

SOUTH BAYLO UNIVERSITY

**Understanding of Mechanisms and Acupuncture Treatment on Bell's Palsy:
Literature Review and Meta-Analysis**

By

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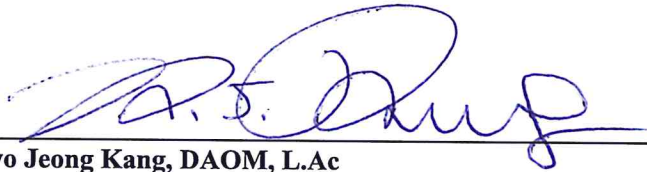
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ABSTRACT

Bell's palsy is a condition characterized by sudden and temporary weakness and paralysis of the facial muscle on one side of the face causing it to droop and causing stiffness. The purpose of this literature review is to find out the effectiveness of acupuncture treatment as to treat people suffering from Bell's Palsy according to etiology in perspective of Traditional Chinese Medicine (TCM) through a comprehensive analysis of randomized control trials, case studies and relevant articles, from recent years 2000-2017 in English and Korean languages by researching databases such as PubMed, EBSCO Research Database, Google Scholar, WebMD, Mayo Clinic, MNT, with keywords Sequelae of Bell's palsy, acupuncture, randomized controlled trial, and case study were used. A total of 5 Randomized Controlled Trials and 4 Case Reports were reviewed.

For meta-analysis were used RevMan 5.3 software, standardized mean difference (*SMD*) with 95% confidence interval (*CI*), *p*-value, Chi square (*Chi*²), *I*² index, and random-effects model. For the Bell's Palsy group showed FDI (Facial Disability Index) Physical function score improved by (*n* = 377; *SMD* [95% *CI*] = 14.21 [-2.52, 30.94], *p* = 0.001), and FDI Social function score improved by (*n* = 377; *SMD* [95% *CI*] = 14.21 [-2.52, 30.94], *p* = 0.001), compared to control group.

From the comprehensive literature review including the meta-analysis and case studies, acupuncture points effective for Bell's palsy are as follows: main points ST4, ST6, ST7, BL2, GB14, LI20, TE23 for local areas, and additional points LI4, TE17, SI18 ST36 were used most often and were most significant acupuncture points in treating Bell's Palsy. This study suggested some positive improvements however, there were difficulties in determining the effectiveness of acupuncture due to the lack of standardized outcome measurements. It is suggested that standardized outcome measurement tools are needed to determine the accuracy of effectiveness of acupuncture treatment.

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I. INTRODUCTION

Bell's palsy is an acute, idiopathic, unilateral paralysis of the face. It involves the paralysis of the facial nerve, which supplies all the muscles of facial expression. The facial nerve also contains parasympathetic fibers to the lacrimal and salivary glands, as well as limited sensory fibers supplying taste to the anterior two-thirds of the tongue. [16]

Its cause is unknown, but mounting evidence suggests that reactivated herpes viruses from cranial nerve ganglia play a key role in the development of this condition; its pattern is consistent with that of peripheral neural dysfunction. Inflammation of the facial nerve initially results in reversible neuropraxia and Wallerian degeneration ultimately ensues [2].

Bell's Palsy was first noted by Nicolaus Friedrich, an 18th-century professor of medicine at Wurzburg, who may have been the first to publish a case report of a facial nerve paralysis of unknown origin. He gave an account of 3 middle-aged adults who had a similar onset of acute or subacute unilateral facial paralysis, which gradually improved over a period of weeks to months. His clinical findings, *De paralysis Musculorum Faciei Rheumatica*, was first published in 1798 in the German medical literature. [4]

Bell's palsy affects many people of different gender, races, ages, not only affecting their overall health but with attitude toward their lives because of facial deformation can cause low self-esteem, anxiety and even depression. This is the reason why it is important to understand the mechanism of this disease and find out the best course of treatment for people suffering from Bell's palsy.

In the Western Medicine perspective, most cases of Bell's palsy recover spontaneously. Therefore, medical interventions aim to promote the recovery process and minimize the risk of

complications and long-term effects. Management includes eye protection, treatment with corticosteroids or antivirals, physical therapy, surgery. Eye ointment is used widely to avoid trauma to and drying out of the cornea. Corticosteroids have long been used in Bell's palsy, thanks to their powerful anti-inflammatory effect, and have been proven to be an effective treatment. Previous studies showed evidence for the presence of the herpes simplex virus in some cases of Bell's palsy. Thus, antiviral agents were applied in some cases. As optional treatments of Bell's palsy, no particular benefits of physical therapy or surgical operation have been reported. [3]

Acupuncture is part of TCM and dates back thousands of years. It involves inserting fine needles into specific points on the skin or applying various other techniques to the acupuncture points to bring about healing. In Bell's palsy, acupuncture treatment is thought to regulate channels and collaterals, harmonize qi and blood, strengthen the body's resistance to pathogenic factors, increase the excitability of the nerve, promote regeneration of the nerve fibers and formation of its collateral branches, enhance muscle contraction and blood circulation, and accelerate metabolism and recovery of body functions. [17] Several different modalities of Traditional Chinese Medicine treatment approaches are used such as acupuncture, electro-acupuncture, moxibustion, and blood-letting techniques.

Unlike in Western Medicine where they focus mainly to treat the symptoms, in TCM, we focus on the etiology and focus to treat the root cause of the problem hence different methods are used according to the patients' particular condition. The main theory of TCM treating Bell's palsy is the use of the meridian channels of Yangming (LI, ST), Taiyang (SI, UB), Shaoyang (TE, GB) where pathways lead to the facial muscle area. Since Bell's palsy mainly affects the eyebrow, side of the eye, corner of the nose and mouth, command point of the face LI4 is used on both

sides and local points of the eyes such as UB2, GB1, GB14 are used and for the face area SI18, ST3, LI20, ST4, ST7 are often used.

Additional techniques are used in combination with acupuncture such as electro-stimulation to strengthen De Qi sensation to open the blockage in the channels and collaterals, moxibustion technique to expel cold to promote circulation in the face in wind-cold attacks and blood-letting technique is used in cases to wind-heat condition to expel the heat in the facial muscle area alleviating the pain and stiffness in the facial muscle area.

Acupuncture is a safe treatment for a variety of symptoms, including Bell's palsy. Whether alone or with drug therapy, favorable effects of acupuncture on the disease response rate in the acute stage of Bell's palsy have been observed. [1] This will further help to develop better methods of acupuncture treatment and hope to provide patients to make an informed decision to choose the right treatment for their conditions and also provide an effective alternative treatment.

Reader of this literature review should keep in mind that although there were many studies treating Bell's palsy however treatment of Bell's palsy with acupuncture were limited. Most RCTs related to the effectiveness of acupuncture treatment used different outcome measurements, studies with standardized outcome measurements were also limited. Therefore, to overcome these limitations, several individual case studies were included along with meta-analysis for a comprehensive review of effectiveness of acupuncture treatment for Bell's palsy.

OBJECTIVES OF THE STUDY

The purpose of this study is to investigate the effectiveness of acupuncture for Bell's palsy, acupuncture points used for treatment according to TCM through a comprehensive review of case studies and meta-analysis.

The objectives of this study are as follows:

1. To understand the condition of Bell's palsy related to Western Medicine and TCM perspective.
2. To evaluate the effectiveness of acupuncture in improving the condition of Bell's palsy through a comprehensive review of meta-analysis and case studies.
3. Determine and compare the acupuncture points effective for treatment of Bell's palsy.

LITRATURE REVIEW

This literature review focused to explore the type of acupuncture method, acupuncture point selection, the mechanism behind the acupuncture treatment method and its effectiveness in treating Bell's Palsy. There are several randomized controlled trials and case studies, as well as articles about treating Bell's Palsy.

There is growing evidence from randomized controlled trials (RCTs) and case studies that acupuncture has clinically significant effects (efficacy over placebo controls). The results have proved that acupuncture may also have clinically significant effects on objective functional outcomes. Many conditions treated and outcome of acupuncture treatments are most often doubted because of subjective feeling of placebo effects, in cases of Bell's palsy however the results can be visually evaluated by analyzing pictures before and after the acupuncture treatment.

The most crucial aspect of treatment is the correct diagnosis of the condition and treating according to the etiology and the root cause of the problem being treated. For example, TCM patterns of attack of the meridians and collaterals acupuncture method to eliminate the wind and remove obstructions, for the invasion of pathogenic wind-heat, the blood-letting technique is combined with acupuncture to clear heat and for the invasion of pathogenic wind-cold, moxibustion is used to name a few. In this literature review, different methods of treatments are explored focused on TCM patterns of diagnosis and their results.

A. Mechanisms of Bell's palsy in the perspective of Western Medicine

Bell's palsy is the most common disorder affecting the facial nerve and is responsible for about 80% of all facial mononeuropathies. It mostly affects the corner of the mouth, nasolabial fold, and eye. It usually starts with the rapid onset of mild weakness to total paralysis on one side of your face, occurring within hours to days. Facial features drooping and drooling, difficulty making facial expressions, such as closing your eye or smiling. Pain around the jaw or in or behind your ear on the affected side may occur. Increased sensitivity to sound on the affected side accompanied by headache, decrease the ability to taste and changes in the amount of tears and saliva production.

