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Ultrasonography for Facial Nerve Palsy: A Systematic Review and Meta-Analysis Protocol

Seojung Ha[1,*]
Bo-In Kwon[2,3,*]
Joo-Hee Kim[1,3]

[1]Department of Acupuncture and Moxibustion Medicine, College of Korean Medicine, Sangji University, Wonju, Korea

[2]Department of Pathology, College of Korean Medicine, Sangji University, Wonju, Korea

[3]Research Institute of Korean Medicine, Sangji University, Wonju, Korea

Background: Facial nerve palsy presents a significant healthcare challenge, impacting daily life and social interactions. This systematic review investigates the potential utility of ultrasonography as a diagnostic tool for facial nerve palsy.
Methods: Electronic searches will be conducted across various databases, including MEDLINE, EMBASE, CENTRAL (Cochrane Central register of Controlled Trials), CNKI (China National Knowledge Infrastructure), KMBASE (Korean Medical Database), ScienceON, and OASIS (Oriental Medicine Advanced Searching Integrated System), up to February 2024. The primary outcome will focus on ultrasonography-related parameters, such as facial nerve diameter and muscle thickness. Secondary outcomes will encompass clinical measurements, including facial nerve grading scales and electrodiagnostic studies. the risk of bias in individual study will be assessed using the Cochrane Risk of Bias assessment tool, while the grading of recommendations, assessment, development, and evaluations methodology will be utilized to evaluate the overall quality of evidence.
Conclusion: This study aims to review existing evidence and evaluate the diagnostic and prognostic value of ultrasonography for peripheral facial nerve palsy.

Keywords: Meta-analysis; Peripheral facial nerve palsy; Protocol; Systematic review; Ultrasonography

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Corresponding author: Joo-Hee Kim
Department of Acupuncture and Moxibustion Medicine, College of Korean Medicine, Sangji University, 83 Sangjidae-gil, Wonju 26339, Korea
E-mail: jhkim714v@gmail.com

*These authors contributed equally to this study.

INTRODUCTION

Facial nerve palsy is a condition marked by the loss of voluntary muscle movement on one side of the face, impacting daily activities like speaking, chewing, and closing the eyes. According to data from South Korea's Healthcare Big Data Hub of the Health Insurance Review and Assessment Service, as of 2022, facial nerve palsy falls under the disease code "G51" and is a prevalent neurological disorder. The statistics reveal 93,053 cases in medical and dental institutions and 94,249 cases in Korean medicine institutions. It ranks 23rd for inpatients and 24th for outpatients in Korean medicine institutions, with 3,163 and 93,686 cases, respectively [1].

Facial nerve palsy can be broadly classified into central and peripheral types. The central type typically presents in cranial nerve diseases such as cerebral infarction, while the more common peripheral type is mainly linked to inflammation of the peripheral facial nerve, often triggered by viral infections like Bell's palsy and Ramsay Hunt syndrome [2,3].

The assessment of peripheral facial nerve palsy holds significant importance in determining prognosis and guiding appropriate therapeutic interventions. Currently, various assessment indicators, including facial nerve grading scales and electrodiagnostic studies, are utilized to assess the severity and functional impact of facial nerve damage. However, facial nerve grading scales like the House– Brackmann scale and the Sunnybrook facial grading system are limited by their subjective nature, relying on doctors' observations for assessment [4]. Conversely, electrodiagnostic studies such as nerve conduction studies and electromyography offer objective data but are limited in their practical application in clinical settings due to time constraints. Accurate results are typically achievable only when these studies are conducted at specific time points relative to the onset of symptoms [5]. The limitations of these assessment methods underscore the need for more objective diagnostic tools and promising alternatives in evaluating facial nerve palsy.

Ultrasonography holds promise as a modality for evaluating peripheral facial nerve palsy, offering real-time imaging and potential insights into anatomical details. Previous research indicates that early-stage ultrasonography of the facial nerve can estimate the diameter, particularly when inflammation causes enlargement [6]. Additionally, facial muscle ultrasonography has been found to complement electromyography results, offering valuable information within the first 2 weeks postonset, when electromyography reliability is limited [7]. In the chronic stage, quantitative ultrasonography of facial muscles can characterize their status during denervation and regeneration [8]. Unlike subjective assessment scales, ultrasonography provides objective visualization, offering a clearer understanding of the extent and nature of damage. However, to date, no systematic review has been conducted on ultrasonography for facial nerve palsy.

