nerve Control group acupuncture points - BaiHui (GV20), Cuanzhu (BL2), Sizhukong (TE23), YangBai (GB14), Chengqi (ST1), Yifeng (TE17), Yingxiang (LI20), Xiaguan (ST7), Quanliao (SI18), ShuiGou (GV26), ChengJiang (CV24), Dicang (ST4), and Jiace (ST6)	Y-system VAS	1. Acupuncture (total number unknown) Inpatient: 2 times a day Outpatient: 2–3 times a week 2. Medicinal acupuncture (total number unknown) Inpatient: once every 2 days Outpatient: 2–3 times a week 3. Western treatment ENoG test after 7–10 days Oral steroids for 10 days 4. Acupotomy Inpatient and outpatient: once every 4–5 d/3 times	Some vertigo and deterioration reactions Most recover within 3 days No other adverse reactions, such as hematomas or nerve damage
2	Lee (2009) [11]	Non-RCT	Not mentioned	11:12/15:13	2 wk	Jiace (ST6), Dicang (ST4), YangBai (GB14), Sibai (ST2), Juliao (GB29), Yifeng (TE17), FengChi (GB20), HeGu (LI4), and Zusanli (ST36)	Y-system VAS	3 times a week for 2 wk/6 times	Not mentioned

M, male; F, female; I/C, intervention group/control group; RCT, randomized controlled trial; VAS, visual analog scale.

3) Evaluation index

Both studies [11,12] used the Yanagihara unweighted grading system (the Y-system) and VAS as a scale for evaluating pain behind the ear. The Y-system is the same grade for 10 areas of facial function and is the most used of the regional scales, and the degree of paralysis is evaluated by the sum of all items. These studies showed significant results on that scale. Back pain is a common symptom of facial palsy. Therefore, the VAS was used to assess patients' subjective pain, and the corresponding index showed significant results.

However, in a study in which manual therapy was the treatment modality, instead of using indicators to evaluate whether the symptoms of facial paralysis improved, patients were asked whether improvements in paralysis, such as improved eye blinking or forehead wrinkles, were more common than before. The effectiveness of manual therapy was judged based on subjective sensations.

3. Side effects

Among the two studies [11,12], only one mentioned side effects [12]. Dizziness and deterioration of the patient's physical condition occurred in those who were sensitive and weak. However, most of them recovered within three days. No other adverse reactions, such as hematomas or nerve damage, were reported.

4. Risk of bias assessment

The one study [12] were RCTs and the risk of bias was evaluated using the risk of bias criteria of the Cochrane Handbook.

Regarding the "random assignment order item," the study selected a specific random assignment method. Since a simple randomization method based on a random number table was used, the risk of the random assignment order was found to be low.

Regarding the "bias due to deviations from the intended intervention," the study used a random number table, and the risk of bias was found to be low.

Regarding the "bias due to missing outcome data" and "bias in the measurement of the outcomes," in the studies, data on intervention outcomes were available for all or most of the randomized study subjects, and the intervention outcome measurement method was appropriate. Therefore, the risk of bias was found to be low.

Regarding the "bias in the selection of the reported result," in the study, the analyses were performed before the data were unblinded, and the data results were judged to be selectively nonselective (Fig. 2). Therefore, the risk of bias was found to be low.

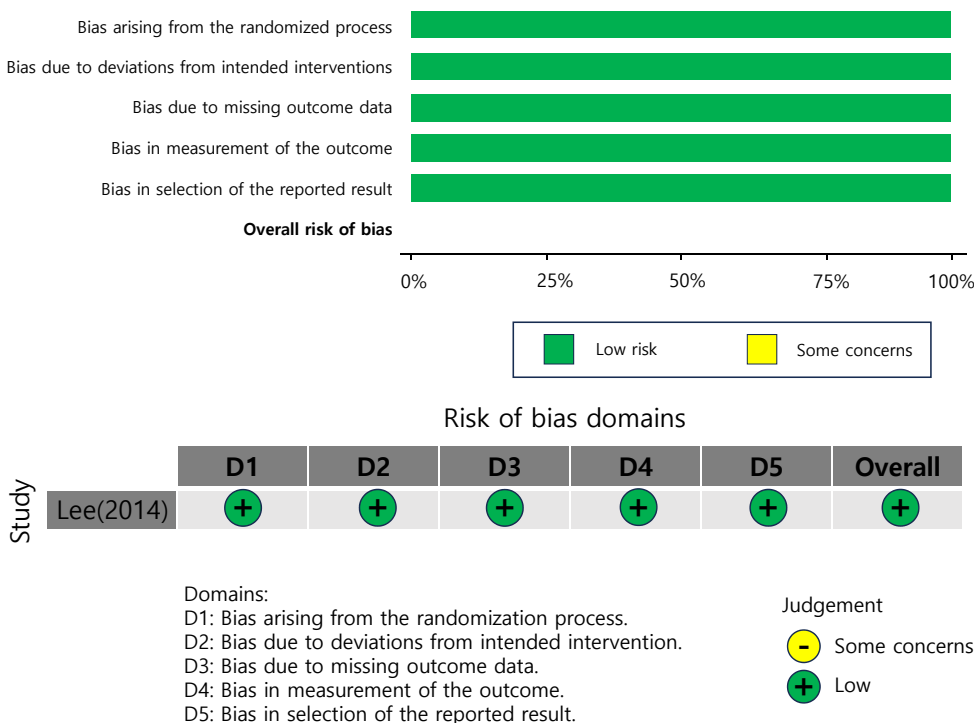


Fig. 2. Risk of bias summary.