The function of the facial nerve (CN VII) is crucial to understanding the pathophysiology of Bell's palsy. The nerve provides efferent motor innervation to the muscles of the face, the stapedius, and the posterior belly of the digastric fibers travel with the facial nerve. These parasympathetic fibers travel with the facial nerve. These parasympathetic fibers supply the lacrimal gland via the greater superficial petrosal nerve and the submandibular, all of these fibers are susceptible to paralysis if the facial nerve is affected. CN VII enters the temporal bone at the internal acoustic meatus, continues via the fallopian canal, and exits through the stylomastoid foramen. The narrowest portion of the fallopian canal is the lateral end of the internal auditory canal. The most probable mechanism of Bell's palsy is an inflammatory process of the facial nerve leading to its compression along this narrow segment of the fallopian canal. This inflammation initially causes temporary loss of sensory and motor function but can lead to permanent nerve degeneration later. [4]

The mechanism of Bell's palsy has been the subject of fierce debate for decades, with the underlying cause of neuropathy remaining elusive despite several proposed theories. One theory

describes Bell's palsy as an acute demyelinating disease, which may have a similar pathogenic mechanism as Guillain-Barre syndrome. It has been suggested that they both represent inflammatory demyelinating neuritis in which Bell's palsy can be considered a mononeuritic variant of Guillain-Barre. Also, Ramsey Hunt syndrome, which is a complication of the varicella-zoster virus infection, is the second leading cause of hemifacial paralysis. [4]

Based on recent reports, the suspected etiology could be due to the reactivation of latent herpes viral infections in the geniculate ganglia, and their subsequent migration to the facial nerve. Herpes simplex virus 1 (HSV-1) and herpes zoster virus (HZV) may be the causative agents, with HZV believed to be the more aggressive virus since it spreads across the nerve by means of satellite cells. [4]

Recently, the inactivated intranasal influenza (flu) vaccine has also been linked with Bell's palsy. Other known documented infectious causes of Bell's palsy include adenovirus, Coxsackie virus, cytomegalovirus, Epstein-Barr virus, influenza, mumps, and rubella. Rickettsia is a rare infectious cause. Suggested non-infectious causes of Bell's palsy include autoimmune processes such as Hashimoto's encephalopathy, ischemia from atherosclerosis leading to facial nerve edema, and familial origin, with about 4% to 8% of Bell's palsy patients reported having an associated family history [4].

In Western Medicine drug is the preferred choice for treatment of Bell's palsy. This is because in Western Medicine the exact cause of this condition still unknown, most western doctors speculate it is from a viral infection which creates inflammation by observing the symptoms and higher occurrence of Bell's palsy in patients with viral diseases. In an attempt to decrease the inflammation, they turn to prescription medicines such as Acyclovir, Valacyclovir, Prednisone. However, a Cochrane review of 4 RCTs conducted in 2004 for instance, showed that

corticosteroids were no better than placebo, and another review of 3 trials in the same year also concluded antivirals had no effect in the resolution of Bell's palsy. [14] Also, most often medication does not offer any improvement, but it creates undesirable side effects. Prolonged use of medication can lead to gastrointestinal problems, elevated blood pressure, glucose and liver enzyme levels along with dizziness and headaches.

Physical therapy is also often used to relieve the condition of paralyzed muscles. It can shrink and shorten, causing permanent contractures. A physical therapist can teach you how to massage and exercise your facial muscles to help prevent this from occurring.

Another option is surgery, decompression surgery is used to relieve the pressure on the facial nerve by opening the bony passage that the nerve passes through. But lately, decompression surgery isn't recommended unless is really needed due to the possible risks of permanent facial nerve injury and hearing loss are associated with this surgery.

Bell's palsy usually resolves in time and causes no long-term complications. However, during the illness most people with Bell's palsy are unable to close their eye on the affected side of their face, feeling of stiffness and pain.

This prompted many patients to seek alternative methods of treatments such as acupuncture treatment which by stimulating the local and distal area of the body promoting the circulation of qi and blood to improve the physical asymmetry of the face and relieving symptoms of Bell's palsy without the side effects of taking oral medications and permanent injuries.

B. Mechanism of Bell's palsy in Traditional Chinese Medicine (TCM)

According to Traditional Chinese Medicine (TCM), facial paralysis is known as “deviated mouth.” It was attributed to “wind” external pathogenic factors by old TCM doctors. There are excess pathogenic factors such as wind-heat and wind-cold conditions which can cause severe deviation of the face and paralysis. The wind also referred as “Thousand Evils” can carry pathogenic factors creating severe conditions of heat in the collaterals reaching to the organ level especially in the liver and stomach channels which govern the muscle and affect the local area. Also, severe wind cold can cause stagnation in the local area by constricting the blood vessels, channels and muscle layer of the face. [17]

Qi refers to the vital substances comprising the human body and the physiologic functions of viscera and bowels, channels and collaterals. It maintains life activities and reflects the resistance of the human body. The deficiency of qi allows the invasion of exogenous pathogenic wind. This is true in children, elderly and pregnant women. As we will see in this literature review, there are many instances of cases Bell's Palsy in this group of people where they were affected by the deficiency of qi and vital substances where the pathogenic factors invasion can easily cause this condition. In Bell's palsy, acupuncture treatment is thought to regulate channels and collaterals, harmonize qi and blood, strengthen the body's resistance to pathogenic factors, increase the excitability of the nerve, promote regeneration of the nerve fibers and formation of its collateral branches, enhance muscle contraction and blood circulation, and accelerate metabolism and recovery of body functions.

According to the TCM acupuncture theory, the main principle that ensure the effectiveness of acupuncture is called "De qi" this refers to unique sensations induced by needle insertion into the acupoint which creates a dull ache, tingling, heating and cooling like sensation.

The stimulation of acupoints can improve the condition of blockage in channels and collaterals. Meridian channels of Hand Yangming Large intestine, Foot Yangming Stomach, Hand Shaoyang Triple energizer and Foot Shaoyang Gall bladder channels are selected for treatment of Bell's palsy. The pathway of these channels passes through regions of the face affected by Bell's palsy, especially around the eyes, nose, and corner of the lip area. Acupuncture stimulation on the local and distal areas such as LI4 (command point of the face), helps the circulation of stagnated qi and blood and clear obstruction caused by Bell's palsy. [22]

Acupuncture is often combined with electrical stimulation to strengthen the sensation of "De Qi" it is used to induce stronger tingling sensation. Also, the cooling sensation can be induced by clearing the effects of heat through the blood-letting technique, for the condition of wind-heat by letting the blood out in the local area can clear the heat and expelling the pathogenic wind-heat. The heating sensation can be induced with the moxibustion technique, application of moxa can relieve wind-cold condition by warming and freeing up the stagnation of qi and blood. [22]

In conclusion, among various kinds of needle sensations, only the needle sensations of fullness could predict better facial function. The needle sensation of fullness claims more of our attention in acupuncture practice and research. Personality traits may have different effects on the objective outcome when different acupuncture techniques are used to treat patients with Bell's palsy. Acupuncture treatment is not just a simple needle placement, it involves many aspects of theories and techniques associated with it so it can help with symptoms but overall confidence of the patients which we will analyze and explore with the RCTs and case studies below.

II. MATERIALS AND METHODS

This narrative literature review is conducted by research databases such as PubMed, EBSCO Research Database, Google Scholar, WebMD, Mayo Clinic, MNT, mostly from recent years 2000-2017, irrespective of any articles and books, limiting to English and Korean language.

Keywords such as, "Acupuncture", "Bell's Palsy", "Randomized control trial", "Case Study" was used to collect information. Available works of literature related to Traditional Chinese Medicine using Acupuncture for treating Bell's Palsy would be reviewed.

Inclusion criteria:

This literature review includes randomized controlled trials (RCTs) that compared acupuncture (in different forms) with a control group and individual case studies. Clinical trials evaluating all forms of acupuncture (classical body, electro-acupuncture, and moxibustion) used alone or in combination were included by researching databases such as PubMed, EBSCO Research Database, Google Scholar, WebMD, Mayo Clinic, MNT, mostly from recent years 2000-2017 in English and Korean languages.

Exclusion criteria:

Databases other than English and Korean language and non-relevant to the topic were excluded. Excluded also are clinical trials and studies that have no indication of methods and statistics of information regarding TCM patterns. Trials with effective acupuncture treatment on

animals but no indication as to using this on a human were excluded. Scalp, auricular acupunctures are also excluded from this review.