This systematic review aims to comprehensively evaluate and synthesize existing literature on the use of ultrasonography in diagnosing and evaluating peripheral facial nerve palsy. By evaluating the potential clinical utility of ultrasonography, we aim to deepen our understanding of its role in peripheral facial nerve palsy. This review seeks to inform future research directions and offer insights to guide clinical practices, ultimately contributing to improved patient care.

MATERIALS AND METHODS

1. Study design and registration

This review adheres to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocols (PRISMA-P) statement [9]. The protocol has been registered with PROSPERO under registration number CRD42022381496. Upon completion of the review, the findings will be disseminated through publication in a journal. Ethical approval was deemed unnecessary for this literature-based study.

2. Eligibility criteria

1) Study types

This review will encompass clinical trials utilizing ultrasonography evaluation in individuals with peripheral facial nerve palsy, as documented in peer-reviewed journals. Excluded will be case reports, case series, experimental studies, editorials, letters, conference proceedings, or studies lacking a control group.

2) Participant characteristics

Eligible participants will be individuals aged 18 years or older diagnosed with peripheral facial nerve palsy. All stages of facial nerve palsy—acute, chronic, or sequelae—will be included, irrespective of disease duration.

3) Outcome measures

Primary outcomes will focus on ultrasonography-related parameters, encompassing facial nerve diameter and

facial muscle thickness. Secondary outcomes will involve clinical assessments, such as the House–Brackmann grading scale or the Sunnybrook facial grading scale, and additional parameters, including electrodiagnostic examination.

3. Information sources and search strategies

We will conduct searches across various databases, including MEDLINE, EMBASE, CENTRAL (Cochrane Central register of Controlled Trials), CNKI (China National Knowledge Infrastructure), KMBASE (Korean Medical Database), ScienceON, and OASIS (Oriental Medicine Advanced Searching Integrated System), up to February 2024.

A thorough search strategy was implemented utilizing a combination of free-text keywords and Medical Subject Headings (MeSH) terms relevant to peripheral facial nerve palsy and ultrasonography. The search terms have been tailored accordingly for each database. There are no language restrictions on the search. The detailed search strategy is outlined in Table 1.

4. Selection of studies

The selection of studies will be conducted independently by a minimum of two reviewers, adhering to predetermined eligibility criteria. Following the consolidation of search results from all databases using EndNote X20 (Clarivate Analytics), duplicate studies will be identified and excluded based on evaluations of titles, abstracts, and full texts. Reviewers will screen titles and abstracts to eliminate obviously irrelevant studies, while full texts of potentially eligible studies will be thoroughly examined. Any discrepancies will be addressed through discussion between the two reviewers, with a third mediator (JHK) intervening if necessary. A flow diagram illustrating the study selection process is provided in Fig. 1.

5. Data extraction and management

Information will be independently extracted by two reviewers using a predetermined extraction table. This table will encompass various aspects including publication year; author; article title; sample size; control group; variables pertaining to the subjects under study such as age, gender, disease duration, and clinical evaluation; as well as variables related to ultrasonography such as device specifications, scan protocols, and outcomes. Additionally, other outcome measures such as results from electrodiagnostic examinations will be included.

6. Addressing missing data

In instances where data is missing, efforts will be made to communicate with corresponding authors for additional information. If such data cannot be obtained, the analysis will proceed using available information. Sensitivity analyses will be conducted to consider the potential impact of any missing data.