## DISCUSSION

Peripheral facial nerve palsy usually indicates weakness of all facial muscles. In facial nerve palsy, facial wrinkles and nasolabial folds disappear, wrinkles appear on the forehead, and the corners of the mouth do not move. In more severe cases, the eyelids do not close, and when the patient attempts to close them, Bell's phenomenon is prominent with an upward rolling motion of the eyes [14]. Facial palsy is an acute paralysis of the facial nerve on one side of the face. The facial nerve contains fibers responsible for the movement of facial muscles and fibers responsible for the stapedius muscle, lacrimal glands, salivary glands, part of the ear, and the anterior two-thirds of the tongue [15].

When nerve damage in the face occurs due to peripheral facial nerve paralysis, various clinical manifestations, such as taste disorders, auditory hypersensitivity, and tear secretion disorders, are observed [16,17]. In other words, as muscle activity decreases due to paralysis, metabolic and oxygen requirements decrease, resulting in a decrease in blood flow and abnormal blood flow control of blood vessels distributed close to the skin of the face as the diameter of the arteries decreases. Furthermore, edema, coldness, and sensory abnormalities may occur due to this phenomenon [18]. The face is supplied with blood from several arteries branching off from the facial artery, which is a branch of the external carotid artery and superficial temporal artery [19,20]. Among them, the shallow coronary artery, the last branch of the external carotid artery, runs upward between the jawbone and the outer ear, gives out the transverse facial artery at a height of about 1 cm below the zygoma and runs upward, and is divided into its front and back branches distributed at the edge of the forehead and the parietal area [20].

Abundant blood flow must be sent to the damaged area to repair the damaged tissue. Increasing blood flow in the surrounding area is the most effective approach in cases of nerve damage where cell regeneration capacity is limited and there is no effective treatment [21]. This increased blood flow increases the levels of oxygen and nutrients in the blood, helping damaged nerves to recover [22]. Therefore, since the blood supply of the facial part depends on the blood vessel branches branching from the external carotid artery, if the muscle tension corresponding to the part where the external carotid artery flows is reduced through treatment, the blood flow increase can make the blood supply of the facial part smooth.

The region of pain is identified as a localized tender point of a nodule palpable within a tight band of muscle. These trigger points can cause associated spasms of other muscles. Eventually, symptoms, such as pain due to pain trigger points in muscles accompanied by continuous pressure applied to nerves when nerves pass through these tight bands of muscles, numbness due to nerve compression, and numbness of sensation, appear [23]. In other words, when pain is caused by the formation of a hard band of muscles for some reason, nerves passing through the area and heading to the face can be compressed, resulting in neurological symptoms. The facial nerve produces five terminal motor branches that exit the skull through the stylomastoid foramen and innervate facial expression muscles [24]. Moreover, it is postulated that the exit of cranial nerve VII through the stylomastoid foramen may lead to local entrapment, potentially resulting from tension in the temporalis muscle that originates from the external cranial protuberance and the inner one-third of the cranial vault curvature [25].

It is possible to approach the treatment of facial palsy from an anatomical perspective, focusing on prominent muscles, such as the sternocleidomastoid muscle, which can cause these issues. This approach involves close anatomical association with the stellate ganglion, which serves as the central ganglion for sympathetic nerves traveling to the head, neck, and chest. The sternocleidomastoid muscle is situated along the path through which these nerves pass. When the sternocleidomastoid muscle becomes tense, it can impede the stellate ganglion, leading to the onset of sympathetic symptoms. Murakawa et al. [26] reported that stellate ganglion block led to an increase in blood flow in the common carotid artery, and Kim et al. [10] showed that relaxing the tension in the sternocleidomastoid muscle improved facial blood circulation. Consequently, it is inferred that if stimulation of the stellate ganglion is reduced by relieving tension in the sternocleidomastoid muscle, excessive sympathetic activity can be diminished, resulting in increased blood flow in the facial region. This suggests that such an approach could be beneficial for treating facial paralysis. Furthermore, the sternocleidomastoid muscle attaches to the mastoid process. The facial nerve exits through the stylomastoid foramen situated on the anterior aspect of the mastoid process, where it intersects with various branches, including the temporal, zygomatic, buccal, and several branches. As a result, tension in the sternocleidomastoid muscle is believed to be correlated with facial paralysis due to its potential compression of nerves in the vicinity of the mastoid process. Therefore, addressing