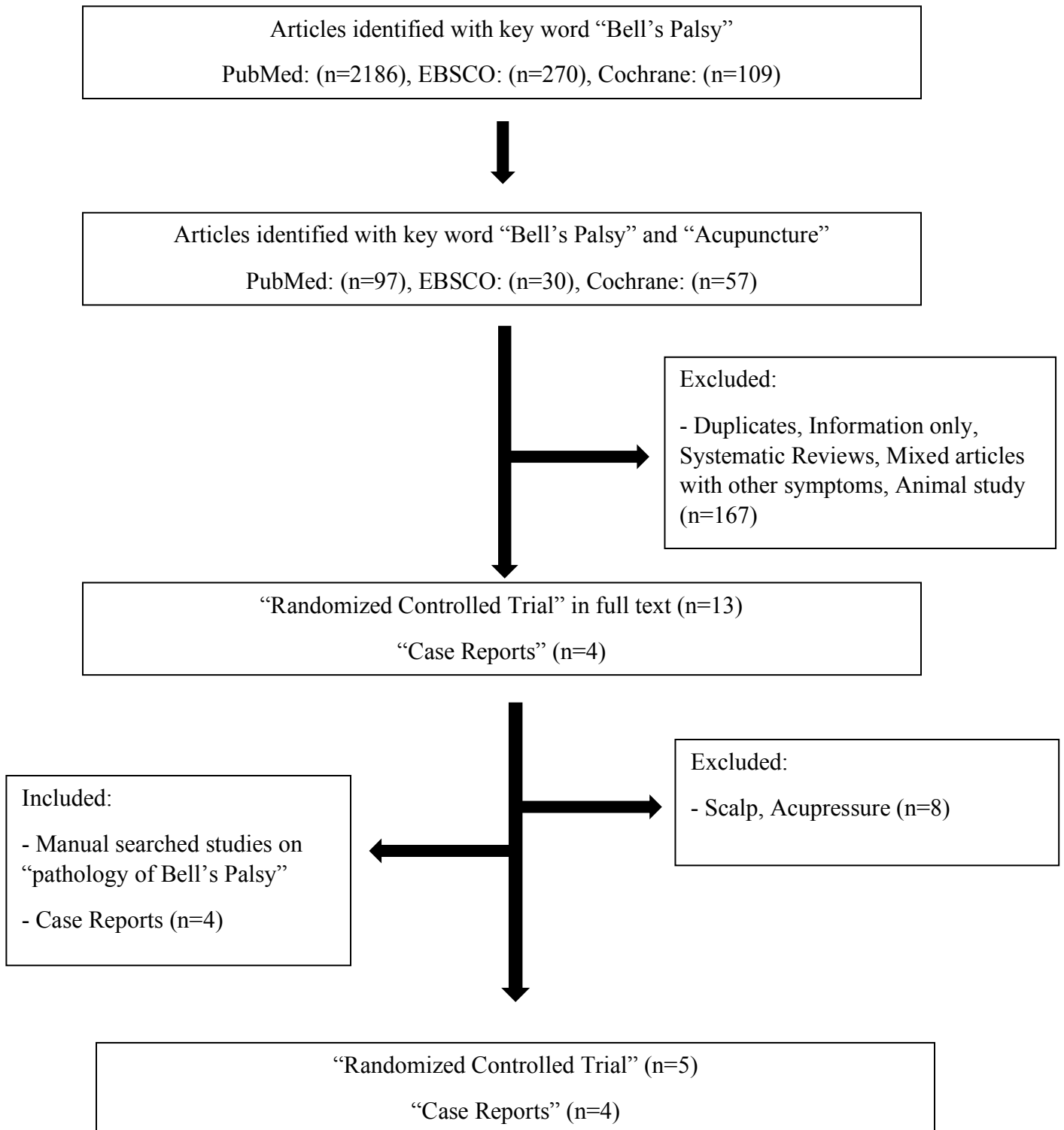


Figure 1. Exclusion and inclusion criteria of selecting research articles

Risk of Bias Analysis

For the methodological quality of included studies, the risks of bias were assessed using the Cochrane Risk of Bias Assessment Tool. It comprises seven quality elements:

1. Random sequence generation (selection bias);
2. Allocation concealment (selection bias);
3. Blinding of participants and personnel (performance bias);
4. Blinding of outcome assessment (detection bias);
5. Incomplete outcome data reporting (attrition bias);
6. Selective outcome reporting (reporting bias); and
7. Other bias.

Each item for risk of bias was given Green color (low risk of bias), White color (unclear), or red color (high risk of bias).

Meta-Analysis

Outcome measures for the analysis of the review were facial functions such as FDI physical score, FDI Social Score and House-Brackmann Grade. RevMan 5.3 software for windows (The Nordic Cochrane Centre, Copenhagen, Denmark) was used to perform the meta-analysis. All of the data in the review were continuous, and end-point scores were expressed as *SMDs* for different scales with associated 95% *CI*. The random-effects model was assumed for combining data because the variation of the effects across studies can follow a particular

distribution.³¹ Chi^2 or I^2 statistic was used to evaluate heterogeneities of studies where I^2 value of 50% or more is considered to be an index of substantial heterogeneity.

III. RESULTS

The overview of the Clinical Study review is summarized in Table 2 and 3 at the end of results section.

Kwon et al (2015) [2] “Acupuncture for the sequelae of Bell's Palsy: a randomized controlled trial”.

The purpose of this study is to explore the effectiveness of Acupuncture treatment for the sequelae of Bell's palsy. Patients were divided into two acupuncture groups. Acupuncture group (n=26) received a total of 24 acupuncture treatment for 8 weeks and waitlist group (n=13) did not receive any acupuncture treatments. The patients were evaluated according to changes in the below categories after 5 weeks and 8 weeks of acupuncture treatment. The acupuncture group received treatment in 3 areas in the following acupuncture points on unaffected side ST4, ST6, affected side ST1, EX-HN4 (Yuyao), TE23, LI20 and on both sides TE17, ST9, LI10, LI4, ST36, GB34. The Acupuncture group received mild and reinforcing method using clockwise-counterclockwise until achieving De-Qi. The rationale for unaffected side treatment was mostly to dispel wind and relieve pain, the affected side was to facilitate movement in the affected area by stimulation and both sides were to regulate qi, tonify qi of the local and distal area. The waiting list group were scheduled to receive similar acupuncture treatment after 8 weeks of randomization trial. There were 2 methods of outcome measurements. First participants were given 5 multiple choice questions regarding muscle function and second, House-Brackmann Grade FDI physical score, lip length and stiffness were measured after 5 weeks and 8 weeks of treatment. A total of 8 weeks and 24 sessions of acupuncture treatment had a positive effect on Bell's palsy. FDI social scores have improved by mean difference 23.54; 95% confidence interval, 12.99 to 34.08), Sunnybrook facial nerve grading have improved as well by mean

difference 14.77; 95% confidence interval 5.05 to 24.49 and stiffness scale improvement to mean difference -1.58, 95% confidence interval -2.26 to 0.89. There were some minimal changes in House-Brackmanns grade but overall acupuncture had a beneficial effect versus the control group.

Xu et al (2013) [31] “Effectiveness of strengthened stimulation during acupuncture for the treatment of Bell palsy: a randomized controlled trial”

The purpose of this study is to explore the effectiveness of Acupuncture treatment for the sequelae of Bell's palsy with De qi stimulation. Patients were divided into two acupuncture groups, acupuncture Control group (n=171) received acupuncture treatment without any manipulation. A total of 20 acupuncture treatment for 5 sessions per week for 4 weeks. And acupuncture De qi group (n=167) received acupuncture treatment with manual manipulation treatments, which involves lifting, thrusting, and twirling. A total of 20 acupuncture treatment for 5 sessions per week for 4 weeks. The acupuncture group received treatment in 2 areas in the following acupuncture points on unaffected side LI4 and on affected side GB14, ST4, ST6, ST7, TE17. The treatment for both groups consisted of 30 minutes session of total of 20 treatments. For the control group needles were inserted and left in place for 30 minutes without stimulation. For the De qi group, the needles were manipulated manually after the insertion by lifting, thrusting and twirling every 10 minutes. The overall De qi score was significantly higher in the De qi group (n = 135; mean 22.74 SD 3.56) than in control group (n = 127; 14.85 SD 2.61). Among the 262 patients who rated the De qi on the visual analog scale, there were a positive effect of De qi on grade 1 scores on the House-Brackmann scale at 6 months.

Zhao et al (2010) [21] Effect of Acupuncture Combined with Blood-letting by a Three-edged Needle on 50 cases of Bell's Palsy at the Acute Stage.

The purpose of this study is to explore the effectiveness of Acupuncture treatment combined with blood-letting by using a three-edged needle for sequelae of Bell's palsy caused by wind-heat syndrome at the acute stage. Patients were divided into two groups of 50 patients. Both groups treated for about a month once every other day. In the control group, 50 patients were treated by acupuncture only and the following acupuncture points were used on the affected side BL2, TE23, ST2, GB14, ST4, ST6, SI18, LI20 and LI4 on both sides. In the treatment group, 50 patients were treated by the same acupuncture points plus the blood-letting method was used by puncturing TE1 and the ear apex on both sides bleeding about 8-10 drops of blood for 5 consecutive days in the first course of treatments.

This study concluded that selecting facial points in combination with distal points of Yangming and Shaoyang meridian points produced better results in therapeutic effects by improving the signs and symptoms on Bell's palsy of the wind-heat syndrome at the acute stage. The comparison of scores for signs and symptoms from week 1, weeks 2 and 1 month were reduced in the treatment group by ($P<0.05$) versus the control group by ($P<0.01$). In table 8, it was concluded that the curative effect of the control group was rated at 78% versus the treatment group rated at 94% after 1 month of treatment. [21]

Kong et al (2015) [20] Specific Correlation between the Hegu Point (LI4) and the Orofacial Part: Evidence from an fMRI Study

The purpose of this study is to explore the neural activity of acupuncture point LI4, ST6 and sham point for sequelae of Bell's palsy. 36 patients were divided into three groups. Each group received randomly received transcutaneous electrical acupoint stimulation (TEAS) at only one of three acupoints (LI4, ST6, and a sham point). Both scans were compared between the resting state for 3minutes and with the electroacupuncture connected for 3minutes.

By TEAS stimulation on acupoints LI4 and ST6, there were 5 main areas of brain regions that were activated that cover different locations of brain areas 1. The somatosensory cortex covers areas like postcentral gyrus, inferior parietal lobule, 2. Motor cortex cover areas like precentral gyrus, 3. The auditory cortex covers areas like superior temporal gyrus, 4. The prefrontal cortex covers areas like middle frontal gyrus, and 5. Cerebellum area of the brain. These five areas of the brain are thought to play an important role in the planning of complex and coordinated movements. However, stimulation in the sham area of the brain does not relate to any specific needling location of the brain. [20] In below table 3 compares the activation of the brain region triggered by TEAS with acupoints LI, ST6, and sham point.

Table 1. Activation of TEAS compared with acupoints LI, ST6 and Sham point [20]

Brain Regions	BA	LI4 L/R	Voxels	BA	ST6 L/R	Voxels	BA	Sham L/R	Voxels
Precentral gyrus	6	L	23	7	R	202			
Postcentral gyrus	½	R	52	1/2	L	258			
				/3/43					
Supramarginal gyrus	40	L	105				40	L	29
Middle frontal gyrus	8	L	129	46	L	284			
Inferior frontal gyrus				9	R	826			
Superior temporal gyrus	22	L	94				41	L	42
Middle temporal gyrus				21	L	245			
Inferior temporal gyrus	20	L	121						
Cerebellum		L	147					L	22
Cerebellum posterior lobe					L	907			
Superior parietal lobule		L	65						
Inferior parietal lobule	5	R	74	5	L	874			
Middle cingulate cortex				31	R	56			

As we can see in Table 1., among the 13 regions of the brain triggered by TEAS acupoint LI4 triggered 9 of 13 regions 7 on left side and 2 on the right side and acupoint ST6 triggered 8 out of 13 regions 5 on left side and 3 on right side however sham point only triggered 3 out of 13 regions and only on the left side. The comparison of brain regions activated between LI4, ST6 versus the sham acupoint, between the LI4 acupoint activation versus sham point activation and we can observe those brain regions that were activated more by TEAS at LI4 than by the sham

point. Also, we can observe that right LI4 showed the same activation area as the ST6 acupoint. Brain regions that were activated of the right LI4 and the left ST6 were broadly overlapping and adjacent. In conclusion, the data above suggest that LI4 and ST6 may elicit more extensive and specific activities in the human brain than the sham point.