7. Data synthesis and analysis

The process of data synthesis will entail a systematic narrative synthesis, which will be presented through both textual descriptions and tabular formats. This approach aims to offer a comprehensive overview and interpretation of the characteristics and findings observed in the studies included. For meta-analysis, Review Man-

Table 1. Search strategy for MEDLINE

Number	Search terms
1	facial paralysis [MeSH Terms]
2	bell palsy [MeSH Terms]
3	facial[Title/Abstract] OR hemifacial[Title/Abstract] OR bell*[Title/Abstract]
4	pals*[Title/Abstract] OR paralys*[Title/Abstract] OR paresi*[Title/Abstract] OR syskine*[Title/Abstract] OR postparalytic[Title/Abstract] OR neuropathy[Title/Abstract]
5	#3 AND #4
6	#1 OR #2 OR #5
7	ultrasonography [MeSH Terms]
8	sonograph*[Title/Abstract] OR ultrasound[Title/Abstract] OR ultrason*[Title/Abstract] OR echotomogr*[Title/Abstract] OR echography[Title/Abstract]
9	#7 OR #8
10	#6 AND #9
11	#10 NOT (animals[MeSH Terms] NOT (humans[MeSH Terms] AND animals[MeSH Terms]))

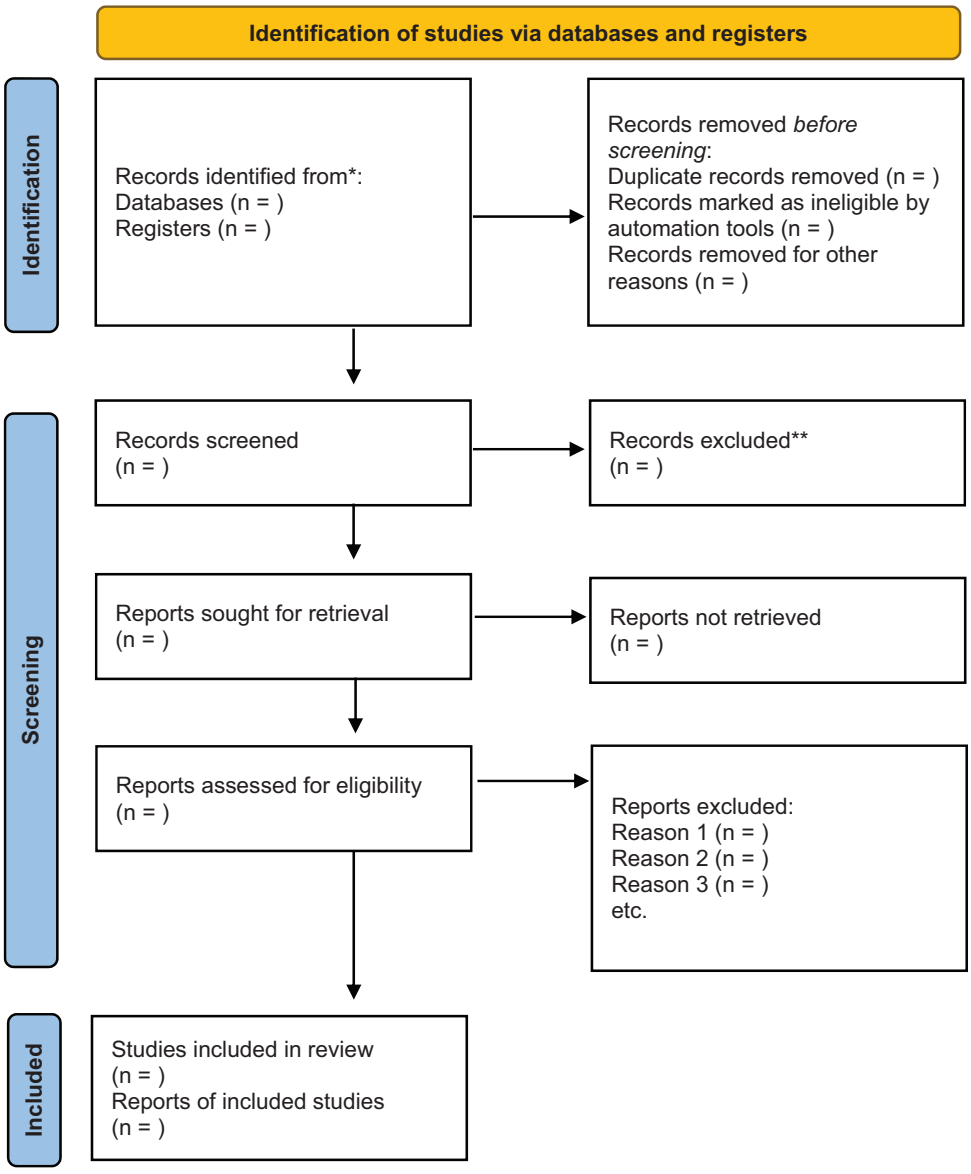

Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-analyses flow diagram.