the areas surrounding the mastoid process, such as the Yifeng (TE17) and FengChi (GB20) situated at the attachment site of the sternocleidomastoid muscle, is suggested to contribute to the improvement of facial paralysis [27]. Considering these points comprehensively, it can be asserted that restoring the mobility of the relevant cervical muscles and alleviating nerve compression play a role in treating symptoms associated with facial nerve paralysis. In this way, it is thought that cervical treatment should be performed together with facial nerve paralysis treatment due to the effect of the neck on facial nerve paralysis. We found two studies that conducted cervical treatment in the treatment of facial paralysis.

In the first study [11], meridian massage was performed on the acupuncture points in the neck region along with facial meridian massage. We tried to determine the efficiency of performing meridian massage on acupuncture points in the facial area and neck region, such as Yifeng (TE17) and FengChi (GB20). Symptoms of tenderness or hypersensitivity on the body surface were alleviated by appropriately stimulating the acupuncture points. It can be inferred that meridian massage can reduce pain by relaxing the muscles. Furthermore, by releasing enkephalins, which contribute to pain reduction, meridian massage can be expected to be effective. Additionally, it is important to alleviate symptoms of anxiety because it is considered one of the causes of facial paralysis. Therefore, it is important to note the effect of meridian massage on psychological aspects, including alleviating anxiety.

In the other study [12], basic treatment with acupuncture was performed, and acupotomy treatment was performed on the neck of the experimental group as an interventional therapy. Acupotomy improves the inflammatory environment of the tissue and relieves tenderness via direct insertion into the tender points. Additionally, by incising the muscle or other soft tissues that entrap the nerve, it is possible to relieve nerve pressure and relax stiff muscles to increase the range of motion of the joint [28]. Therefore, it seems that acupotomy of the cervical region directly stimulates the origin and insertion of the fascia and muscle to relieve the pressure of the nerve in the area and positively affect local blood circulation and nerve conduction. Approaching this concept, the tension in the cervical vertebrae adversely affects the blood flow from the cervical region to the facial region. Reducing tension in the cervical spine can affect the treatment of facial paralysis. It has been reported that relieving tension in the cervical spine muscles and smoothing the overall blood speed have a significant effect on the

treatment of paralysis [29]. Although most of the acupuncture sessions commonly performed in the treatment and control groups were performed in the same area, there was an exceptionally different area, and there was no explanation for the observation.

This study was conducted to review the importance of cervical region treatment in the treatment of facial paralysis disease through domestic and online data searches and to investigate the effectiveness of creating reference data for treating the disease in the future. The two selected studies [11,12] used various treatment modalities, such as acupotomy and meridian massage. In the first study [11], only one treatment was used, facial meridian massage, whereas in the other study [12], treatment was performed based on Western treatment, drugs, medicinal acupuncture, and acupotomy.

This study has some limitations. Given that only two studies [11,12] were selected, the sample size is too small to discuss whether relieving tension in the cervical spine is effective in treating facial paralysis. Although the clinical research papers that could be analyzed varied in terms of techniques or tools used for treatment, the number of studies was insufficient. Additionally, no study has performed treatment on the neck alone. Thus, additional high-quality clinical studies in which the intervention was performed on the neck alone are needed to increase the level of evidence. Additionally, since the association between facial paralysis and cervical spine was investigated, whether such treatment is effective for patients with facial paralysis without neck pain or muscle tension remains unknown. Thus, further studies are needed to investigate this point. Furthermore, acupotomy was used to reduce the stiffness in the cervical spine. Thus, more research is needed to investigate whether acupuncture can continuously stimulate the inflexible area and reduce stiffness in this area. Therefore, as a high-quality randomized controlled comparative study, it is necessary to conduct a study in which the cervical spine is included in the treatment as an interventional treatment while performing oriental or comprehensive treatment for the facial area to increase the level of evidence.

## CONCLUSION

This study was conducted to investigate the importance of the part of the neck located in the path of the facial nerve leading to the face and a direct treatment for the face in the treatment of facial paralysis. There-



fore, we searched for papers on the treatment of neck pain in the course of treating facial paralysis, and two papers were ultimately selected. Facial meridian massage was performed on the cervical spine and face, and acupotomy was performed on the cervical spine as an interventional treatment after treating the facial and cervical spine with acupuncture. In both studies, significant treatment effects were observed when cervical region treatment was performed in patients with facial paralysis.

## AUTHOR CONTRIBUTIONS

Conceptualization: YJK, YSL. Formal analysis: YJK, HRJ, SRK. Investigation: All authors. Methodology: YJK. Writing – original draft: YJK. Writing – review & editing: All authors.

## CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

## FUNDING

None.

## ETHICAL STATEMENT

This research did not involve any human or animal experiment.

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