Guan et al (2012) [22] Infrared thermography and meridian-effect evidence and explanation in Bell's Palsy patients treated by moxibustion at the Hegu (LI4) acupoint

The purpose of this study is to explore the effects of moxibustion thermal stimulation on acupuncture point LI4 for Bell's palsy. Total of 60 people were involved. Two groups of 30 control group of healthy individuals and 30 Bell's Palsy patients. Each group received moxibustion at LI Hegu acupoint and an infrared thermal imaging camera was used to observe changes in facial temperature in real time. Among the 30 healthy (control group) and 30 Bell's palsy patients (BP group), below figures shows significant temperature increase in the face overall in healthy group forming a T-shaped hot area, especially in the case of Bell's palsy patients; after 11 minutes moxibustion in LI4 acupoint has increase asymmetry temperature in the face area concentrated around the lips through thermal image. This study shows that by increased temperature can help circulation in the face area improving asymmetry of the face caused by wind-cold invasion in Bell's palsy patients.

Cho et al (2013) [19] Case study of Jung-an Acupuncture on the Sequelae of Peripheral Facial Palsy.

The purpose of this study is to explore the effectiveness of Jung-an acupuncture treatment for sequelae of Bell's palsy. This study involves 4 patients suffering from Sequelae of peripheral facial palsy with Jung-an acupuncture by measuring Yanagihara's scores and Peitersen grades.

Case #1: 36-year-old female [19]

This patient had right side facial paralysis of unknown etiology. The patient had the first paralysis back in 2010 and was treated at a local acupuncture clinic. She got better after the treatment but there were some traces of paralysis but she ignored it. On 2012 paralysis returned at that time Y-system grade was 23. She had a treatment 1-2 times a week for 3 months total of 20 treatment after the treatment Y-system score improved to 39 and SP grade improved from grade II to grade I. The SAQ (synkinesis assessment questionnaire) showed that patient mostly complained about not being able to close right eye and lip movement giving SAQ score 31.1 and after treatment had improved to SAQ score 26.7 points. No pictures were taken.

Case #2: 43-year-old female [19]

Right side facial paralysis occurred in December of 2012. The patient had a history of high blood pressure and currently taking medication. The patient showed paralysis on the lower lip area before the treatment Y-system score was 29 points, SP grade was I. The treatment was planned for 2 months but due to fast recovery treatment was finished after 10 treatments for about a month and Y-system score had improved to 33 points and SP grade improved to 0.

Case #3: 42-year-old female [19]

The left anterior and cleft lip facial paralysis occurred in June 2012. Prior to the treatment Y-system score was 34 points and SP grade were at II. After an interview with the patient, treatment was planned for over course of 2 months 1~2 week according to her schedule achieving a total of 15 treatment. After the treatment, the Y-system score showed 37 points of improvement and SP graded to I. However, there were still some visual traces of unbalance.

Case #4: 40-year-old female [19]

Right side facial paralysis in 1995. The patient was suffering from the effects of untreated Bell's Palsy for many years. There were some improvements over the years but still showed facial unbalance. Patient has also a history of high blood pressure and currently taking medication. Prior to the treatment Y-system score was 39 points somewhat minor unbalance, and SP grade was at I. After an interview with the patient, treatment was planned for over course of 2 months 1~2 week according to her schedule achieving a total of 15 treatment. After the treatment, the Y-system score showed 40 points improvement and SP graded to 0. However, there were still some visual traces of unbalance before and after the picture was taken showed minor differences.

Lei et al (2010) [23] Acupuncture Benefits a Pregnant Patient Who Has Bell's Palsy: A Case Study.

This is a case study report where it explores the safety of acupuncture treatment for Bell's palsy during pregnancy. A 27-year-old women were exposed to wind and cold weather at 27 weeks of pregnancy. After exposure to this kind of weather, she noticed that she was not able to close her left eye completely, and the crease around the eye and nose weren't noticeable. Also, she couldn't wrinkle the left side of her forehead and the left eyebrow was lower than the right.

Upon evaluating her condition with the House-Brackmann facial nerve grading system from levels I to VI, her level was at level II. Nottingham system was 50.88% which measures the four points on the face and the sides and compare the movement with normal side and abnormal side as a percentage. The patient was treated for 2 weeks with acupuncture and moxibustion. First week the patient had daily treatment of acupuncture on the following points, BL2, Taingyang, ST4, Shangneidicang, Xiangneidicang, LI20, SI18, ST36, on both sides and moxa sticks were applied to GB14, ST4 for 5 minutes at 3cm above the skin. On second 2, the patient had daily treatment of acupuncture on the following points, GB14, BL2, Taiyang, ST4, LI20, I18, REN24 on affected side ST36 on both sides. Acupoint LI4 was excluded because it is contraindicated during pregnancy. After 2 weeks of treatments, patients' symptoms have disappeared. Her face was returned to normal. The House-Brackmann score has improved to Level I and the Nottingham score was 96.46%. In this case, acupuncture with moxa sticks treatment helped a sudden attack of the wind-cold.

Wong et al (2008) [25] Effect of Acupuncture in a patient with 7 years history of Bell's palsy.

This is a case chronic case of a Bell's palsy of 15 years old girl who has been suffering since the age of 7 years old. Examination showed asymmetric eyes where the right eye was smaller, it had synkinesis, involuntary twitching of eyes, facial distortion of cheeks, smiling, and an imbalance of raising eyebrows. During the period of 7 years, she tried the conventional method of using steroid but it didn't help so resorted to acupuncture treatment. Upon evaluating her condition with the House-Brackmann facial nerve grading system from levels I to VI, her level was at level IV. The patient was treated for 25 sessions in 2 months and following

acupuncture points were used locally, LI20, ST2, ST3, ST4, ST6, ST7, SI18, BL2, TE17, TE23, GB14, GV26, CV24, EX-HN5 (Taiyang), EX-HN16 (Qianzheng) and distal points LI11, ST36, ST40, SP6, SP10, HT8, SI3, BL67, PC8, TE5, LR3. After 2 months of treatments, the overall improvement was about 60%. Muscle strength of the has improved by 45% and around the eyebrows has improved by 60% but there was an only 1-grade level improvement on House-Brackmman; this thought to be caused by the length of the Bell's palsy condition. Despite the improvement on muscle strength of the face area, due to the long term almost 7 years of Bell's palsy there was not much improvement on the asymmetry of the face and a still noticeable trace of synkinesis.

Jihe Zhu et al (2017) [27] Case Report – Pediatric Bell’s Palsy Treatment with Acupuncture

This is a case of an 8-year-old boy. The examination showed that the left side of the face was affected by paralysis; he could not close the eye and the corner of the mouth was dropped. This was caused after he experienced a very stressful situation and dreadful fright, he also experienced excessive sweating but appetite and sleep were normal. Prior to the acupuncture treatment, he was prescribed Neurobion, Amosksiklav, and Acyclovir but none of the medication helped with the condition. The patient was treated for 10 sessions once per week, 30-45 minutes for each session, a total of 10 weeks. Acupuncture points, ST4, ST6, ST7, GB14, LI4, TE17 were used. After 10 treatments, the patient was able to open and close the eye again, winkle, smile, yawn, and chew, also with the treatment facial muscle function was completely recovered, muscle tone was normal with the full range of motion without any side effects.

The overview of the Clinical Study review is summarized in Table 2.

The below Table 2 summarizes the participants, interventions, outcome measurements and results of each clinical case studies in table format. Nine articles were found that five were the randomized controlled trials and four were the case studies with seven participants participated in the study. As shown in Table 2 and 3, total 573 participants were participated from ten studies. All nine articles were published in last 20 years.

Table 2. Overview of the RCTs, Case Study Reports

Clinical Study Cases	Participant	Intervention	Outcome Measurements	Results
Kwon et al (2015) [2]	RCT/39 patients in 2 groups	No Acup/Acup	House-Brackmann Grade FDI Physics function and Social function Score	FDI Physics 21.54 [9.15, 33.93] FDI Social 23.54 [13.22, 33.76]
Xu et al (2013) [30]	RCT/338 patients in 2 groups	Acup/Acup with strong De qi	House-Brackmann Grade FDI Physical function and Social Function Score	FDI Physics 3.40 [1.50, 5.30] FDI Social 6.40 [4.43, 8.37]
Zhao et al (2010) [21]	RCT/100 patients in 2 groups	Acup only /Acup with blood-letting	House-Brackmann Grade	curative effect of the control group was rated at 78% versus the treatment group rated at 94%
Kong et al (2015) [20]	RCT/ 36 patients were divided into three groups.	(TEAS) acupoints (LI4/ST6/ sham point)	fMRI	Total of 13 regions of the brain triggered by TEAS was higher in acupoint LI4 by 9, ST6 8, and Sham 3 areas respectively.
Guan et al (2012) [22]	RCT/60 patients in 2 groups Healthy/ Bell's palsy	moxibustion on LI4	facial IRT (infrared thermography)	Improved the balance of the temperature by 25/30 of cases in high temperature area 5/30 of cases in low temperature area.
Lei et al (2010) [23]	Case Report 27-year-old women during pregnancy	Acup/moxa	House-Brackmann	Improved 1 grade level

Table 2. - continued

Wong et al (2007) [25]	Case Report 15- years-old girl with a 7-year history	Acup only	House-Brackmann Grade	Improved 1 grade level
Cho et al (2013) [19]	Case Report 4 patients treated	Jung-an acupuncture	Yanagihara's scores Contraction	Case 1 improved 3 points, Case 2 improved 4 points, Case 3 improved 3 points, Case 4 improved 1 point
	Case #1: 36-year-old female			All cases improved by 1 grade level
	Case #2: 43-year-old female			
	Case #3: 42-year-old female			
Case #4: 40-year-old female				
Jie Zhu at al (2017) [27]	Case Report 8-year- old boy	Acup only	Visual Signs and symptoms	facial muscle function completely recovered muscle tone was normal with the full range of motion.