ager 5.3 (RevMan web; The Cochrane Collaboration) will be utilized. The primary outcomes of the meta-analysis will be depicted as mean differences along with their corresponding 95% confidence intervals (CIs), utilizing the fixed-effects model. When adequate data are accessible, sensitivity and specificity estimates, along with their respective 95% CIs, will be calculated for individual studies. To assess heterogeneity among the studies, the I^2 statistic will be utilized, with heterogeneity deemed significant if it surpasses 75%. Additionally, the χ^2 test will be applied, with a *p*-value less than 0.05 indicating significant heterogeneity among the studies.

8. Subgroup analysis

If a sufficient number of studies are available, subgroup analyses will be conducted to examine the impact of factors such as etiology, disease duration (stage), and other relevant variables.

9. Risk of bias assessment

Two authors will independently assess the methodological quality of randomized controlled trials using the Cochrane Risk of Bias assessment tool. This tool evaluates several aspects of bias, including random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other

potential biases. Each aspect will be categorized as low risk, high risk, or unclear risk. In case of any disagreement between the two assessors, a third reviewer will be consulted to facilitate resolution.

10. Certainty of evidence

We will employ the grading of recommendations, assessment, development, and evaluations methodology to assess the quality of evidence for all outcomes. This assessment will consider domains such as risk of bias, consistency, directness, precision, and publication bias. Based on this evaluation, the quality of evidence will be categorized as high, moderate, low, or very low.

DISCUSSION

Facial nerve palsy, characterized by weakness in facial muscles, significantly disrupts daily life, impacting both function and appearance. It not only induces physical discomfort but also hampers social interactions and overall well-being [10]. Bell's palsy, a common type of peripheral facial nerve palsy, remains challenging to diagnose and treat due to its idiopathic nature [11].

Within the field of Korean medicine, there are still more patents visiting Korean medicine institutions for facial nerve palsy than medical or dental institutions [1]. The standard treatment typically involves steroid administration followed by various Korean medicine interventions like acupuncture and herbal medicine [12-14]. While effective, the varying disease progression among patients highlights the need for more objective diagnostic and monitoring tools [15].

In this context, ultrasonography emerges as a valuable diagnostic tool in Korean medicine institutions for facial nerve palsy. It enables early detection of facial nerve inflammation, facilitating timely intervention [7]. Moreover, ultrasonography aids in ongoing treatment monitoring and objective evaluation of improvement [8,16]. It also extends beyond diagnosis, providing dynamic, real-time evaluations of facial nerves and muscles. When used alongside established tests like facial nerve grading scales and electrodiagnostic studies, ultrasonography enhances diagnostic accuracy and treatment efficacy [17].

CONCLUSION

In conclusion, the utilization of ultrasonography as a diagnostic tool within Korean medicine institutions holds promise for enhancing patient care in cases of facial nerve palsy. Its capability to detect early pathological changes, monitor treatment progress, and provide an objective assessment of improvement supports the overarching goal of refining diagnostic accuracy and customizing treatments to suit individual patient needs. Nonetheless, prior studies have exhibited discrepancies in sample sizes, outcome measures, and literature quality, resulting in some debate. Therefore, this systematic review aims to appraise existing evidence and evaluate the diagnostic and prognostic value of ultrasonography in managing peripheral facial nerve palsy.

AUTHOR CONTRIBUTIONS

Conceptualization: JHK. Funding acquisition: JHK. Investigation: SH, BIK, JHK. Methodology: SH, JHK. Project administration: JHK. Supervision: JHK. Writing – original draft: SH, BIK, JHK. Writing – review & editing: All authors.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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ETHICAL STATEMENT

This research did not involve any human or animal experiment.

ORCID

Seojung Ha, https://orcid.org/0000-0001-9369-1119
Bo-In Kwon, https://orcid.org/0000-0003-3949-3052

Joo-Hee Kim, https://orcid.org/0000-0003-1435-5649

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