The overview of the Clinical Study review is summarized in Table 3.

The below Table 3 summarizes the objectives, main and supplemental acupuncture points and methods used for each clinical case studies in table format. Total of 573 participants were participated from nine studies. Nine articles were found that five were the randomized controlled trials and four were the case studies with seven participants participated in the study.

Table 3. Overview of Acupuncture points used in Study Cases, Case Study Reports

Clinical Study Cases	Objective	Main points	Supplement points	Method
Kwon et al (2015) [2]	Explore the effectiveness of Acupuncture treatment for sequelae of Bell's palsy	ST4, ST6, ST1, EX-HN4, TE23, LI20	TE17, ST9, LI10, LI4, ST36, GB34	Acupuncture to achieve De qi
Xu et al (2013) [30]	Explore the effectiveness of Acupuncture treatment for sequelae of Bell's palsy	ST4, ST6, ST7, GB14, LI4, TE17.	Lifting, thrusting, twirling	Acupuncture to achieve De qi
Zhao et al (2010) [21]	Explore the effectiveness of Acupuncture treatment combined with blood-letting by using a three-edged needle for sequelae of Bell's palsy caused by wind-heat syndrome at the acute stage.	BL2, TE23, ST2, GB14, ST4, ST6, SI18, LI20, LI4	TE1 blood-letting 8-10 drops	Acupuncture and blood-letting
Kong et al (2015) [20]	Explore the neural activity of acupuncture point LI4, ST6 and sham point for sequelae of Bell's palsy	LI4, ST6, Sham point		Transcutaneous electrical acupoint stimulation (TEAS)
Guan et al (2012) [22]	Explore the effects of moxibustion thermal stimulation on acupuncture point LI4 for Bell's palsy	LI4		Moxibustion

Table 3. - continued

Lei et al (2010) [23]	Explores the safety of acupuncture treatment for Bell's palsy during pregnancy.	BL2, Taingyang, ST4, Shangneidicang, Xiangneidicang, LI20, SI18, ST36, on both sides.	Moxa sticks were applied to GB14, ST4	Acupuncture plus moxa sticks
Wong et al (2007) [25]	Explores the management of a chronic case of a Bell's palsy.	LI20, ST2, ST3, ST4, ST6, ST7, SI18, BL2, TE17, TE23, GB14, GV26, CV24, EX-HN5, EXHN16	LI11, ST36, ST40, SP6, SP10, HT8, SI3, BL67, PC8, TE5, LR3.	Acupuncture to achieve De qi
Cho et al (2013) [19]	Explore the effectiveness of Jung-an acupuncture treatment for sequelae of Bell's palsy	ST3, ST4, ST6, ST7, ST8, BL2, SI18, GB7, GB10, GB14, TE20, TE23	Treated according to the affected area	Acupuncture to achieve De qi
Jie Zhu et al (2017) [27]	Explores a case of a child with the traumatic emotional problem causing Bell's palsy	ST4, ST6, ST7, GB14, LI4, TE17.		Acupuncture to achieve De qi

Risk of Bias of Studies Included in the Meta-analysis

After reviewing the Meta-analysis, Figure 2 shows the risk of bias of the studies among the five RCTs analyzed above, in random sequence generation (selection bias) 60% of the study showed low risk of bias meanwhile 40% of the study showed high risk of bias, in allocation concealment (selection bias) 40% of the study showed low risk meanwhile 40% of the study showed high risk, in blinding of participants and personnel (performance bias) 20% of the study showed low risk meanwhile 60% of the study showed high risk, in blinding of outcome assessment (detection bias) 20% of the study showed low risk meanwhile 60% of the study showed high risk, in incomplete outcome data (attrition bias) 60% of the study showed low risk meanwhile in selective reporting (reporting bias) showed 60% of the study showed low risk.

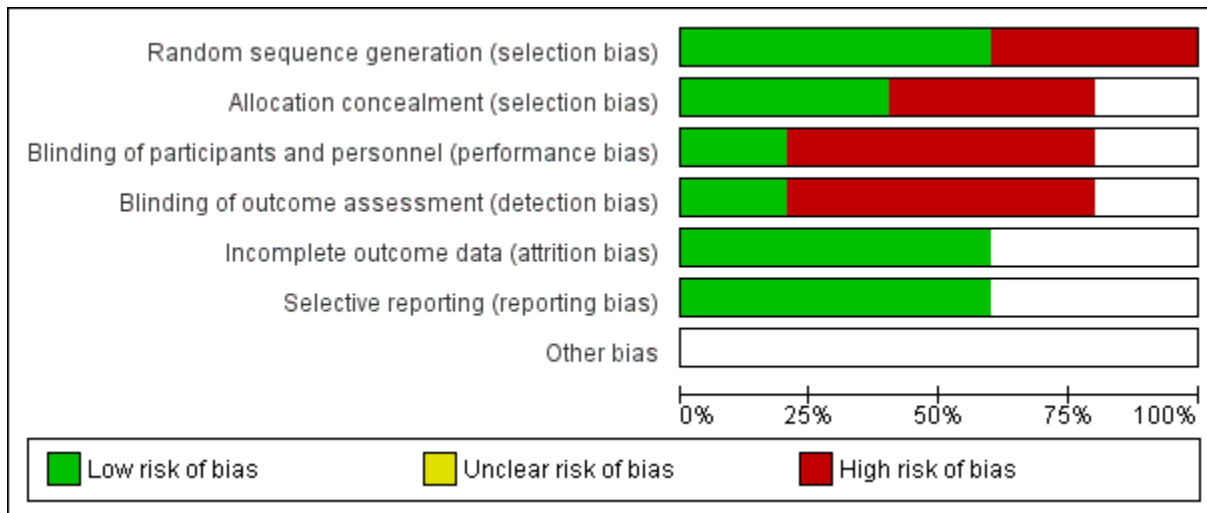


Figure 2. Risk of bias graph: review of authors' judgements about each risk of bias item presented as percentages across all included studies.

The Risk of bias summary of the studies in Figure 3 shows that among the five RCTs included, Xue et al showed most reliable results with the lowest risk of bias and Kwon et al also showed relatively reliable results with lower risk of bias. Rest of the studies were found to have higher risks of bias and inconsistent outcome measurements. However, both studies Xue et al and Kwon et al have measured their outcomes by using FDI physics and FDI social scores. Therefore, these 2 studies were found to be more suitable and chosen for meta-analysis.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Guan et al 2012	⊖	⊖	⊖	⊖	⊕	⊕	
Kong et al 2015	⊕		⊖	⊖	⊕	⊕	
Kwon et al 2015	⊕	⊕				⊕	
Xu et al 2013	⊕	⊕	⊕	⊕	⊕		
Zhao et al 2010	⊖	⊖	⊖	⊖			

Figure 3. Risk of bias summary: review of authors' judgements about each risk of bias item for each included study.

Synthesis of Outcome Measurement

Synthesis of Outcome FDI Physics

The overall finding of RTCs involving 377 patients, among them, experimental group of 193 patients and control group of 184 patients, suggested that acupuncture treatment had beneficial effects in treating Bell's palsy. The result of FDI Physics shows significant improvement by acupuncture treatment: ($n = 377$; $SMD [95\% CI] = 11.39 [-6.26, 29.05]$, $p = 0.005$; $Chi^2 = 8.04$, $df = 1$, $I^2 = 88\%$). (Figure 4)

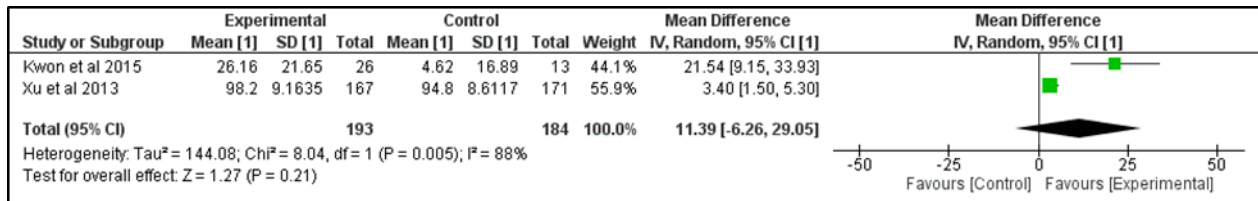


Figure 4. Forest plot of comparison: 1 House-Brackmann Grade, outcome: 1.3 FDI Physics [1].

Synthesis of Outcome FDI Social

The overall finding of RTCs involving 377 patients, among them, experimental group of 193 patients and control group of 184 patients, suggested that acupuncture treatment had beneficial effects in treating Bell's palsy. The result of FDI Social shows significant improvement by acupuncture treatment: ($n = 377$; $SMD [95\% CI] = 14.21 [-2.52, 30.94]$, $p = 0.001$; $Chi^2 = 10.41$, $df = 1$, $I^2 = 90\%$). (Figure 5)

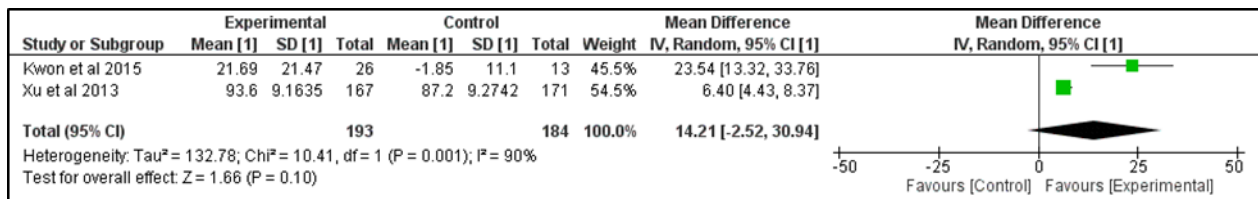


Figure 5. Forest plot of comparison: 1 House-Brackmann Grade, outcome: 1.4 FDI Social [1].

IV. DISCUSSION

Total of 573 participants were participated from nine studies: five randomized controlled trails and four case studies. Each study used different types of acupuncture such as regular acupuncture, electroacupuncture, blood-letting technique and moxibustion. Two most frequent type of acupuncture were electroacupuncture and acupuncture with moxibustion.

Kwon et al (2015) stated that local effects of acupuncture in stimulating nerve fibers in the skin and muscle, the psychosomatic effects of acupuncture on the autonomic nerve system by regulating qi probably contributed to the improvement of other outcomes such as the FDI social score. The stimulation of local nerve fibers on skin and muscles promotes and regulates the circulation of qi contributing to the better movement of the face leading to the reduction of inflammation in the area also acupuncture can promote healing in the body through strengthening the immune system through tonifying method. Especially in this study local points ST1, EX-HN4 (Yuyao), TE23, LI20 were used to stimulate De Qi sensation and distal area points TE17, ST9, LI10, LI4, ST36, GB34 were used to tonify the body with the reinforcing method. Although there were positive outcomes of this study, the population size and length of this study results were too ambiguous to draw a definite conclusion of the effects on Bell's palsy but can help us to understand and have an objective view of the mechanism of acupuncture as a possible alternative treatment method.

According to Zhao et al, most cases of the acute stage of Bell's palsy is of the excess type 2010 excess yang in the body or heat accumulation remains in the Yangming channels of stomach meridian and wind-cold is most likely to be transformed into heat because of excessive yang and stagnation of pathogens. Since the three Foot-yang meridians and Hand-Yangming meridian, all end in the face which pathogens of Bell's palsy is located on the face, points of

these meridians are selected. In the case of wind-heat TE1 (Guanchong) and point of ear apex are used to remove wind and expel heat. In this study wind-heat cases of Bell's palsy, blood-letting showed much better result than with acupuncture alone, based on the principle of excess and deficiency, tonifying deficiency and reducing the excess by strong stimulation of meridian points in this case even blood-letting on these two points with a three-edged needle can help expel wind-heat and reduce fire to stop pain.

According to Kong et al (2015), the TCM theory of pathway of meridians which Large intestine and Stomach channels lead to the region of the facial area, which means that by specifically targeting acupoints LI4 and ST6 can significantly help to treat the condition of Bell's palsy. Based on these findings it is worth to conduct more clinical studies for a better understanding of the mechanism of specific correlation between the orofacial area and TEAS stimulation of LI4 and ST6. The acupuncture point, large intestine 4 (LI4) also known as He Gu is the yuan point of the large intestine channel of hand yangming and command point of the head and face. LI4 is located on the midpoint on the radial side of the second metacarpal bone. The pathway of the large intestine channel goes through the cheek and crosses the opposite channel at the philtrum. Stomach 6 (ST6) is a point of the stomach channel hand-yangming in the facial area which is located at the belly of the masseter muscle with teeth clenched, one finger width anterior and superior to the angle of the mandible and often used for the local point for Bell's palsy. By overserving and comparing Table 3 and Figure we can determine that LI4 and ST6 acupoints showed more specific and extensive activities in the brain than the sham point which may help confirm the therapeutic effects of acupuncture for Bell's Palsy. Transcutaneous electrical acupoint stimulation (TEAS) is an electrical stimulation method that uses skin electrodes to input specific low-frequency pulse into the acupoints to treat diseases. As we

progress with new technology, neuroimaging such as functional magnetic resonance imaging (fMRI) has been used to investigate the neurophysiologic mechanism of acupuncture which is generally agreed that the brain and nervous system play a role in processing acupuncture stimuli in the brain. [20]

According to Guan et al (2012) Infrared thermography (IRT) has emerged as a new technology used to observe different levels of temperatures in body regions. The theory behind the IRT is the autonomic nerve system and vasodilation. The temporal, facial, carotid vein and arteries are spread around the face area. Acupuncture is believed to activate the sympathetic and parasympathetic regulation of vasodilation and promoting blood flow in the facial area as well as repair and regeneration of facial nerves and muscles in Bell's palsy patients. [22]

Especially in TCM, the application of moxibustion in acupoint point LI4 (Hegu) has been known to increase the temperature in the mouth area and acupoint GB37 (Guangming) promoted an increase in temperature eye area benefiting the eyes. [22] By observations in this study application of moxibustion in LI4 (Hegu) acupoint triggers a targeted thermal effect promoting a rapid raising of temperature in three main areas of the face affected by Bell's palsy especially in the mouth, nasal ala and corner of the mouth.

The control group of healthy people before moxibustion treatment, facial IRT showed high temperatures at the forehead, inner canthus, nasal ala, and mouth corner, and low temperatures in both cheeks; after moxibustion treatment on LI4 showed high temperatures at the forehead, inner canthus, nasal ala, and mouth corner but low temperature at bilateral cheeks with good symmetry in bilateral temperature, a T-shaped "hot area" was formed.

Bell's Palsy group showed asymmetric where the temperature of the affected side was higher. In this group of patients with higher temperatures on the affected side, the temperature at the unaffected side was increased in 25/30 subjects with asymmetry of bilateral temperature after moxibustion treatment on LI4. Also, second Bell's Palsy group showed asymmetric where the temperature of the affected side was lower. In this group of patients with low temperature on the affected side, the temperature at the low-temperature was increased in 5/30 subjects with asymmetry of bilateral temperature after moxibustion treatment on LI4.

The facial temperature for both the control group and Bell's palsy group has increased in forehead, inner canthus, pars zygomatica, nasal ala, around lip area; however, in Bell's palsy group the temperature on affected side is slightly higher based on this evidence moxibustion not only improve circulation on the whole face area but targeted areas, especially on the affected area such as around lips in Bell's palsy patients. This study helps to prove the mechanism of moxibustion by improving the overall balance of the temperature in Bell's palsy patients.

According to Cho et al (2013) Jung-an acupuncture is one of the methods used for facial "beauty" acupuncture. Jung-an means to restore or correct the unbalance, in this case, in the face area. Also, this method uses the meridian and collaterals to free up the qi stagnation in the body to resolve phlegm and dampness used in wrinkles and skin disorders such as acne. This method of acupuncture focuses on using many points on the local area with a 0.16x0.30mm gauge needle to balance the asymmetric face improving the appearance and stiffness scale. The cases here mentioned above were evaluated by the Yanagihara Score and Peitersen Grade which is equivalent to House-Brackmman and Sunnybrooks facial grading systems. As we see the results all four cases had positive outcomes. Jung-an acupuncture has helped significantly improve the overall Y-system scores. Especially, this method of acupuncture helps improve balance in the

face as shown in the figures of before and after pictures. Patients on paralysis often complain and conscious about the face disfiguration and balance of the face which not only affects the movement and discomfort and pain but relatively affect the psychological level of the patients. By recovering the facial balance, patients feel more confident about their appearance improving the score of balance and movement. Out of 4 individual cases, all 4 cases showed improvement as we can see in the figure of before and after treatment, especially in the lip area.

According to Lei et al (2010), Bell's palsy during pregnancy can be very hard for the mother psychological fear of possible side effects of medications and the physical disfiguration of nontreatment can cause extreme anxiety and stress leading to poor appetite and difficulty eating which in turn can affect the growth of the fetus and possibly resulting in premature birth and fetal hypoplasia. Also, Bell's palsy may increase the risk of hypertension and toxemia in pregnancy. It is important to address this issue and explore the possible alternative methods of treatment. Acupuncture stimulation has been known to increase the diameter and blood flow velocity of the peripheral arterioles enhance microcirculation and improve the state of the afferent and efferent links of the neuromuscular system. [23] Fortunately, in this particular case, the patient recovered almost to 100% by the end of the first week of treatment. This is confirmed by the before and after pictures of the treatment. The patient was able to close her left eye tightly, wrinkle the left side of the forehead and left and right eyebrow was evenly balanced with normal facial movements. This study was limited to a single case but the effects of the treatment were promising, a larger scale clinical control study could benefit many pregnancy patients with Bell's palsy.

Wong et al (2008) is a chronic case of Bell's palsy where a 15 years old girl had this condition for 7 years. This patient presented a history of absence seizure since 2000 and obesity

with (body mass index of 29.9) also although she is not a diabetic, she has a long family history of type 2 diabetes. At the time of acupuncture her eyes were asymmetric with the right eye smaller and synkinesis was present when she blinked her eyes, there was an involuntary twitching of mouth at the right side. Initially, Bell's palsy occurs due to acute etiology wind-cold or wind-heat and chronic conditions occur mainly due to conditions such as qi and blood stagnation and blockage by phlegm in the meridians and collaterals since weakness can cause slow movement of the Qi. According to Internal classic, abnormal functioning of Stomach Meridian may cause "skewed eye and mouth" which suggested that improper diet can cause Bell's palsy. By observing the age and medical history of this patient of obesity and family history of diabetes are more prone to Bell's palsy and improper diet can lead to malnutrition which in turn weakened immune system this could cause a sudden condition of attack of Bell's palsy. Acupuncture treatment in this case not only focuses on local area but distal points such as ST36 and ST40 tonifies the Stomach channel and also LI4 and LIV 3 (Four Gates) which helps with the circulation of Qi. Although acupuncture treatment didn't completely cure this chronic case of Bell's palsy continuous treatment 2 months treatment still improved 1 HBS grade level. In a patient perspective as being a 15-year-old female, this improvement significantly helped both emotional and psychological health as well.

According to Jihe Zhu et al (2017), Children are often vulnerable to physical and emotional stress this can have a significant impact on their immune system. It is common knowledge that when the immune system is low our body can be easily invaded by internal and external pathogenic factors. Especially, in this case of an 8-year-old boy, he was under fearful and stressful condition. In order to improve the immune system, in this case, acupuncture helped him to expel pathogenic factors, eliminate obstruction, relieve stress and improve circulation of qi

and blood. Just like in a dentist, acupuncture can be a little intimidating for children but careful insertion by trained professional treatment is just as effective in treating adults.

In Kwon et al (2015) and Xu et al (2013), discussed about the efficiency of acupuncture by comparing Bell's palsy patients treated with acupuncture versus a waiting group with no acupuncture treatment. This study showed that the FDI (Facial Disability Index) Physical function score improved by 11.4% and FDI Social function score improved by 14.2%. From the acupuncture treatment group, six out of nine patients with House-Brackmann grade moderately severe to severe dysfunction (4-5) showed improvement to mild to moderate dysfunction (2-3) after 8 weeks of treatments.

In Cho et al (2013), Juan-an acupuncture was effectively used to help cases of Bell's palsy. This method was developed to focus on balancing the symmetry of the face. This method is often called "Beauty" acupuncture due to its effectiveness to correct unbalance of the face. One curious fact is that one of the measurements used to evaluate the most beautiful people in the world is how balanced the symmetry of the face. People perceive that face with more balanced symmetry is considered "gorgeous". There is a saying that beauty is in the "eyes of the beholder" but outside perception of the first impression can be affected emotionally for Bell's palsy patients.

Since Bell's palsy involves the asymmetry of the face it was only natural that this method was incorporated to treat this condition. In theory, if your face is unbalanced toward one side, the qi and blood flow can be affected causing stiffness and pain in the face, lacrimation on the eyes referred to as "crocodile tears", stuffy nose, and even speech impairment. This method of acupuncture focuses on to correct the balance of the face left and right side can improve the

overall flow of the qi and blood on the face by strategically chosen acupoints according to the location of the where unbalance occurs.

In Kong et al (2015), it explores the principles of stimulation of De qi by observing the fMRI results of acupuncture points LI4, ST6, and Sham points through transcutaneous electrical acupoint stimulation (TEAS) which showed larger trigger area of the brain by using the acupuncture points rather than a local sham point area. Brain regions were divided into superior, middle, inferior areas, and frontal and posterior areas. As we can see in figures 10 and 11, compared with the resting state, TEAS at the LI4 and ST6 acupoint triggered stronger and larger area of the brain than sham point area and also with stimulation right LI4 and left ST6 acupoints broad and overlapping area were triggered by acupoints than sham point area. The results of this study may confirm the central mechanism behind the meridian and collateral theory of acupuncture.

Another theory in TCM in Bell's palsy is an excess condition of wind-heat and severe wind-cold turning into heat. Excessive stagnation in Yangming and Shaoyang meridians can manifest through the hot feeling on the face area causing pain and stiffness in the area. In these cases, the principle method is not only needling the local points but need to expel the pathogenic wind-heat. The acupoint TE1 and ear apex can remove the wind and purge heat by the bleeding method. In Zhao et al (2010), it discusses the effectiveness of the blood-letting technique for the excess case of a wind-heat condition where acupuncture combined with bleeding 8-10 drops of blood in TE1 acupoint showed better results than just acupuncture treatment. In the acute cases of wind-heat, the blood-letting method showed better results than acupuncture alone. The total effective rate in the blood-letting group was 94% versus 78% in the control group. This shows that acupuncture is still effective in most cases but in the case of the wind-heat syndrome in the

acute stage combination of the blood-letting method can produce better results. This can be explained by the TCM theory where heat in the blood can be expelled by the blood-letting which relieves not only clears heat but pressure and stagnation build up in the local area causing stiffness pain.

In Wong et al (2007) and Jihe Zhu et al (2017), discusses the deficiency cases where children due to their weak immune system and weak mind where they can't deal with stress and emotions; pathogenic factors can easily invade the medians and collaterals susceptible to Bell's palsy. And asymmetry of the face can even lead to depression where children can be mistreated or bullied at school because of their appearance. In these cases, most often children don't respond well to drug treatments. They are prone to side effects such as nausea, vomiting, fever, anxiety, insomnia, etc.... and most parents are also worried about putting their children through drug treatments. Acupuncture under a professional practitioner and careful supervision can be very effective for children with Bell's palsy. Children can be afraid of needles and cry time to time due to little pain but with less stimulation and careful needling after a couple of sections of treatment, they are more than willing to get treatment. In case 6, there was a good response for the treatment and visual signs and symptoms were all improved and in case 5 due to the timing of 7 years history, there was 1-grade House-Brackmman level improvement.

In Lei et al (2010) and Guan et al (2012) reports attack of wind-cold. Lei et al (2010) reports about the pregnant patient with a sudden wind cold and due to the nature of pregnancy condition, her immune system was weakened which can be easily attacked by excess conditions. Also, in this case, patients are reluctant to take any kind of medication afraid that something might happen with the baby so they tend to not seek any type of treatment. As alternative method acupuncture came in handy in this case by tonifying supplemental points and warming the local

area by moxa sticks it was very helpful almost completely healing the patient. In Guan et al (2012), reports about the warming of LI4 point with moxibustion through facial IRT which provides more insight where the command point of the face LI4 can help invigorate the cold area with heat. This can improve the overall asymmetry experienced by Bell's palsy patients.

Main acupuncture points used for Bell's palsy were the local area such as eyes, cheeks, nose, corner of the lips, points such as ST4, ST6, ST7 used in all six cases, BL2, GB14, LI20, TE23 were used in 4 cases, LI4, TE17, SI18 were used in 3 cases and ST36 was used in 2 cases. Each of the case studies focuses on acupuncture points in terms of stimulation De qi to promote healing by circulation of qi and targeted their TCM etiology by excess and deficient conditions.

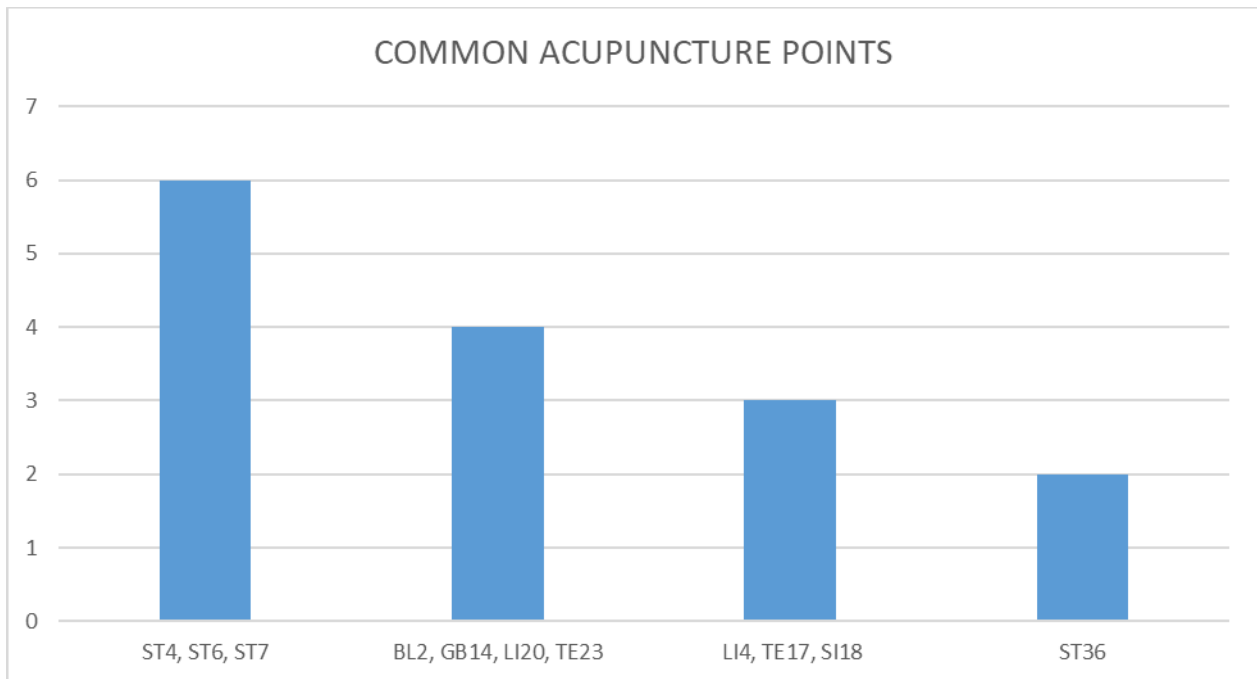


Figure 6. Most common acupoints used.

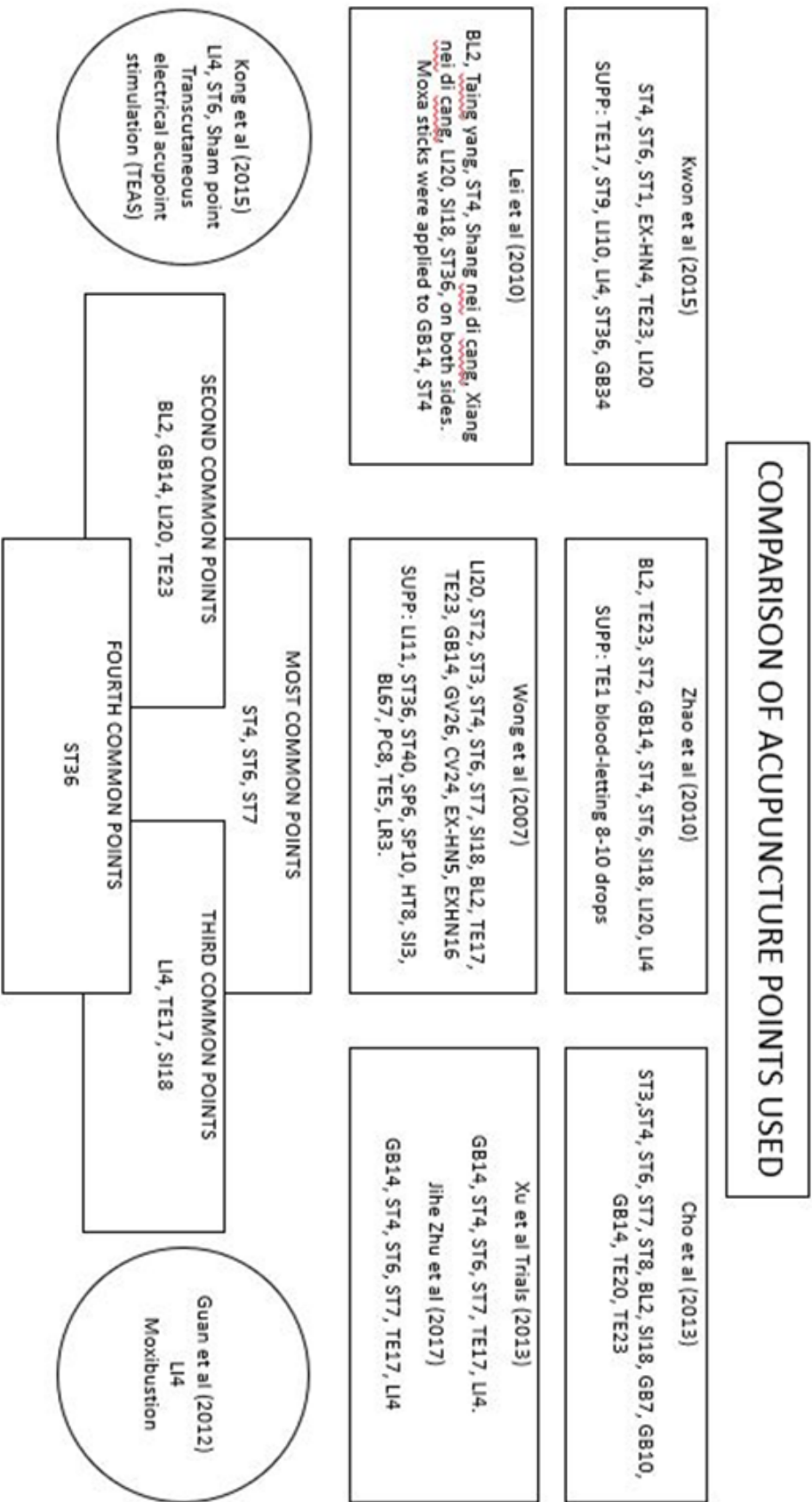


Figure 7. Most common acupoints used.

Proposed Acupuncture Protocol and Herbal Formula

Based on the must be focused on the main acupuncture points in the local area such as eyes, cheeks, nose, corner of the lips, points such as ST4, ST6, ST7, BL2, GB14, LI20, TE23, TE17, SI18 in terms of stimulation De qi to promote healing by circulation of qi and targeted their TCM etiology by excess and deficient conditions.

The distal points such as LI4 and LIV3 have been mentioned in many studies. LI4 as being a command point of the face; it can help stimulate the facial muscle of the face. Along with LIV3 which the combination is known as 4 gates can promote better circulation also alleviating stress and add ST36 to strengthen overall qi energy and ST40 to resolve phlegm. In wind-cold conditions, moxibustion can promote the vasodilation of facial arteries and veins. In wind-heat condition incorporate the blood-letting technique in TE1 and ear apex to clear heat and alleviating pain.

Use of herbal formula Qian Zheng San (lead to Symmetry powder) is recommended for Bell's Palsy which originate from wind-stroke from wind-phlegm attacking on the meridian and collaterals with head, face symptoms and sudden facial paralysis with deviation of eyes and mouth, facial muscle twitch. This formula is consisted of following herbs:

Bai Fu Zi: Dries Dampness, transforms Phlegm, expels Wind and stops spasms.

Jiang Can: Extinguishes Wind, transforms Phlegm and stops spasms and convulsions,

Quan Xie: Extinguishes Wind, stops tremors and convulsions, unblocks the collaterals and stops pain. (equal amounts into powder 3 doses w/ wine decoction w/ 6g each).

Limitations

There are several limitations on this review. Although there were many RCTs related to Bell's palsy, not many objective trials done about the effectiveness of acupuncture treatment. Most RCTs related to the effectiveness of acupuncture treatment used different outcome measurements, studies with standardized outcome measurements were also limited. Thus, to overcome these limitations and minimize the risk of bias, individual case studies were included to further show the effectiveness of acupuncture treatment according to their conditions along with meta-analysis for a comprehensive review of effectiveness of acupuncture treatment for Bell's palsy.

V. CONCLUSION

This literature review has reached following conclusion that acupuncture treatment is effective in treating Bell's Palsy.

From the meta-analysis, among the total of 377 patients (183 patients in control group and 193 patients in with Bell's Palsy); in Bell's Palsy group showed FDI (Facial Disability Index) Physical function score improved by 11.39 [-6.26, 29.05], ($p = 0.005$), and FDI Social function score improved by 14.21 [-2.52, 30.94], ($p = 0.001$) compared to control group.

From the comprehensive literature review including the meta-analysis and case studies, acupuncture points effective for Bell's palsy are as follows: main points ST4, ST6, ST7, BL2, GB14, LI20, TE23 and supplemental points LI4, TE17, SI18 ST36 were effective in treating Bell's palsy.

The results of meta-analysis and cases studies reviewed showed improvements however, there were difficulties in determining the effectiveness of acupuncture due to the lack of standardized outcome measurements. Therefore, it is imperative that standardized outcome measurements tools need to be implemented and long-term follow up and in-depth studies are suggested to determine the accuracy of effectiveness of acupuncture.

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APPENDICES

APPENDIX 1. House-Brackmann Grade

HBS	Grade
I	Normal, symmetrical function in all area
II	Slight weakness on close inspection, complete eye closure with minimal effort, slight asymmetry of the smile with maximal effort, slight synkinesis, absent contracture or spasm
III	Obvious weakness but not disfigurement, inability to lift the eyebrow, complete and strong eye closure, asymmetrical mouth movement with maximal effort, obvious but not disfiguring synkinesis, mass movement, spasms
IV	Obvious disfiguring weakness, inability to lift the brow, incomplete eye closure, asymmetry of mouth with maximal effort, severe synkinesis, mass movement, spasms
V	Motion barely perceptible, incomplete eye closure, slight movement at the corner of mouth, synkinesis, contracture, usually the absence of spasm
VI	No movement, loss of tone, no synkinesis, contracture, spasm

APPENDIX 2. Facial Disability Index (FDI) Physical

Physical Function

1. How much difficulty did you have did you have keeping food in your mouth, moving food around in your mouth, or getting food stuck in your cheek while eating?

Usually did with: 5 – no difficulty, 4 – a little difficulty, 3 – some difficulty, 2 – much difficulty

Usually did not eat because: 1 – of health, 0 – of other reasons

2. How much difficulty did you have drinking from a cup?

Usually did with: 5 – no difficulty, 4 – a little difficulty, 3 – some difficulty, 2 – much difficulty

Usually did not drink because: 1 – of health, 0 – of other reasons

3. How much difficulty did you have saying specific sounds while speaking?

Usually did with: 5 – no difficulty, 4 – a little difficulty, 3 – some difficulty, 2 – much difficulty

Usually did not speak because: 1 – of health, 0 – of other reasons

4. How much difficulty did you have with your eye tearing excessively or becoming dry?

Usually did with: 5 – no difficulty, 4 – a little difficulty, 3 – some difficulty, 2 – much difficulty

Usually did not tear because: 1 – of health, 0 – of other reasons

5. How much difficulty did you have with brushing your teeth or rinsing your mouth?

Usually did with: 5 – no difficulty, 4 – a little difficulty, 3 – some difficulty, 2 – much difficulty

Usually did not brushing or rinsing because: 1 – of health, 0 – of other reasons

APPENDIX 3. Facial Disability Index (FDI) Social.

Social Function

6. How much of the time have you felt calm and peaceful?

6 – all the time, 5 – most of the time, 4 – a good bit of the time, 3 – some of the time

2 – a little bit of the time, 1 – none of the time

7. How much of the time did you isolate yourself from people around you?

6 – all the time, 5 – most of the time, 4 – a good bit of the time, 3 – some of the time

2 – a little bit of the time, 1 – none of the time

8. How much of the time did you get irritable toward those around you?

6 – all the time, 5 – most of the time, 4 – a good bit of the time, 3 – some of the time

2 – a little bit of the time, 1 – none of the time

9. How often did you wake up early or wake up several times during your nighttime sleep?

6 – all the time, 5 – most of the time, 4 – a good bit of the time, 3 – some of the time

2 – a little bit of the time, 1 – none of the time

10. How often has your facial function kept you from going out to eat, shop, or participate in family or social activities?

6 – all the time, 5 – most of the time, 4 – a good bit of the time, 3 – some of the time

2 – a little bit of the time, 1 – none of the time

APPENDIX 4. Yanagihara's Unweighted Grading System (Y-system)

Number	Scale of rating	Scale of three rating
1. at rest	0 1 2 3 4	0 2 4
2. Wrinkle at forehead	0 1 2 3 4	0 2 4
3. Blink	0 1 2 3 4	0 2 4
4. Closure of the eye lightly	0 1 2 3 4	0 2 4
5. Closure of the eye tightly	0 1 2 3 4	0 2 4
6. Closure of eye on the involved side only	0 1 2 3 4	0 2 4
7. Wrinkle nose	0 1 2 3 4	0 2 4
8. Whistle	0 1 2 3 4	0 2 4
9. Grin	0 1 2 3 4	0 2 4
10. Depressed lower lip	0 1 2 3 4	0 2 4

APPENDIX 5. The Scale of Peitersen

Grade	Palsy	Contraction	Synkinesis
0	None	None	None
I	Slight	Just visible (<1 mm)	None
II	Moderate	Clearly visible	Visible
III	Severe	Disfiguring	Marked
IV	Complete	None	None

APPENDIX 6. Synkinesis assessment questionnaire (SAQ)

Question	1	2	3	4	5
When I smile my eye closes					
When I speak, my eye closes					
When I whistle or pucker my lips, my eye closes					
When I smile, my neck tightens					
When I close my eyes, my face gets tight					
When I close my eyes, the corner of my mouth moves					
When I close my eyes, my neck tightens					
When I eat, my eye waters					
When I move my face, my chin develops a dimpled area					
Total synkinesis score: the sum of scores 1 to 9 / 45 x 100					

1	2	3	4	5
Seldom or not at all	Occasionally or very mildly	Sometimes of mildly	Most of the time or moderately	All the time or severely